Faculty of Business and Law

Accounting for Nuclear Power Plants under IFRS: A Global Perspective

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ABSTRACT

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Nuclear energy provides almost 10% of the global electricity production. *Albeit* the increasing reliance on nuclear power plants to derive energy in the prior fifty years, accountability in the financial statements still remains a challenging area. Since the withdrawal of IFRIC-3 *Emission Rights* in 2005, a wide-range of accounting treatments for the classification and recognition of carbon emission allowances are being practiced worldwide. Additionally, most companies have completely disregarded accounting disclosures on this area. Ambiguous accounting practices has jeopardised qualitative characteristics of useful financial information and withheld crucial information from wider-stakeholders.

This research filled the gap in the literature by outlining the global accounting practices of the owners of nuclear power plants that follows IFRS standards. Accounting treatments for carbon emission allowances are benchmarked with nuclear fuel and asset retirement obligations for relative analysis. Materiality and consistency were tested to understand the significance of the accounting issue. To offer a broader viewpoint, an equal sample of NON-IFRS entities has also been used for comparative benchmarking. This study analysed the motivation behind the voluntary accounting treatments and disclosures in the absence of official guidelines.

By adopting a mixed-methods research approach and using content-analysis technique on the annual reports and interview responses, this study has found intriguing results.

Based on a minor global trend, carbon emitters have switched their accounting criteria from intangible assets to inventory method for purchased emission allowances. However, the interviewed experts supported intangible assets criteria similar to the withdrawn IFRIC-3 guidelines. Multiplicities in accounting treatments among the IFRS sample was higher than the NON-IFRS sample. The level of non-disclosures has continued to ascend, incurring transparency and comparability issues in accounting. Despite the material significance of emission allowances, disclosures were poorly presented due to the poor attention by accounting bodies. Lack of awareness for carbon emission allowances dominated the industry. Results revealed that coercive and normative pressures are more likely to result in coherent disclosures than material significance all alone.

Keywords: Carbon Emission Allowances, IFRIC 3, EU-ETS, Institutional Theory, Nuclear Power Plants.

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LIST OF ABBREVIATIONS AND ACRONYMS

ACCA	Association of Chartered Certified Accountants
BBC	British Broadcasting Company
CO2	Carbon dioxide
CSR	Corporate Social Responsibility
EBITDA	Earnings Before Interest and Tax, Depreciation and Amortisation
EFRAG	European Financial Reporting Advisory Group
EITF	Emerging Issues Task Force
EU	European Union
EUA	European Union Allowances
EU ETS	European Union Emission Trading Scheme
FASB	Financial Accounting Standards Board
FERC	Federal Energy Regulatory Commission
FIFO	First In First Out
FRC	Financial Reporting Council
GAAP	Generally Accepted Accounting Principles
GHG	Greenhouse Gases
IAEA	International Atomic Energy Agency
IAS	International Accounting Standards
IASB	International Accounting Standards Board
ICSID	International Centre for Settlement of Investment Disputes
IETA	International Emissions Trading Association
IFRIC	International Financial Reporting Interpretations Committee
IFRS	International Financial Reporting Standards
NFPM	Non-Financial Performance Management
NRC	National Regulatory Commission

PBT	Profit Before Tax
PPE	Property, Plant and Equipment
SEC	Security and Exchange Commission
US DOE	United States Department of Energy
US GAAP	United States Generally Accepted Accounting Principles

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I. INTRODUCTION

Following the techniques governed by the leading accounting body, the International Financial Reporting Standards (IFRS); financial accounting for nuclear power plants has still remained with numerous unanswered and ambiguous issues. They play a prominent role in emitting greenhouse gases (GHG) considering the lifecycle analysis, due to their involvement in the carbon emission markets. IFRS has remained officially silent since 2005, after the removal of its latest accounting interpretation IFRIC-3 *Emission Rights* (IASB, 2005), and issued no specific direction towards the financial accounting for carbon emission allowances (Lovell, et al., 2011; PWC/IETA, 2007; Romic, 2010).

Because the lifecycle of a power station is dependent upon various elements, from uranium extraction for nuclear fuel leading to its deconstruction, demolition and restoration of the land to its original condition; emissions are created throughout the operational life of a power plant (Quirk, 2014). Accounting for carbon emission allowances is a crucial and challenging aspect, that necessitates special instructions by the accounting bodies. Without the presence of any official accounting regulation at present, carbon emitters are allowed to adopt any accounting policy that in their judgement would provide more relevant and reliable picture of a company's accounts. Multiplicities in accounting practices were found, which makes it difficult for key stakeholders and investors to make crucial financing decisions (Allini, Giner and Caldarelli, 2018; Mookdee, 2013). Not only that, disclosures remained voluntary, that have largely been overlooked by the carbon emitting companies (Warwick and Ng, 2012). Allowances are rights, that allows the emitter to release up to a tonne of carbon-dioxide or equivalent toxic gases in the air (EU ETS Handbook, 2015). These allowances are granted by the regulators to certain entities as gratis, but also have an active trading marketplace, which makes them a marketable commodity (Fornaro, Winkelman and Goldstein, 2009). Literature has heavily criticised the absence of authoritative guidelines that are deemed to be the chief reason for comparability and transparency issues in financial reporting (Montero, Calderon and Dias, 2020).

Therefore, outlining the continuing industrial practice with regards to the classification and recognition of carbon emission allowances in the financial statements, is the chief aim of this study. It followed by the experts' opinion on a possible accounting alternative. Because

of the high level of non-disclosures related to emission allowances (as reported in the literature), this study aims to find the principal motives of the emitters behind their disclosure practices. It is to understand whether institutional pressures or other circumstances have played a role in determining voluntary disclosures in the absence of an official accounting standard. Accounting treatments for carbon emission allowances are benchmarked against nuclear fuel and decommissioning liabilities to understand the companies' financial reporting pattern. This study aims to outline whether the qualitative characteristics of useful financial information were being practised by the owners of nuclear power plants. Experts' opinion will also help in defining the elements of a good accounting practice for entities dealing with emerging issues, without an official accounting guidance.

1.1. Background

In 1973, William L. Ureel stated that the emerging advancements in the nuclear energy sector to meet the electric power demands would soon require accountants' technical services. They must get prepared to face numerous complications to perform their services shortly for the owners of nuclear power plants (Ureel, W.L., 1973). Nuclear energy has become the main ingredient in worldwide electricity production in the last five decades, presently contributing approximately 10% towards the global electricity division (World Nuclear Association, 2021).

The lifecycle of a nuclear power plant is responsible for emitting a high amount of carbon into the atmosphere, making the Earth warmer than ever before. Greenhouse Gases (GHG) emitted from these reactors has been increasing the planet's temperature and alarming climate-change scientists (Sanctis, Monti and Ripani, 2016; Fazekas, 2009).

Businesses have faced a series of difficulties because of the development of carbon markets; however, accounting for carbon emissions is conceivably the lesser-known subject in financial accounting (Ayaz, 2017). The accounting techniques to recognise emission allowances in the annual report is still a work-in-progress by the European Union experts at carbon trading, who has been dealing with this issue for at least a few decades. On the other hand, carbon-emitting American corporations have only recently begun to grapple with the complex financial accounting issues related to this unexplored market. Besides, with the continuous expansion of the carbon markets with the combination of new elements, an increasing number of accounting issues will continue to materialise.

In order to tackle the rising GHG emissions level, the United Nations intervened in 1997 with the development of a global treaty, the Kyoto Protocol (Jackson, 2009), a pact to tackle climate-change and the rising issues of warming of the Earth because of carbon emissions. Its purpose was to legally bind member countries and parties to reduce GHG levels, which became effective in 2005 (Austin, n.d).

Using the Kyoto Protocol as a foundation, members of European states came up with a brilliant arrangement, namely, the European Union Carbon Emission Trading Scheme (EU ETS) to address the climate change issues (Taticchi, Carbone and Albino, 2013). However, it has generated various complexities, and possibilities for all participating organisations, including the regulators. The aim behind EU ETS is to convey a clear message to the carbon emitters; it is now time to pay for the harmful carbon footprints on to the environment (Bebbington and Larrinaga, 2008). The scheme is designed to achieve a dynamic and useful reduction in greenhouse gases by putting a price towards the carbon credits. Additionally, offering carbon emission allowances for corporations that are acting responsibly and considering trading their allowances in the market (Cook, 2009).

The first and the most significant carbon emissions market across the globe, EU ETS operated by thirty-one European countries, is based on Europe's strategy to battle climate-change by diminishing GHGs as efficiently and cheaply as possible. The reduction in the emissions level was distributed into various stages starting with initial Phase I on 1st January 2005 to build an essential foundation and awareness of carbon trading. After the first three years of the introductory cycle, Phase II started on 1st January 2008 that matched the first promise of the Kyoto Protocol in five years (Ellerman and Buchner, 2008; Giner, 2014). The scheme has been operating in its pivotal Phase III that started on 1st January 2013 to and ended in December 2020. Finally, a ten-year Phase IV started in January 2021, following the aim to accomplish a 43% cutback in comparison with the 1990 levels, before the end of the phase by 2030 (Europa, 2021a).

Carbon emission markets evolved actively right from the beginning. As per the World Bank, carbon-trading figures soared at an alarming rate. Between 2005 and 2007, carbon allowances traded from 321 million to 2.1 billion, respectively. The volume tripled to 6.3 billion in 2009 before reaching the highest level of almost 8 billion allowances during the year 2012, valued at fifty-six billion euros (Europa, 2021b). The scheme prevailed the vital player status in the global carbon emissions market by accounting for more than four-fifths

of the entire industry value in 2010 (Point Carbon, 2010). Due to the involvement of notable amounts in the carbon market, financial accounting issues started to materialise by seeking more clarity in the financial statements on carbon emission allowances (Ayaz, 2017; Warwick and Ng, 2012).

Because of the global expansion of the carbon emissions market, the precise obligation to communicate a company's performance to stakeholders related to carbon issues has gained immense importance. Furthermore, past researches have confirmed that eco-friendly measures, along with ample environmental disclosures, are connected with the robust financial performance of the business (Black 2013; KPMG, 2008; Romic, 2010).

Countries are pursuing unique methods to meet the national carbon emission reduction targets and lessen the GHG emission levels. Many countries are using carbon emission trading schemes due to their popularity in the global markets, despite the numerous concerns in financial accounting. These schemes allocate a price in the form of credits or allowances towards the carbon footprints to keep the corporations focus on carbon reduction. Each credit or allowance owner can release up to a metric tonne of carbon dioxide in the air (Bebbington and Larrinaga, 2008; EU ETS Handbook, 2015). As per the cap and trade scheme, each phase is squeezing the level of entire carbon emissions to reduce the harmful environmental footprints by the operators. Within the allocated quota, companies can trade their carbon credits in the open market if they have surplus or deficit. It offers extra flexibility that assures lower carbon emissions at the least possible cost to the environment. Carbon credit holders must forfeit the required level of credits on an annual basis to match their radiations level in order to avoid hefty penalties (PWC/IETA, 2007; Regan and Stagliano, 2007). Handling carbon emissions becomes much more efficient for businesses by adopting carbon emission trading schemes (Pahuja, 2012).

The ultimate idea behind the debut of carbon trading schemes by multiple nations was to encourage the reduction of carbon emissions. There are various carbon-trading schemes in practice worldwide, and several others are currently in the pipeline. Warming of Earth is a crucial problem that the world must act upon. Disclosures regarding the environmental footprints and similar issues have become a norm, stressing the importance of financial accounting measures related to carbon emissions as well (Barbu et al., 2014).

Governments awards carbon emission allowances to the owners of nuclear power plant for free. These allowances can either be sold for cash to other operators or used to surrender the operator's own obligation towards its emissions (Fornaro, Winkelman and Goldstein, 2009). It is a complicated area for an accountant as allowances that fulfils the classification of an asset, are being traded in the market as a financial instrument. Although this trending issue has made necessary improvements by the accounting standard bodies, the lack of official guidelines to address financial accounting issues related to carbon emissions is still far to be seen (Ayaz, 2017; Mookdee, 2013). Despite the growing popularity of carbon emissions market, financial accounting concerns on emission allowances' remains challenging due to the extensive work in progress by the leading standard setters, namely, the IASB and the IFRS. How to recognise carbon emission allowances in the annual reports remains puzzling at present. Several steps were taken in the past to address this matter, such as: -

- In 2003, the description of financial accounting issues concerning carbon credits (or allowances) in EITF 03-14 by the Emerging Issues Task Force (EITF), only to be withdrawn from the schedule shortly (FASB, 2003).
- In December 2004, the publication of IFRIC-3 *Emission Rights* by the International Financial Reporting Interpretations Committee (IFRIC) regarding carbon emissions, however, corporations and European politicians challenged the interpretation resulting in its withdrawal within the six months of its publication in 2005 (IASB, 2005).

The project jointly owned by both FASB and IASB was a work-in-progress since 2007, awaiting the conclusion, only to be deferred in November 2010 (Lovell, et al., 2010). IASB later revived the task at the end of December 2012 committing to its promise as per the Agenda Consultation 2011, which is still underway, without any deadline. In 2015, the project was renamed to 'Pollutant Pricing Mechanisms' from emission trading schemes (IFRS, 2015). Due to the silence by the IFRS and other accounting federations, businesses dealing with carbon emissions have been using various accounting methods to suit their requirements (Deloitte, 2007; PWC, 2021). Owners of carbon emission allowances are freely adopting distinctive accounting treatments as per their expertise. It has created an environment of uncertainty for accountants, questioning if they are using the right or wrong accounting treatment (Giner, 2014). Therefore, ambiguities in the carbon market related to the carbon emissions can be fairly blamed upon the shortage of an appropriate accounting

interpretation. More importantly, literature claimed that companies have been tampering with the relevant disclosures, keeping away crucial information for wider-stakeholders. Either it was due to the lower materiality levels as previously reported by IFRS (Makarova, 2014) that led the emitters to simply disregard the disclosures as it would outweigh the benefits or any other possible reasons. Nevertheless, global carbon emitters have been roaming free without proper scrutiny of the monetary values involved in the dealings of carbon emission allowances (Haupt and Ismer, 2011). If the values were entered somewhere in the financial statements, disclosures were not maintained to the professional accounting standards.

As per the revised Conceptual Framework (2020), all material transactions, whether material (significant) by value or nature must be reported in the financial statements. Past studies have reported multiplicities in accounting treatments along with the lack of necessary disclosures related to carbon emission allowances (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Balatbat and Wang, 2010; Elfrink and Ellison, 2009; Lovell, et al., 2010; Steenkamp, Rahman and Kashyap, 2011; Mookdee, 2013; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020; PWC/IETA, 2007; Warwick and Ng, 2012). While IFRS claimed that carbon emission allowances are insignificant to the financial statements (IFRS, 2014, pp.11), practitioners and researchers argued that valuable information was allowed to be omitted from the annual reports by the oversight of accounting bodies. This raises a question whether IFRS mainly consider an item to be material on the basis of values over their nature. Additionally, whether the failure of accounting bodies for creating active awareness of voluntary disclosures have resulted in omissions of material items from the financial statements?

1.2. Rationale for the Research

Because of the lack of an authoritative accounting interpretation for carbon emission allowances, carbon emitters are free to exercise their own independent judgement in the selection and application of suitable accounting treatments. Under the normal circumstances, deviating away from the official accounting methods would need to be justified in the annual reports as per IAS-8 *Accounting Policies, Changes in Accounting Estimates and Errors*. The standard allows the participating entities to select alternative accounting policies if it will result in more relevant and reliable information, however complete disclosures must still be presented in the financial statements. Additionally, the accounting treatment must carefully

address relevant material transactions, and should be free from management bias (IAS 8, 2020). Given the lack of public awareness on this area, limited studies, and the silence by IFRS and other accounting bodies for the last few years; carbon emitting companies are largely not disclosing their accounting treatments at all (Balatbat and Wang, 2010; Ernst and Young, 2009; Steenkamp, Rahman and Kashyap, 2011; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020). Prior findings have discovered greater diversity in practice among those entities that have disclosed their chosen accounting methods. The motivation of this study is to create awareness in the public and research domain to undertake necessary actions towards the accounting practices for carbon emission allowances. Because IFRS has dropped this topic from their active agenda panels in 2015, companies have subconsciously been given a message about its non-importance for financial accounting purposes. Audit firms, such as KPMG have started to request IFRS to reconsider their decision and place it back on their high priority projects (KPMG IFRG Ltd, 2021, p.4). Although, the public has become more concerned regarding climate-change issues in the recent years (Gallego-Alvarez, et.al., 2017), financial accounting issues are still far to be seen by the stakeholders. Therefore, the key motive of this research is to create awareness of this pressing issue by filling the gap in the literature, using a global sample of the owners of nuclear power plants.

As the public is becoming more aware of the climate-change issues, reduction in greenhouse gases across all industries has become a priority of wider-stakeholders. The Kyoto Protocol, and other relevant initiatives have been focusing on setting agendas for participating nations to curtail their harmful carbon footprints (Zhang-Debreceny, Kaidonis and Moerman, 2009). Countries have unanimously committed to watch their emissions level, and required the businesses to adhere to the various carbon-trading schemes, such as the EU ETS. An allowance for carbon emission permits the emitter to create one tonne of carbon-dioxide or an equivalent amount in other harmful gases (EU ETS Handbook, 2015). While the State support certain businesses by providing allowances as *gratis*, many businesses are only eligible to purchase emission allowances from the carbon marketplace. This has created an arena where allowances are being traded as a commodity. The confusion lies in the classification and recognition of carbon emission allowances in the financial statements, i.e. whether they are assets or financial instruments? The aim of this study is to sketch the prevalent accounting practices by the owners of nuclear power plants, and simultaneously take the experts' opinion on this subject. The comparison of practical and professional

judgement will be used to draw a possible accounting solution for carbon emission allowances.

Given that all material transactions, whether material by nature or value, must be disclosed in the financial statements, with the use of a suitable accounting method (IAS 8, 2020); carbon emission allowances also requires similar attention. The motivation behind this study is to outline the existing accounting practices for carbon emission allowances by the owners of nuclear power plants. A complete sample of IFRS, benchmarked against NON-IFRS frameworks, would be used to uncover the global practice on this area. Prior studies have mostly covered case-studies, particularly on European entities, and didn't cover the comparison of an entire IFRS and NON-IFRS sample on a global scale. Additionally, no prior studies have compared carbon emission allowances with the accounting practices for nuclear fuel and assets retirement obligations to identify the entities' disclosures reporting pattern. Not only that, so far, it has not been established whether carbon emission allowances are materially significant to the financial statements. This study aims to fill the gap in the literature by outlining global accounting practices for carbon emission allowances via comparative analysis of IFRS and NON-IFRS companies. By interviewing experts in accounting, this study aims to present the most preferred accounting solution by the accounting professionals. The author aims to provide an independent view of the possible accounting approach, considering the industrial practice, interview discussions and the ongoing research over the course of this study.

With the help of experienced accounting professionals, this research will also investigate the underlying reasons behind the logics applied by the carbon emitting entities in their selective accounting methods for emission allowances. Because non-disclosures were exceptionally higher on this area as reported in the prior studies (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Balatbat and Wang, 2010; Elfrink and Ellison, 2009; Lovell, et al., 2010; Steenkamp, Rahman and Kashyap, 2011; Mookdee, 2013; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020; PWC/IETA, 2007; Warwick and Ng, 2012), the author is motivated to pinpoint the reason behind the lack of disclosures. It is vital to understand whether there's a pattern followed by entities in determining disclosures and selecting particular accounting treatments in the absence of an official accounting standard. This information could be used in the research domain to investigate financial reporting patterns for other emerging accounting issues that also lacks authoritative accounting guidelines.

Additionally, the rationale of this research is to highlight the elements of good accounting practice that would help in raising the accounting and disclosure standards on this area. This study will highlight the qualitative characteristics of useful financial information that are crucial in practice, using the experts' opinion.

This research would be of enormous importance to accounting standard bodies, carbon traders, governmental authorities, academics, accountants and other stakeholders. Following the increasing popularity of carbon emissions trading scheme, accounting treatments implemented by the carbon emitters would also be of huge significance. All stakeholders, including connected, internal and external, with concerns related to the transparency issues in financial statements prepared by the controllers of power stations, will advantage greatly from this research.

1.3. Research Problem

The option for buying-and-selling carbon emission allowances would have lasting financial effects for carbon emitting entities (Veith, Werner and Zimmerman, 2009). As companies are able to keep or trade allowances that are received as *gratis* by the State, but also have an active market value facing economic effects; financial accounting methods for emission allowances needs a proper visit. While the nations are urging to tackle climate-change on a global level, accounting treatments on this area have largely been disregarded by the relevant authorities. Since 2005, after the withdrawal of the proposed accounting solution by the IFRS, namely, IFRIC-3 *Emission Rights* (IASB, 2005), no active guidelines have come forward for the participating entities (Ayaz, 2017; Montero, Calderon and Dias, 2020; PWC, 2021). There are classification and recognition issues for carbon emission allowances in the financial statements, as companies are treating them as inventories, intangible assets, financial instruments, and much more (Mookdee and Bellamy, 2017). Additionally, a majority of carbon emitters are disregarding their obligation to disclose emerging accounting issues (i.e. carbon emission allowances) in their annual reports; keeping the stakeholders uninformed (Allini, Giner and Caldarelli, 2018; Steenkamp, Rahman and Kashyap, 2011). The lack of public awareness on this alarming issue is unprecedented. In fact, IFRS renamed this issue to *Pollutant Pricing Mechanisms* in 2015 and removed it from their active agendas. Practitioners and audit firms have started to recommend IFRS to consider placing carbon emission allowances back on their priority list of emerging issues to be handled with (KPMG, 2021, pp.4). This relaxed approach by the standard setters have given room for

multiplicities in financial accounting to grow, jeopardising the qualitative characteristics of useful financial information in the annual reports.

Not only the existence of variable accounting methods, a larger consensus has not been reporting on this area for many years now; disclosures have been poorly maintained, even by large emitters (Balatbat and Wang, 2010; Montero, Calderon and Dias, 2020; Romic, 2010; Steenkamp, Rahman and Kashyap, 2011). Comparability and transparency in financial reporting have continued to endure (Fornaro, Winkelman and Goldstein, 2009), while inconsistency in approaches mean that the basis of accounting standards, i.e. the Conceptual Framework (2018) requirements have possibly not been met for over a decade now. It is vital to understand the reasonings behind the selection of voluntary disclosures, i.e. whether there are forces that drives an entity to disclose or not disclose certain items in the financial statements. For that reason, official interpretation by the IFRS and other accounting bodies are required to address this prolonged unsettled matter.

Prior studies have either focused on case-studies or European companies (possibly due to the popularity of EU ETS and a higher public concern over climate-change issues), but no studies have been done on a global scale, covering the entire sample of the owners of nuclear power plants. This study aimed to complete the gap in the literature by analysing worldwide trends in the energy and utility industry concerning carbon emission allowances. Additionally, other complex areas in the lifecycle of a nuclear power plant, i.e. nuclear fuel and assets retirement obligations are benchmarked against carbon emission allowances for comparative analysis. There are classification issues pertaining to nuclear fuel and lack of suitable guidance for the selection of discounting rates for decommissioning liabilities. The author tried to form a comparative analysis to understand whether there's a pattern that determines an entity's accounting practice in the absence of an official accounting standard. It is important to understand the motivation of entities behind their chosen accounting policies and disclosures in the financial statements. Benchmarking of nuclear fuel and asset retirement obligation with emission allowances will help determine if there are institutional pressures that shapes the organisations' reporting behaviour in the absence of legislative guidelines.

1.4. Research Aims and Objectives

This research aims to contribute to the present knowledge by adding deeper insights to the

literature, on an empirical and theoretical level. The **objectives** for this study are fourfold, they are as under:

1. To outline the prevalent accounting treatments used for carbon emission allowances, benchmarked against nuclear fuel and asset retirement obligations, by the companies following IFRS framework.

2. To understand the expert proposal on accounting for carbon emission allowances in the financial statements.

3. To pinpoint the main inspiration behind the chosen accounting treatments and disclosures for emission allowances by their emitters.

4. To discover the elements of good accounting practice for carbon emission allowances as per the accounting professionals.

1.5. Research Questions

Following are the **research questions** designed to address the research objectives:

1. How do the owners of nuclear power plants classify and recognise carbon emission allowances, in comparison with nuclear fuel and asset retirement obligations, in their financial statements based on IFRS framework?

2. What are the possible accounting solutions for carbon emission allowances based on the experts' opinion?

3. What are the key sources of accounting information, and the basis of disclosures in the absence of a particular accounting standard for the owners of nuclear power plants?

4. What are the qualitative characteristics of useful accounting information for carbon emission allowances, in light of the constituents of good accounting practice?

1.6. Research Contribution

This study aims to fill the gap in the literature by outlining global accounting practices for carbon emission allowances. As per the authors research, no prior studies have been conducted on a noticeable sample of the owners of nuclear power plants. As per the latest data, there are 443 operational power plants currently owned by approximately seventy-one companies, worldwide (IAEA, 2020). Many entities are following the IFRS accounting framework, but numerous other frameworks are also being practiced by the carbon emitters, that includes US GAAP, HKFRS, KFRS, Indian GAAP, etc. This study has chiefly focused on the IFRS regulations, due to the authors' professional expertise. In order to provide a wider perspective, NON-IFRS sample has also been selected for competitive benchmarking. Apart from a minor number of companies where annual reports weren't accessible online, from the total population of seventy-one, twenty-seven IFRS and NON-IFRS companies each were selected for this study. The sample represents a 76% of the total population of the owners of nuclear power plants. Not only the review of accounting treatments for carbon emission allowances, this study will cross-examine other complex areas in the lifecycle of nuclear power plants, that covers nuclear fuel and asset retirement obligations. This is to analyse the trend in reporting complex accounting issues, and whether there's a correlation between materiality and disclosure practices.

Additionally, this study aims to pinpoint the motivation behind the chosen accounting treatments for carbon emission allowances, and disclosure practices by the carbon emitting companies. The likely sources of accounting information and the decision-making factors for key disclosures in the annual reports are uncovered by interviewing experienced accounting professionals.

Lastly, the findings of this study will offer a possible accounting treatment based on the expert opinion, after analysing the industrial data and critical review of the literature. Expert interviewees will also elaborate on qualitative characteristics of useful accounting information for the firms dealing in carbon emission allowances.

1.7. Theoretical Background

Following the insights gained from the literature review, it is understood that the lack of an authoritative guideline to account for carbon emission allowances, management would voluntarily apply accounting policies that they seem fit for the purpose. Various reasons

could prompt the management to pursue one method or the other, however disclosure practices for material information are considered to be a norm of professional accounting standards. In order to understand the motivation behind the application of particular accounting treatments for emission allowances, the author has adopted institutional theory to uncover the hidden reasons. What are the reasons behind similar or dissimilar practices of organisation that are introduced to equal economic, social and practical environment and pressures? The institutional pressures are a perfect theoretical lens to answer this question.

Isomorphism and decoupling are the two principal branches of institutional theory. Pressures from the governmental organisations, regulators, State and other political authorities via standardisation of laws and regulations are covered under coercive pressures. When organisations start imitating or implanting the practices of market leaders, and other competitors who are facing identical situations, mimetic pressures are present. Normative stresses come from professional standards, i.e. accounting bodies in the case of carbon emission allowances. However, societal norms and influences could also bring normative pressures (DiMaggio and Powell, 1983). Other than isomorphic factors, decoupling bridges the gap between administrative guidelines and real-life practices. The idea behind the selection of institutional theory is to understand whether institutional pressures are the reason for multiplicities in the accounting practices for carbon emission allowances (in the absence of an official accounting standard by IFRS). As explored in the literature review (Chapter two), lack of accounting disclosures continues to exist in this area. Is it because allowances are not material to the financial statements, and without any official guidelines, management is of the opinion that the benefit outweighs the cost of reporting? Or if the values are material, whether there were institutional factors that drove accounting mayhem in this sector? All these arguments are covered in Chapter three – Theoretical Framework.

1.8. Philosophical Lens and Research Methodology

Understanding the factual reality of the real world that we can learn from, and how that knowledge can be created are the founding steps of **philosophical lenses**, namely *ontology* and *epistemology*, respectively (Vogl, Schmidt and Zartler, 2019). The current accounting practices for carbon emission allowances without the presence of official IFRS guidelines serves as ontological position for this research. Epistemologically, the annual reports and the literature can help in understanding the ontological point. Using a *pragmatist* philosophical idea, the researcher aims to discover the reason why carbon emitters acts the way they have

been acting in terms of accounting for carbon emission allowances can be understood by interviewing experienced accounting professionals. Instead of worrying about the approach, the issue needs all the attention as per the pragmatism beliefs (Rossman & Wilson, 1985; Cherryholmes, 1992). With the help of expert opinion, disclosures criteria and the qualities of good accounting practices for the owners of nuclear power plants can be justified.

The **research methodology** is formed on the basis of mixed-methods research approach. Using both primary and secondary data collection methods, this research provides a multi-dimensional view of the research issue. With the help of official IAEA database, a list of the owners of global nuclear power plants is selected to identify the emitters that follows IFRS and NON-IFRS framework. Archival data is collected by downloading the annual reports from the selected companies' websites, and other financial platforms, i.e. Bloomberg (for companies that don't publish their reports on their own websites). Out of the total population of seventy-one owners of nuclear power plants, the author has selected fifty-four in total for this research. This included twenty-seven companies each that follows IFRS and NON-IFRS frameworks. The main focus is on the IFRS regulations, due to the authors' command on the guidelines through his professional career, however other entities were also studied to perform competitive benchmarking. Semi-structured interviews of twenty professionals who have long-term experience in environmental accounting were conducted online. A multitude of knowledge was gathered from the interviewed participants as they work in different industries, and hold titles ranging from professors, senior auditors, directors, analysts and chartered accountants, with years of experience between 10 and 35 years. Convergent parallel design (or triangulation) is used to upsurge the reliability and quality of this research. By using the content analysis technique, data is analysed and presented in an easily understandable format. Interviews are analysed using NVivo software to run queries and to find important correlations in the transcripts.

Ethical considerations were thoroughly addressed to protect the rights, privacy and confidentiality of the interviewed participants. The author has completed the mandatory ethics online course, as well as a perusal of GDPR regulations to maintain the professional standards expected of the researcher. In addition, the author has also completed an ethics course run by the professional accounting body, the Association of Chartered Certified Accountants (ACCA).

1.9. Structure of the Thesis

Assessment of the Energy sectors' financial accounting and reporting practices in relation to the carbon emission allowances is the notion behind this study. Besides allowances, the key areas of interest are the nuclear fuel and asset retirement obligations; that are the other complex areas in the lifecycle of a power plant. Accounting treatments for carbon emission allowances are benchmarked against fuel and decommissioning liabilities to map out a pattern, if any, behind the motivation to use particular accounting methods in the absence of official guidelines.

Using pragmatic philosophical lens, this study outlines the necessity for the identification of accounting treatment for the global operators of nuclear reactors that follow IFRS. Non-disclosures level has been tremendously higher in this sector for carbon emission allowances. After exploring the background of the research issue, along with the problem statement, Chapter One explains the research objectives and questions, theoretical framework, philosophical lens, methodology and the structure of the thesis.

Literature review focus on accounting practices for carbon emission allowances as identified in the prior studies. Additionally, accounting solutions for nuclear fuel and asset retirement obligations are also discussed to build the case in Chapter Two. Carbon emission allowances are a tricky area, as the government allocates a predetermined quantity at no cost to the companies, but they can also be purchased from the carbon market for production usage and trading purposes. These chapters also elaborate on the classification of those allowances by looking into the accounting measures taken by the accounting standard setters. Past researches are also included to stress the need for an interpretation by the accounting bodies to address these complicated issues. Additionally, the criteria for nuclear fuel and asset's retirement obligations covering the discounting rates and the nuclear fund payments are explained in this chapter.

Chapter Three explains the theoretical framework. It covers the institutional theory as a lens for this research, and emphasises why institutional theory is the best choice to conduct this study. This chapter explains isomorphism and decoupling as the two main branches of the selected theory, and builds a case for emission allowances under this theoretical context.

Chapter Four covers the research methodology, and highlights the data collection techniques, sample selection criteria by using both primary and secondary sources, mixed methods research approach, data sample and ethical limitations.

Data analysis from the global owners of nuclear power plant that follow IFRS guidelines are the main focus for this study. For benchmarking purposes, an equal representative sample of NON-IFRS companies were also used for competitive benchmarking. Results are presented and explained in Chapter Five, research findings.

Finally, Chapter Six presents the conclusion. It also provides authors recommendation to account for carbon emission allowances in the financial statements, on the basis of other IFRS standards. Also, this chapter covers the potential research area, contribution to the research and research limitations.

II. LITERATURE REVIEW

2.1. Background

2.1.1. Nuclear Energy Cycle

In 1973, William L. Ureel said that electric companies' accountants would soon be required to perform accounting services for the new nuclear-fueled power stations. The emerging developments of nuclear reactors to meet electric power needs will present numerous complications for accountants (Ureel, W.L, 1973). Nuclear energy has become a fundamental basis for the world's electricity within the last fifty years, which currently provides for approximately 10% of the world's total (World Nuclear Association, 2021a) previously identified as 16% in 2010 (Hore-Lacy, I 2010). The decline in the usage was due to the safety concerns, leading to the full or partial-closures of at least sixty-five global nuclear power plants after the Fukushima disaster in 2011 (IAEA, 2021a). However, there are about fifty-four additional reactors currently under constructions that will add 57,442 MW(e) in the next few years, equivalent to 15% of the existing 392,098 MW(e) global energy as of July 2020 (IAEA, 2021b, p.12). The most recent proposal put forward by the World Nuclear Association, called the Harmony Programme, has forecasted the total global usage rising to 25% by 2050, as the work to gain public confidence on nuclear safety continues to grow (The Harmony Programme – World Nuclear Association, 2022). Unlike coal or gas-powered reactors, nuclear energy produces relatively lower-level of emissions during the power-generation process, however indirect emissions (as compared with direct emissions) are far higher throughout the complete lifespan of a nuclear power plant (OECD, 2012, p.17).

The nuclear fuel cycle comprises of numerous activities linked with electricity production by the use of uranium from nuclear reactions. This cycle begins with uranium mining leading to the clearance of harmful waste created by nuclear operations; however, fresh fuel can be generated by recycling used nuclear fuel, which reduces the overall harmful wastage. Figure 1.1 below represents a creative image of the lifecycle of nuclear fuel (USNRC, 2019).

Two phases complete the entire operations of nuclear fuel for electricity generation, namely the front and the back-end (CGNP, 2019). Nuclear reactors require uranium (Brookes and Motamen, 2014), the main ingredient of the nuclear fuel cycle, which goes through various platforms from mining to fuel fabrication, making it the front-end of the cycle (Zohuri and

Fathi, 2015). In the back-end stage, after uranium stays on average about three years in the nuclear reactors for electricity generation; all the used fuel undergoes several steps involving short-term storage, recycling, and reusing before the ultimate waste disposal (USNRC, 2019; World Nuclear Association, 2021).

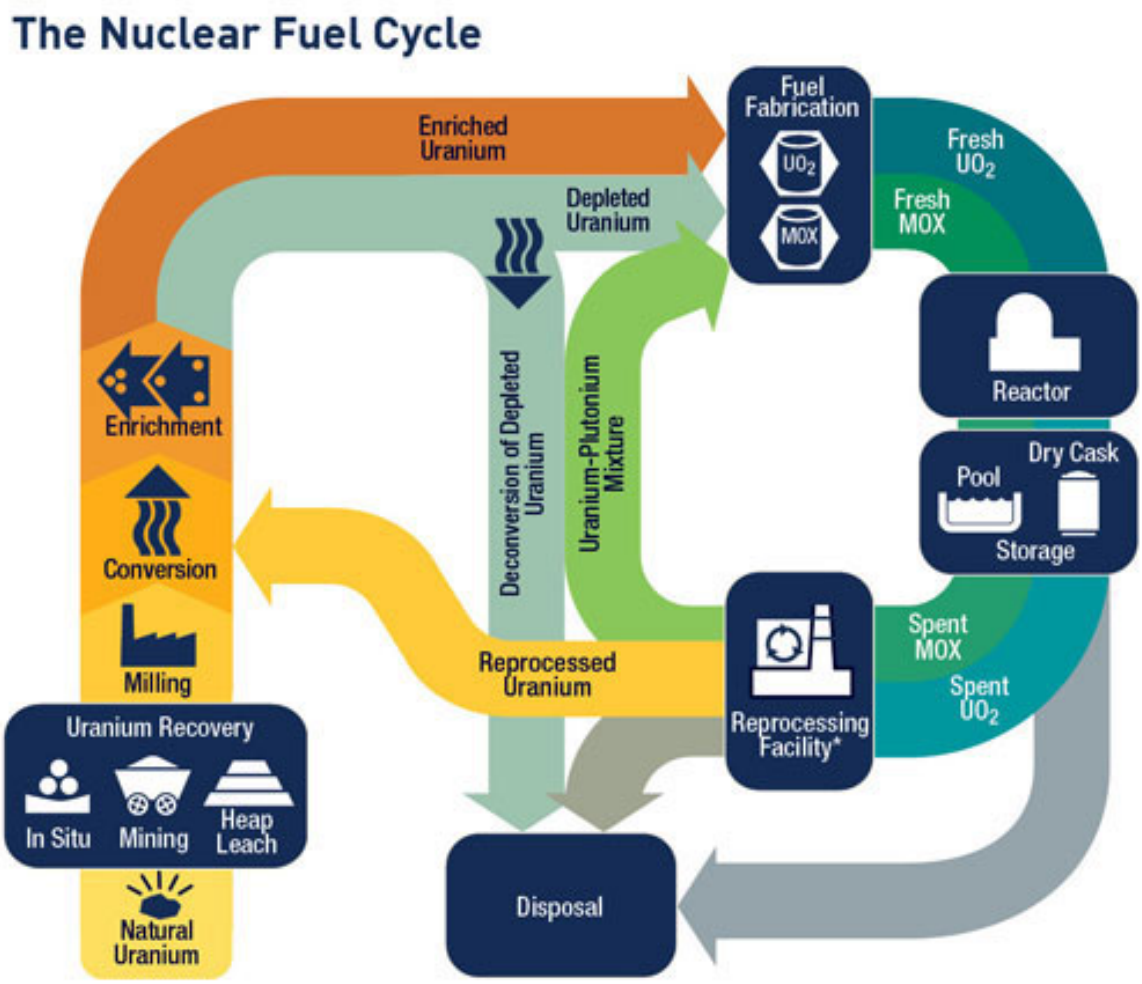


Figure 1: A Creative Representation of a Standard Nuclear Fuel Cycle, United States Nuclear Regulatory Commission, 2019.

2.1.2. Accounting for Nuclear Power Plants in the Financial Statements

The lifecycle of a nuclear power plant entails complex accounting issues for its owners in their financial statements. From the mining or purchase (for certain operators) of uranium to be used in the reactor for power-generation to the assets' retirement procedure; owners of nuclear power plants have to deal with a few rather challenging accounting areas. These crucial parts are mainly three-fold that includes, i.e. recognition of nuclear fuel (both initial and spent-fuel), emissions created during the operational life of a power plant (carbon-

emission allowances /credits) and the decommissioning obligations (liabilities related to demolition of the asset, site-rehabilitation cost, disposal of radioactive material, etc.) to complete the final step of the cycle.

Professional accounting bodies continuously work on accounting standards to ensure that investors have access to useful accounting information to make informed business decisions (Rodeck, 2017). This is done via standardisation in practice with the help of accounting regulations, i.e. interpretation and standards (Green, 2020). Financial accounting is focused on stakeholder's confidence, supported by ethical regulations, as well as business knowledge derived from the extensive industry experience and the connectivity of business network (ACCA, 2021). Amongst others, the International Financial Reporting Standards are adopted and used by at least 144 nations worldwide (IFRS, 2018), with more to follow suit. The aim of global standardisation of accounting practices is currently in process to improve transparency, accountability and efficiency to global financial markets (IFRS, 2021a). Uniformity in accounting practices have received a huge support from various stakeholders, including the World Bank that has been rooting for a top quality, single set of universal accounting standards (IFRS, 2017). Currently, there are numerous accounting standards created by global accounting bodies that covers almost every item stated in the financial statements, however not all areas are thoroughly addressed, where a few are relevant to the existence of nuclear power plants.

Although the IFRS accounting standards and interpretations have provided some useful guidelines on the initial recognition of nuclear fuel and decommissioning liabilities; carbon-emission allowances were mostly disregarded. In order to deal with the rising emissions level, and the emergence of carbon-trading markets along with the cap-and-trade schemes, IFRIC-3 *Emission Rights* was launched in December 2004 to assist in the financial accounting for emission allowances (IASB, 2005). Due to the rising concerns of accounting contradictions by the practitioners (on the basis of the recommended treatment in the interpretation), IFRIC-3 was short-lived, and later withdrawn in early 2005 (Mookdee, 2013). Since then, no other official standard or interpretation has come-forward by either IFRS or other authoritative accounting bodies (McManus, 2011; Montero, Calderon and Dias, 2020). Companies dealing with emission allowances, have since been relying on voluntary accounting practices, i.e. using their own independent judgement on how to account for such allowances in their financial statements; or whether to even disclose them

at all (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Balatbat and Wang, 2010; Elfrink and Ellison, 2009; Lovell, et al., 2010; Steenkamp, Rahman and Kashyap, 2011; Mookdee, 2013; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020; PWC/IETA, 2007; Warwick and Ng, 2012).

As per PWC/IETA 2007, it is a vital duty of professional accounting bodies to specify useful financial information related to the mounting environmental challenges. While the cap-and-trade schemes have helped in quantifying the industrial emissions levels, the trading option has largely fuelled this controversial issue (Mookdee, 2013). Whether such schemes have been useful or not, having a trading option has made the allowances marketable by giving them an economic value, thereby, raising more accounting issues (Raiborn and Massoud, 2010). Since the removal of IFRIC 3, IFRS worked briefly on this project, and renamed it to *Pollutant Pricing Mechanism* in 2015 (IFRS, 2015). Following the name change, no further agendas were released by either IFRS or IASB. Due to the relaxed approach on this issue by the accounting regulators; transparency and comparability of financial reporting has been compromised, particularly in relation to the relevant disclosures in the financial statements (Montero, Calderon and Dias, 2020).

In order to understand the role of accounting bodies in ensuring the superior quality of useful financial information, in the absence of a relevant accounting standard for emission allowances, in a chronological order, this chapter explains and critically review the following areas: -

- Structure of the cap-and-trade scheme, followed by the related guidelines in the existing accounting standards issued by the International Accounting Standards Board (IASB) and connected organisations (i.e. IFRS) for emission allowances.
- Past studies conducted on the area of carbon-emission allowances to discover the prevailing accounting practices among the entities releasing and trading emissions.
- Existing guidelines in the current accounting standards by IASB for nuclear fuel and asset retirement obligations to make a meaningful comparison with emission allowances.
- Review of the influence of accounting regulations in ensuring higher transparency, uniformity and comparability of accounting information.

Literature is reviewed using the official accounting standards published by IFRS, annual reports of utility and energy companies, scholarly articles, published studies and news articles, amongst other material to build the case for this study.

2.2. Current Accounting Guidelines for Carbon-Emission Allowances

Because of the rising climate-change concerns around the globe, and in order to curtail the emissions level across various industries, the United Nations intervention in 1997 came up with the Kyoto Protocol Agreement (UNFCC, 2008, p.12). Its purpose was to legally bind member countries to reduce GHG levels, which became effective in 2005 (Austin, n.d).

Using the Kyoto Protocol as a foundation, members of European states came up with a brilliant arrangement, namely, the European-Union Carbon Emission Trading Scheme (EU ETS) in 2005 to address the climate-change issues (Taticchi, Carbone and Albino, 2013). However, it has generated various complexities for all participating organisations, including the regulators (Ayaz, 2017). The aim behind EU ETS is to convey a clear message to the carbon emitters; it is now time to pay for the harmful carbon footprints on to the environment. The scheme is designed to achieve a dynamic and useful reduction in emissions by putting a price on it, thereby, quantifying and capping the total amount of emissions created by participating entities.

As per EU ETS (and similar cap-and-trade schemes), an allowance gives the holder the right to emit equivalent amount of carbon in the air. Because the total number of allowances are controlled by the regulators, and the creation of trading option (where allowances can be purchased and sold in the trading market), financial accounting issues have continued to materialise. Accountants have been using their own independent judgement to recognise these allowances in the financial statements, and relying on the voluntary disclosure practices (Allini, Giner and Caldarelli, 2018; Giner, 2014; Montero, Calderon and Dias, 2020).

Due to the multifaceted nature of emission allowances (that can be received for free from the scheme regulators, and can also be purchased from the trading-market for business-use or for trading purposes), this section starts with the explanation of EU-ETS structure (cap-and-trade scheme for emission allowances). It follows by the current accounting guidelines given by the accounting bodies on this area, and its complications.

2.2.1. The European-Union Emissions Trading Scheme (EU-ETS)

After several discussions, in January 2005, the European-Union Emissions Trading Scheme (EU ETS) came out as one of the biggest carbon-trading schemes in Europe. The main idea behind the scheme was to reduce greenhouse gases (GHGs) substantially by the end of 2020 as compared to 1990 levels. The aim of EU ETS, being the chief carbon trading system (Point Carbon, 2010), was to ensure that all EU participants are liable for its carbon footprints by enforcing maximum emission thresholds. By capping the carbon emission levels, measurement of harmful footprints on the environment became much more manageable. The scheme introduced **'cap'** on the emissions, convertible into 'carbon allowances or credits', required by the entities in order to protect their measurable carbon emissions on a yearly basis. The regulators typically allocate a prearranged quantity of carbon credits for **free** to certain businesses (Warwick and Ng, 2012). These allowances were issued as gratis at the beginning of the scheme to almost all businesses, reaching 95% of the total allocations in the early stages (Lovell, et al., 2010), though the picture has changed over the years. Every year in February, privilege owners receive some allowances for free by the scheme, and they must yield one carbon allowance (EUA) per tonne of carbon emitted by April of the next year (IFRS 2014, pp.3). Companies can easily **trade** their allowances in the carbon-exchange marketplace to satisfy their emission targets (Bebbington and Larrinaga, 2008), which was organised to reduce fiscal charges for entities' carbon commitments by trading the allowances (EurActiv.com, 2009). However, the trading option has given these allowances marketable value for investments, thereby requiring the entities to separate the criteria for business-use and investment allowances (Ayaz, 2017; Woerdman, 2015). For this research, carbon allowances allocated by the scheme as gratis are referred to as 'granted emission allowance', otherwise, 'purchased emission allowance', either for own-use or trading-purposes.

The following are the four stages of EU ETS:

1. The principal objective of Phase I was to spread knowledge about the system, and to create a vital methodical foundation for carbon operation. From 2005 until 2007, it served as an educational period when a minimum of 95% of carbon allowances were distributed for free to the businesses (Woerdman, 2015).
2. Phase II ran between 2008 and 2012, as per the Kyoto Protocol. For not surrendering the required amount of carbon credits and non-compliance, a minimal fine of €100

per tonne of carbon emissions was payable. The proportion of allowances at no cost reduced to 90% (Warwick and Ng, 2012).

3. From 2013 until 2020, Phase III continued for additional trade of carbon allowances under the EC Directive 2009/29/EC. Accountants faced intense challenges because three-quarters of carbon credits were sold by the end of this Phase. Furthermore, trading option was popular besides the compulsions to meet the emissions target. The prices of emission allowances started fluctuating mainly from 2011 onwards. The price variations are shown in Figure 2 below:

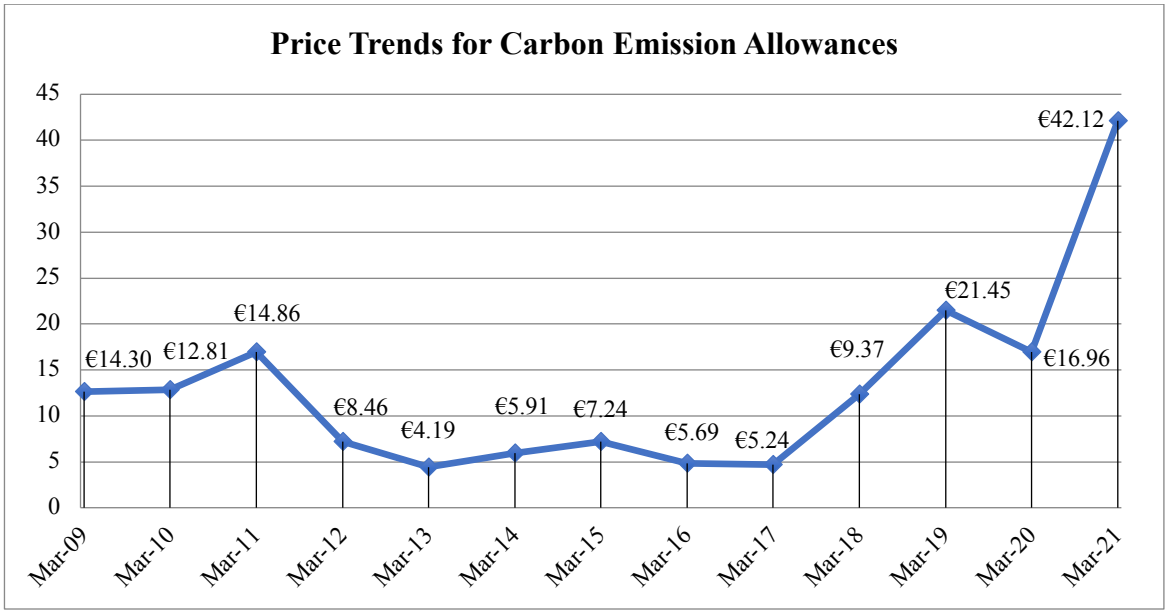


Figure 2: Price Trends for Carbon Emission Allowances, Markets Insider, 2021.

In the last decade, by looking at the variations, price of emission allowances has taken a rollercoaster ride. Since the significant drop in prices from €14.86 to €8.46 between 2011-12, down to €4.19 in 2013, the European carbon emissions market has recovered and has almost reached €10 in 2018 due to high demand from buyers (following the recovering of financial crisis). Experts were, however, unsure whether the inclining trend would be sustainable (Murray, 2018). However, by the end of March 2019, it has more than doubled its value from last year, reaching €21.45 (Markets Insider, 2021). Due to the COVID-19 pandemic, the whole world paused, almost every industry took a hit and productions slowed down, so as the emissions (Gerlagh, Heijmans and Rosendahl, 2020, p.862). Economic recessions could be one factor for the decline in prices, which has caused less production and, therefore, minimal emissions. The decrease in demand led to a significant decline in the

price of EUAs, which dropped to €16.96 in March 2020. However, with the slow recovery across the globe, emission prices have reached its all-time at €42.12 at the end of March 2021. Experts believe that the current price will continue to incline following Europe's commitment for reducing carbon emissions, and analysts at Refinitiv said that it could reach €89 by the end of Year 2030 (Watson, 2020).

4. Phase IV will span from 2021 – 2028 as per EU ETS draft with the main focus on extending the cap-and-trade scheme as the operator to drive investment. Free distribution of carbon would still be in operation to make the market more competitive. The aim is to achieve carbon reduction at 43% lower than the 2005 levels (Europa, 2021a).

2.2.2. Accounting for Carbon Emission Allowances

2.2.2. i. IFRIC-3 Emission Rights

Since the introduction of EU-ETS, in order to deal with the accounting concerns for emission allowances, accounting bodies decided to take initiatives on this matter. IFRIC was approached by IASB to shed light on this issue by providing some guidance on this subject. Later in 2004, the interpretation came out in IFRIC 3 *Emission Rights,* with the recommendation of separate treatment of assets and liabilities. The main points of the interpretation were as below:

- Carbon allowances are **intangible assets** regardless of their origin, whether granted by the government or purchased from the carbon market; and that IAS 38 *Intangible Assets* disclosure requirements must be applied. Both cost and revaluation methods could be applicable.
- Under the cost model, carbon allowances are valued at 'cost' minus impairment.
- Under the revaluation model, 'fair value' must be used for the tradeable allowances. Any revaluation surplus is taken to the statement of financial position (equity), with the further increases in the surplus to the other comprehensive income.
- Any difference between the market value and the payable amount (if any) is considered as a **government grant** (mainly applies to granted allowances). Deferred income is recorded in the statement of financial position following the guidelines

under IAS 20 *Accounting for Government Grants and Disclosure of Government Assistance.*

- Asset and liabilities for emission allowances could **not be set-off** against each other.
- A **provision** at 'market value' must be recognised for its liabilities to fulfil the carbon allowances obligation, following the guidelines set out in IAS 37 *Provisions, Contingent Liabilities and Contingent Assets.*
- Any signs for **impairment** of allowances must mean that they are tested for it as per IAS 36 *Impairment of Assets.*

2.2.2. ii. Inconsistencies in IFRIC 3 Accounting

A remarkable number of disagreements and substantial negative feedback followed IFRIC 3 proposals that led to its complete removal (Allini, Giner and Caldarelli, 2018; Ayaz 2017; Balatbat and Wang, 2010; Mookdee and Bellamy 2017; Montero, Calderon and Dias, 2020). Inconsistencies in financial accounting application were one of the main reasons for not supporting the IFRIC 3 approach. For example, recognition of surplus or deficit due to the estimated liabilities in the Statement of Comprehensive Income, however, increases or decreases caused by revaluation are reported in the Statement of Financial Position. This approach received mixed reviews from the audiences that led to the label 'Mixed Presentation Standard' by the analysts, due to the fear of credible instability in the stated income (Lovell, et al., 2010). While the European Financial Reporting Advisory Group (EFRAG) agreed with the IFRIC's suggestion that emission allowances do give rise to an asset, liability and a potential deferred income in the form of government grants, accounting requirements were questionable. EFRAG raised concerns regarding the economic reality and disclosure requirements. It was stated in the letter written by the then Chairman of EFRAG to the Director General of European Commission:

"IFRIC 3 will not always result in relevant financial information because in certain cases it **does not faithfully represent** the economic reality……., we believe it is not in the European interest to adopt IFRIC 3 in its present form" (Enevoldsen, 2005, p.2).

Practitioners also raised concerns regarding the valuation method, that both fair value and cost application would create imbalance in the financial statements, as the same items would be recorded at different values. Furthermore, the choices to adopt flexible accounting numbers to record assets, such as using costs or market value, also triggered concerns about

discrepancies in financial accounting (Cook, 2009). EFRAG also voiced their opinion stating the recognition of allowances at 'cost' while recording the obligations to the scheme at 'fair value' represented a mixed-approach. They objected accounting credibility by adopting IFRIC 3 approach and stated:

"It is contrary to the 'true and fair principle' set out in Article 16(3) of Council Directive 83/349/EEC and Article 2(3) of Council Direction 78/660/EEC; and it does not meet the criteria of **understandability**, **relevance**, **reliability** and **comparability** of the financial information needed for making economic decisions and assessing the stewardship of management" (Enevoldsen, 2005, p.2).

As raised by EFRAG, other studies have highlighted the failure of IFRIC 3 in maintaining the fundamental characteristics of useful financial information (Moore, 2010). Following the feedback from the users of accounting information, IASB withdrew IFRIC 3 in June 2005 (IASB, 2005).

Various accounting methods appeared following the departure of IFRIC 3 (Mackenzie, 2009). Many companies started valuing carbon allowances at nil value (since the government grants them for free), and, likewise, valuing the liability for carbon allowances at nil value (for the same reason) after which any surplus or deficit is to be recorded at fair value. Many European countries issued guidance in this area because of the non-existence of an official standard in financial accounting. For example, Spain issued accounting procedures identical to the IFRIC 3 method except for accounting for provisions where Spanish regulations measure provisions for carbon allowances at the net book value instead of the fair value (Lovell, et al., 2010). Guidelines were also presented by the US accounting bodies, i.e. the Emerging Issues Task Force in 2003.

2.2.2. iii. EITF Issue 03-14 Participants Accounting for Emission Allowances

In 2003, the Emerging Issues Task Force confronted the concerns related to the accounting for carbon emissions in EITF Issue 03-14. US Companies responsible for creating emissions, followed the guidelines provided by the Federal Energy Regulatory Commission (FERC) in relation to such allowances as directed in the Clean Air Act Amendments of 1990. EITF issue referred to the accounting treatments presented by FERC in 1993 under the 'Uniform System of Accounts' (Fornaro, Winkelman and Goldstein, 2009). The discussion material referred to the following accounting practices: -

- Carbon emission allowances must be recognised as **inventory**, valued at the historical **cost**.
- Purchased emission allowances are valued at the e**xchange price,** whereas the granted versions at **nil value**.
- Regular calculations or estimations must be performed to value allowances, and the weighted-average cost method would be applicable.

However, several members of EITF had increasing worries regarding the compatibility of other US GAAP accounting standards with this one, as it might trigger accounting disparities, particularly in relation to accounting for licenses and permits by authoritative agencies (FASB 2007; Fornaro, Winkelman and Goldstein, 2009; Mookdee, 2013; Romic, 2010). Surprisingly, FASB stated that many members were of opinion that there weren't concerns regarding multiplicities in practice as stated in EITF Abstracts Issue No. 03-14:

"Still other Task Force members observed that they **did not perceive a practice issue** or diversity in the accounting for emissions trading programs" (FASB, 2007).

As the US adopts a rule-based approach to accounting, in the absence of an official accounting standard, companies would simply not disclose such items in the financial statements, as non-compliance would not be considered a breach of law. This meant that voluntary accounting practices and relevant disclosures would be either minimal, or largely not expected. Referring to the FASB's statement above, if some members believed that accounting practices were unanimous, that might indicate the behavioural acceptance of accounting rules that companies probably adapted to FERC's guidelines on emission allowances. However, the EITF 03-14 discussion ignored the need for a thorough perusal of allowances classification in the books, that whether the existing criteria was largely valid or not. Additionally, it overlooked the disclosure requirements, that are of equal importance, particularly for material values.

Following the only discussion about emission allowances in the abstracts, EITF updated its future agendas by removing this matter from further discussions (FASB, 2007). It was reconsidered on a project together with IASB, but again officially disregarded in 2014 (Batker and Harrington, 2018).

Very recently, the President and Chief Economist of the company, Earth Economics, wrote a letter to the Chairman of Financial Accounting Standards Board (FASB) and raised several issues regarding the accounting mismatches in practices, even though many EITF members previously believed that diversities in practices weren't an issue. Many important factors were highlighted including that the size of carbon emissions market in the US has tremendously grown over the past few ten years. On average, between 1% and 3% of total liabilities in the financials were related to emissions, highlighting the materiality of such transactions. A survey conducted by Earth Economics identified discrepancies in practice. He wrote:

"In the absence of guidance, companies are **not consistent** in their selection of methods to record and value allowances and liabilities on their balance sheets, and in many cases **do not report them at all**" (Batker and Harrington, 2018).

Arguments above suggested that the extended silence by the leading accounting standard bodies, i.e. IASB and FASB, is questionable, especially when the diversities in practices are not in alignment with the true-and-fair view of the financial statements. Confusion lies among the classification of emission allowances. While there isn't yet an official classification in an accounting standard, former interpretations and guidelines reflected upon divergent accounting treatments.

2.2.3. Classification of Carbon Emission Allowances for Accounting Purposes

According to the former standard IFRIC 3 *Emission Rights*, because of the absence of physical reality and meeting the further criteria of assets, carbon allowances ticked many boxes to be known as 'intangible asset'. Among the four big firms, Deloitte and PWC established that the need for carbon credits in the market relegates them to be classified as 'financial assets', as they are easily convertible in cash. Carbon credits can also be 'inventory' as the entities pool necessary expenses to fulfil the legal obligations related to the environment. Nevertheless, the suggestion was that allowances anticipated for business-use would establish its accurate description, i.e. recording them as either inventory or intangible asset for active functions (Batker and Harrington, 2018; Ayaz 2017) and financial asset for trading purposes (Mookdee, 2013). This created a debate about the classification of emission allowances for accounting purposes, i.e. whether, as per the current guidelines

given by IASB/ IFRS, allowances meet the definition of inventory, intangible assets, financial instruments, or others?

Without the presence of an appropriate accounting regulation, IAS 8 *Accounting Policies, Changes in Accounting Estimates and Errors* is applicable. The standard recommends the administration to practice its **independent judgment** in selecting and employing an accounting policy that is more suitable and reliable in the financial statements. The chosen policy must be trustworthy, free from bias and sound (IAS 8, 2020). IAS 8 states that:

"In making the judgment, management shall refer to, and consider the applicability of... the requirements in IFRSs dealing with similar and related issues; and the definitions, recognition criteria and measurement concepts for assets, liabilities, income and expenses in the Conceptual Framework for Financial Reporting" (IAS 8, 2020, p.A973).

Based on this, it is understood that various accounting regulations can handle the issue of accounting for carbon emission allowances. The relevant accounting standards are IAS 20 *Government Grants and Disclosure of Government Assistance*, IAS 2 *Inventories*, IAS 39 *Financial Instruments: Recognition and Measurement*, IAS 37 *Provisions, Contingent Liabilities and Contingent Assets* and IAS 38 *Intangible Assets* (Ayaz, 2017).

Carbon credits are used for numerous reasons, as they may be kept by the business to either fulfil the EU ETS (cap-and-trade scheme) obligations or for trading purposes. Ambiguity regarding the accounting classification of carbon emission allowances is climbing, questioning whether they are a type of assets or financial instruments? bringing rational arguments before the accounting bodies. As it is quite complicated for an administration to comprehend the reality of carbon allowances, an 'Activity-Based Model of Accounting' was suggested by KPMG in 2008. It explains that accountants could use different accounting techniques, depending on the type of business. Instead, IASB was not persuaded to back this idea because their preferred 'Principles-Based Method of Accounting' does not fit in this context (Lovell, et al., 2010).

2.2.3. i. What Type of Asset is an Emission Allowance?

Measuring and recognising an asset is one of the vital accounting problems since the expansion of global carbon emission markets. Some of the accounting differences to define emission allowances are addressed in this section.

As per the specification of an asset under the revised IASB's Conceptual Framework 2018, carbon emission allowances meet the criteria to be known as assets in the financial statements. They state that an asset is:

"A present **economic resource** controlled by the entity as a result of past events. An economic resource is a right that has the potential to produce **economic benefits**" (Conceptual Framework, 2020, p.A38).

The three fundamental properties of an asset are:

- The presence of an economic resource.
- The company has benefits over that resource.
- Both the benefits and the economic resource existed at the financial statement date.

Carbon credits owned by the entity are a current economical resource, and the entity can limit the access to it by owning all the privileges to the credits. Carbon credits also have economic value because the receiving company has legal privileges to release emissions or to trade those credits with other businesses. Moreover, the asset recognition in the financial statement is related to the potential to bring economic benefits from that asset. These allowances are available because of the former installations of nuclear reactors, with the likelihood of future economic benefits resulting from them (Raiborn & Massoud, 2010; Mookdee, 2013; IFRS 2014, p.8).

As mentioned above, an asset can be described in different ways by miscellaneous businesses. Allowances give its owner the privilege to emit a certain amount of carbon emission, such as a tonne of CO2 per each allowance. These allowances are easy to obtain from various means:

- Distribution from the governing organisation, either for free or for a minimal price; typically, lower than its fair value.
- Bought from the governing organisation in an auction.
- Bought from a different company in the carbon industry (Romic, 2010).

Presuming that carbon emission allowances satisfy the classification of an asset, the question arises, what kind of asset are those allowances? As per the accounting regulations, there are four different kinds of asset classifications given in the interpretations:

a) Inventories as per IAS 2 *Inventories*.
b) Intangible assets as per IAS 38 *Intangible Assets*.
c) Government Grants as per IAS 20 *Accounting for Government Grants and Disclosure of Government Assistance*.
d) Financial instrument as per IFRS 9 *Financial Instruments.*

(A). Inventories

As stated earlier in chapter two, IFRS defines inventory in IAS-2 *Inventories* as:

"Inventories are assets **held for sale** in the ordinary course of business [finished goods]; in the **process of production** for such sale [work in progress]; in the form of materials and supplies to be consumed in the production process or in the rendering of services [raw materials]" (IAS 2, 2020, p.A939).

The chief reason for the categorisation of emission allowances as inventory is that they constitute a high cost and are an input (intangible raw material) in the production process. Considering the lifecycle emission analysis of nuclear power plants, emissions are not only created during the power-generation process; pre and post production cycle incurs indirect emissions as well (OECD, 2012, p.17). For example, the entire nuclear fuel cycle is responsible for creating certain level of emissions in the air. Because they are not strictly consumed only during the production cycle itself, due to the absence of its physical reality (ANC, 2012, p.8), one would assume that inventory classification would be incorrect. However, allowances give the entity a legal privilege to release emissions, and its operations (i.e. its entire existence, from back-end to the front-end of nuclear fuel cycle) are the cause of emissions; the inventory classification largely supports this condition.

Emission allowances owned by the entity for buying-and-selling are available for sale in the ordinary course of the business, thereby meeting the inventory classification. It applies to entities that hold allowances for trading purposes to make profits from temporary price variations in the marketplace. Following the inventory approach, it is quite surprising that allowances held for multiple purposes are designated with an identical title in the financial statements (Romic, 2010). The Federal Energy Regulatory Commission (FERC) Uniform System of Accounts supports the idea of inventory method (Fornaro, Winkelman & Goldstein, 2009). It is because of the suggestion about emissions accounting, which can also

serve as a building-block for many carbon emissions accounting issues on a larger scale (Elfrink & Ellison, 2009). This idea also gained support from several other institutions, including the Security and Exchange Commission (SEC) in the United States, as long as it is a continuing practice by the entity (Fornaro, Winkelman & Goldstein, 2009). Additionally, French Accounting Standards setter ANC backed the classification of allowances as inventory based on the fact that allowances are commodities that can be purchased for production or trading, and are a fundamental requirement in the operations of nuclear power plants (ANC, 2012; Batker and Harrington, 2018).

(B). Intangible Assets

Carbon emission allowances were intangible assets as per IFRIC 3 *Emission Rights*, rightly so, as they do not physically exist plus most of the entities receive it as gratis from their governments. IAS 38 *Intangible Assets* states that:

"An intangible asset is an **identifiable** non-monetary asset without physical substance" (IAS 38, 2020, p.A1399).

As per the revision of IAS 38 in March 2004, identifiability is an essential feature of intangible assets, so that the goodwill is easily differentiated. When the assets are either separable from the business or a result of legal rights; they are identifiable assets for IAS 38 purposes (IAS 38 2020, p.A1400). Entities can recognise items as intangible assets in their financial statements if they can demonstrate the potential financial benefit and a reliable cost estimate of that asset to the entity (IAS 38, 2020, p.A1402).

Intangible assets can be recognised by the entities using either of the two models, cost or revaluation model. In the **cost model**, assets shall be recorded after deducting the amortisation and impairment losses from the cost and any revaluation surge is not allowed. On the other hand, revalued amount, i.e. the fair value at revaluation date minus accumulated amortisation, as well as impairment losses, can be used to record assets under the **revaluation model** (IAS 38, 2020, p.A1412). Many companies have intentions to use their allocated carbon emission allowances for trading purposes, outside of their business-use. IAS 38 clearly states that held for sale intangible assets comes under the umbrella of IAS 2 *Inventories* instead (IAS 38, 2020, p.A1397).

IFRIC 3 *Emission Rights* supports the idea of labelling allowances as identifiable non-monetary assets since they are not physically present. With that in mind, IFRS in 2003 suggested emission allowances be included in IAS 38 (Batker and Harrington, 2018), as a new subcategory of intangible assets, by making some changes in the standard, with the measurement at fair value through profit or loss (Romic, 2010). According to Veith, Werner and Zimmerman (2009), IFRIC suggestion minimizes differences amidst the three interrelated matters in this context, i.e. government grants, emissions allowances assets, and carbon liability in the statement of financial position and their influence on earnings.

In comparison, Krupova and Cerny (2007) claimed that emission allowances are temporary assets held by the company with a potential trading motive even though they meet intangible assets criteria. Unpredictability and liquidity in the carbon emissions industry indicate that such allowances are more financial instruments than intangible assets (Krupova and Cerny, 2007). In 2009, both the leading auditing firms in the U.S, Deloitte and PricewaterhouseCoopers, specified that FASB management support the classification of allowances as intangible assets. Conversely, Deloitte (2009) does not back the amortisation criteria, claiming that it is not entirely suitable. It is because allowances remain unused until the agreement phase ends (when they are surrendered to the scheme regulators) in order to fulfil the entity's commitment in connection with the real carbon emissions for that period (Romic, 2010).

There could be many comparability concerns created by the inventory and intangible methods, such as:

- The categorisation of emission allowances trading in the Cash-Flow Statement.
- Subsequent measurement of carrying value.
- Recognition of previous cost basis reduction.
- The requirement to state disclosures

Asset classification for specific activities is a major factor in preparing a cash-flow statement. Inventories are temporary, whereas intangible assets are permanent unless sold or transferred (Batker and Harrington, 2018). Under the intangible assets method, the carrying value of emission allowances needs a price index for either revaluation or impairment; nonetheless, the price index readiness is dependent on live activity in the carbon industry. Furthermore, the use of both methods leads to distinctions and pre-eminence in costs and

expenses recognition because of dissimilar subsequent measurements (Ernst &Young, 2009).

As pointed out by the French Accounting Standards setter ANC (2012), although allowances lack physical substance, they are not a permit or a licence itself, for example. Unless the owners of nuclear power plants were required to purchase a permit to emit carbon (similar to the licence they require to join the cap-and-trade scheme), allowances are not a licence (or permit) by nature. Additionally, there isn't a requirement to arrange allowances in advance of the actual emissions period, instead, they are surrendered back to the scheme at the year-end, after the emissions were produced and measured accordingly, usually in April each year (IFRS 2014, pp.16). This indicates that companies can emit carbon without holding emission rights equivalent to their actual emissions, as the companies can buy additional allowances from the marketplace. Fines are imposed for not fulfilling the duty to surrender the correct amount of allowances back to the scheme (Europa, 2021a). However, the current legislations do not prohibit the participating entities from creating excess emissions, or ultimately shutting the reactors down (ANC, 2012, p.7).

For the abovementioned reasons, it is a question whether the classification of emission allowances as 'intangible assets' based upon its lack of physical substance is justified? Or whether such allowances be scrutinised in comparison with other examples of intangibles, such as a licence, in which case, allowances cannot be intangibles as they don't reflect the features of a licence or similar.

(C). Government Grants

Governmental organisations offer grants, rewards, loans and related assistance, both monetary and non-monetary, in order to bring financial advantages to specific businesses. The idea of providing such help is to promote activities that the entities will not necessarily adopt otherwise. IAS 20 *Accounting for Government Grants and Disclosure of Government Assistance* explains these assistances by the government as:

"Government grants are assistance by government in the form of transfers of resources to an entity in return for past or **future compliance with certain conditions** relating to the operating activities of the entity. They exclude those forms of government assistance which cannot reasonably have a value placed upon them and transactions with government which

cannot be distinguished from the normal trading transactions of the entity" (IAS 20, 2020, p.A1124-25).

When a business receives support from the government, its recognition in the annual report becomes crucial for a couple of reasons; the need for an appropriate financial accounting method to record the transfer of resources, and the extent of advantage to the entity from those resources. IAS 20 recommends the recognition of governmental assistance only upon the likelihood that the business will obey the requirements related to the grant, and the grant is receivable. That means only receiving the aid is not a sufficient proof of compliance of the prerequisites related to the grant (IAS 20, 2020). It is an expectation that the entities will use the granted allowances to match their emission levels. Moreover, emission allowances are tradeable with trending market value; hence, they do not come under the exclusion of IAS 20.

Companies that emit carbon are distributed allowances through the EU ETS system (or similar cap-and-trade schemes) with a prerequisite that they are obliged to achieve all the carbon emissions compared to the first distribution. 'Granted Carbon Emission Allowances' is a general term known for the carbon emission credits given away under such a scheme (Deloitte, 2007; Ernst & Young, 2009). In case of the issuance of those allowances at less than their fair value, IAS 20 recommends the deferred income recognition for the differences, which is also supported by IFRIC 3 *Emission Rights* (IASB 2005). Conversely, IFRIC 3 backs IAS 20 where real carbon emissions surpass the given threshold. Liability and expense must, therefore, be recognised.

According to Wambsganss and Sanford's (1996), not recognising granted allowances represent inconsistent financial reporting, where purchased carbon credits are recorded in the statement of financial position (highlighting the aspect of net-liability method, later discussed in the literature review), and recognising them as expenses while they are used to reimburse for carbon emissions. They recommended that purchased and granted allowances both are donated assets, that should be recognised at fair value, taking into consideration their free apportionment. However, the justification for their argument is still needed (Wambsganss and Sanford, 1996; Mookdee 2013).

The unpredictability of outcomes exists because of the distinctive estimations by various entities in recognising assets and liabilities related to emission allowances (Bebbington &

Larrinaga, 2008). As per Krupova and Cerny (2007), treatment of assistance by the government can only be as an income upon the deterioration in carbon emissions by the entity. Nonetheless, Deloitte (2009) claimed that instead of calculating the liability at the current market value of carbon credits, the calculation based upon the value of allowances kept as assets for the future settlement of liabilities, would be more appropriate (Krupova and Cerny 2007; Romic, 2010).

While IFRIC 3 support to recognise the deferred income generated due to the difference in the fair value and the amount paid to acquire the allowances from the regulators (usually as gratis through the scheme's quota) had potential; distinguishing between granted and purchased allowances was a bigger question. Should the deferred income generated due to the pricing differences in emission allowances be treated as a form of government grant or assistance? Or whether the condition of future compliance (i.e. to reduce emission reduction as part of the global agenda, and surrender matching allowances back to the scheme on an annual basis) attached to the allowances be considered to analyse its classification as a form of government's assistance?

(D). Financial Instruments

Entities negotiate in various kinds of financial instruments with other businesses. IAS 32 *Financial Instruments* highlights the criteria to distinguish between liability and equity, and establish the principles to offset assets and liabilities in the business. It describes financial instruments as:

"Any contract that gives rise to a financial asset of one entity and a financial liability or equity instrument of another entity" (IAS 32, 2020, p.A1240).

As per IAS 32 illustrations, elements such as cash, equity instrument from a different company, contractual right to obtain cash equivalents, or exchange conceivably advantageous financial asset or liabilities is called a financial asset. A financial liability is quite the opposite of a financial asset. It is a written agreement to remit cash or cash equivalents or a swap of a potentially disadvantageous financial asset or liabilities with other entities. Lastly, after subtracting off all the dues to other businesses, an agreement with any remaining interest in an entity's asset are classified as equity instruments (IAS 32, 2020).

Treatment of carbon emission allowances as financial instruments has raised several questions. Because carbon allowances do not physically exist, but are available for sale in the market, it gives strong credence for arguments. Few businesses such as traders and brokers that hold carbon allowances exclusively for trading motives have a strong reason to choose alternate accounting techniques than inventory and intangible assets for the credits owned. They would want to recognise them as financial instruments, where fair value measurement of carbon credits would be essential.

Because emission allowances are outside the scope of a financial instrument definition, treating them as such would be inappropriate (ANC, 2012, p.7). Many trade agreements for non-monetary items are particularly scoped-in based on the facts that they appear as financial instruments (Deloitte, 2009). Such trade agreements that can be agreed net and remain held primarily for trading motives lies under the umbrella of the accounting standards connected to financial instruments under IAS 32.

It has been emphasised by Krupova and Cerny (2007) that emission allowances are financial instruments instead of intangible assets, as they are temporary assets projected for yearly apportionment, that company could theoretically trade. Conversely, it has also been illustrated that the carbon allowances do not fully meet the IAS 32 & IAS 39 description because they are neither receivables nor equity instruments. Emission allowances also don't fulfil the criteria to be classified as derivates either. Furthermore, KPMG (2012) explains that the allocated and purchased carbon allowances are the outcomes of legal commitments instead of a contractual agreement as described in the standards for financial instruments. Therefore, the problem is the imperfection of the financial instrument method.

The use of inventory and intangible asset techniques to measure carbon credits has created a variety of practices (PWC/IETA, 2007). Because of the lack of authoritative guidelines for carbon allowances swaps, trade between two entities that used a distinctive accounting technique is irrelevant.

Deloitte (2009) has argued that the asset's nature mainly depends on the planned use of allowances by the business for its treatment as either an inventory or intangible asset. It has been suggested by Hamidi-Ravari (2012) that emission allowances are assets whose actual nature upon initial recognition results in the use of its impairment subsequently. IAS 36 *Impairment of Assets* would be applicable once allowances are categorised as intangible

assets, whereas IAS 39 (now replaced with IFRS 9) impairment requirement would be applied for categorising them as financial assets.

Overall, recognition of emission allowances as a financial instrument is dependent upon the local conditions in each nation (Haller and Thoumi, 2009). Every method has its advantages and disadvantages. Lovell, et al., (2010) found that after interviewing accountants that the legislator must determine the nature of carbon credits rather than the accounting standard setters. Accounting techniques can begin once the lawful nature of carbon allowances has been determined, such as in Europe for the EU-ETS (Mookdee and Bellamy, 2017).

2.2.3. ii. What Type of Liability is an Emission Allowance?

Businesses suffer from a commitment to counterbalance the number of carbon allowances to the cap-and-trade scheme regulators, or else they face fines as a consequence for not fulfilling the scheme (Europa, 2021b). It means that entities regularly measure and record liabilities to fulfil their legal obligations. The description of liability as per IASB's Conceptual Framework perfectly meets the criteria above. They define a liability as:

"A present obligation of the entity to **transfer an economic resource** as a result of past events. An obligation is a duty or responsibility that the entity has **no practical ability to avoid**" (Conceptual Framework, 2020, p.A42-43).

The updated definition of liability as per the revised Conceptual Framework 2018 stresses the importance of the criteria when the businesses cannot bypass their obligations. It appears reasonably straightforward to initially record a liability to fulfil the obligation for emission allowances, especially in comparison to recognising assets where the initial categorisation of allowances is already quite confusing. Based on the definition above, the owners of nuclear power plants cannot practically avoid carbon emissions due to the nature of the business, unless the plant has officially been decommissioned. If emissions are prone to be created, and the scheme's obligation to deliver equivalent allowances to the regulators already exists; owners of the reactors have a liability to fulfil.

Because an obligating event would occur when the business starts emitting carbon directly during the power-generation cycle, but there are also indirect emissions, would the liability exist if there were no direct emissions?

Based on the assumption that some emissions would definitely be created as per the lifecycle analysis, emission allowances satisfy the classification of a liability. However, whether the obligation is a provision or a contingent liability is another question. As per IAS 37 *Provisions, Contingent Liabilities and Contingent Assets*, a provision must be recorded when a business has:

"A **present obligation** as a result of past event. It is probable that an outflow of resources embodying economic benefits will be required to settle the obligation; and a **reliable estimate** can be made of the amount of the obligation" (IAS 37, 2020, p.A1401).

On the other hand, IAS 37 explains a contingent liability as:

"Either a **possible obligation**, as it has yet to be confirmed whether the entity has a present obligation that could lead to an outflow of resources embodying economic benefits; or a **present obligation** that do not meet the recognition criteria in this standard" (IAS 37, 2020, p.A1400).

Provision are different from other liabilities as the timing and amount are not accurate, but only a best estimate based on the experts' independent judgement. In case of emission allowances pertaining to the production cycle, entities are required to surrender allowances each year in April to fulfil their obligations to the regulators (Ayaz, 2017). Because emission allowances have a tradeable market value, it is fairly easy to calculate a reliable amount to satisfy the liability. So, the condition of present obligation and a reliable estimate of timings and amounts can easily be determined. It would fall in to the category of a 'possible obligation' only if the owners of nuclear power plants weren't sure about the likelihood of carbon emissions. Alternatively, if the measurement of a reliable amount or timing cannot be estimated with confidence. Considering the probability of carbon emissions created during the nuclear fuel cycle, contingent liability is more likely to be overruled by provisions. Contingent liabilities are not revealed in the financial statements, except for necessary disclosures in the notes to the financial statements (IAS 37, 2020). As the former IFRIC 3 *Emission Rights* acknowledged that an obligation exists that can be measured reliably, relevant disclosures and amounts are to be given in the financial statements under provisions. However, there are challenges for liability measurements as we can either use best estimates (fair value) of the compliance period or present obligation.

A business must record a liability for the entire carbon emissions at any point throughout the year using their most reliable judgement of the liability. Management uses their expertise in measuring the closest estimate of the future obligations of carbon emissions. This approach is known as the *present value approach*. On the contrary, the *market value* of carbon credits is used for a similar obligation under the fair value technique, which is also supported by the IFRIC 3 *Emission Rights* (Romic, 2010). Additionally, the other method suggests that the estimated liability for the entire carbon emissions during the fulfilment period should surpass the initially owned carbon credits. The management reports the balance of the overall estimated shortfall at the end of each reporting period. In addition to the current liability using the present value approach, an accrued liability also requires recognition in the financial statements. Conversely, the estimation of the total liability for the fulfilment period is measured using the market value, plus an accrual, equal to the level of real emissions concerning the predicted cumulative level, as per the fair value technique needs recognition (Montero, Calderon and Dias, 2020; Mookdee and Bellamy, 2017).

It is questionable whether the spot price or forward-price would be relevant for the fair value estimation of the predicted future obligations (relevant to the techniques described above)? Preferably, a forward price must be used to measure future liability. Businesses are left with the alternative solution to measure the forward liabilities at the current market value (spot price), thereby entailing an even forward curve.

Although the techniques provide a useful guide for the entities to value their future liabilities, many inconsistencies can still occur in the accounting journals of the operators of nuclear facilities. An entity would most likely end up with a smaller liability in the initial fulfilment period leading to a higher liability near the completion of the fulfilment period as an example. The latter of the two techniques appears to be more reliable due to the involvement of a substantial amount of estimations in the measurement of future liabilities. However, the total estimate also subjects it to the company's best scrutinisation, investigation, and estimation methods, i.e. susceptible to variations in estimations (Desjardins & Schuh, 2008).

Once businesses have made accounting strategy decisions for measuring assets and liabilities, the subsequent decision is whether the recognition must be net or gross.

The netting technique is appropriate when both parties owe each other money, but it does not apply to carbon markets since the controller is not borrowing from the owner of emission

allowances. Moreover, netting usually happens in conditions where the asset and liability are comparable to each other, such as account debtors and creditors. Lastly, the use of gross presentation seems suitable because the two elements appear to be self-governing and not correlated. The allowances initially owned (asset) can be traded, utilised, or swapped for another asset regardless of the company's present/future commitment to forfeit emission allowances. Likewise, despite of the presence of a commitment to surrender allowances, the operator has no authority over which credits the entity will use to fulfil its responsibility.

Because of the non-existence of an official accounting treatment on carbon emissions allowances, disclosure requirements for their trading are not yet compulsory. Generally, a company should reveal all the transactions in the financial statements that are material in nature and valuation to represent an unbiased and truthful view of their annual performances as per the UK accounting regulations (FRC, 2014). PWC proposes that the risks related to the atmospheric change will ultimately become a material fact that will need a disclosure in financial statements (PWC, 2008).

The discussion above does have strong support for the classification of emission allowances as provisions. In case the operator created more emissions than the given allowances, an obligation exist to purchase extra allowances (which involves money for purchase) to surrender back to the regulators. Because the surrendering process does not involve money to the State, should there be a liability towards the purchased allowances, once again, when the additional allowances were delivered to the regulators? Or the obligation to match the actual level of emissions was fulfilled when the extra allowances were purchased? It has been argued that the process of matching emissions with equivalent allowances by forfeiting them to the state is only to remain compliant with the scheme's regulation. It is because the State simply destroys the surrendered allowances, and doesn't earn money for those allowances (ANC, 2012). This process would be much easier if allowances can either granted or purchased only.

After the perusal of guidelines given by the accounting bodies for carbon emission allowances, and questioning its classification under both assets and liabilities; current accounting practices must be reviewed. It is to understand the industry's financial accounting preferences in the absence of an official accounting standard on this area.

2.3. Accounting Practices Implemented by Carbon Emitters

2.3.1. Surveys

Carbon emission trading schemes, in particular, the EU ETS is responsible for creating numerous financial accounting issues for the participants. It is mainly due to the apportionment of allowances as gratis, while having the purchase option alongside, where no stringent financial reporting regulations are in place (Veith, Werner and Zimmerman, 2009). Due to the silence by the accounting bodies on the correct treatment for emission permits in the financial statements, and clarification and inspection by accounting professionals; standard-setters have been unsuccessful in developing an appropriate accounting treatment for this matter. Due to this, consistency and comparability in practical application of carbon emissions accounting is lacking within the Energy sector (Allini, Giner and Caldarelli, 2018; Elfrink and Ellison, 2009; Mookdee, 2013).

Surveys of carbon emitters' prevalent financial accounting practices have been covered in a few studies over the last few years, though more studies would have helped in pressing this issue to the highest level.

Soon after the withdrawal of IFRIC 3 *Emission Rights* in 2005, one of the leading Big4firms PricewaterhouseCoopers (PWC) in collaboration with the International Emissions Trading Association (IETA) conducted a study to explore the accounting treatments used by twenty-six large European companies. The aim of the study was to explore the accounting practices in the industry, and to understand the emerging issues related to emission allowances for the companies following IFRS guidelines. The results drawn from the study were as below:

- More than half of the sample recorded granted (65%) and purchased (58%) allowances as intangible assets as suggested by IFRIC 3, followed by inventory method used by 15% and 11% of the respondents, respectively. Rest of the sample adopted other methods. However, amortisation or revaluation was not applied in subsequent accounting.
- As low as 14% of the sample followed the withdrawn IFRIC 3 recommendations to adopt fair value approach, instead, a majority of 76% recognised granted allowances at zero value.

- Carrying value was used by the majority to recognise the emissions liability for surrendering equivalent allowances back to the scheme, where market value was adopted by the rest.
- Trade of emission allowances (forward contracts) were treated as per IAS 39 *Financial Instruments.*
- US GAAP guidelines over IFRS were predominantly adopted by the sample companies.
- Respondents raised several issues related to the ambiguities in accounting regulations for emission allowances, stating comparability and consistency were severely affected in practice. The absence of an accounting standard was making it challenging to pursue investment decisions in the Energy sector.
- Overall, a minority practiced former IFRIC 3 accounting suggestions (PWC/IETA, 2007).

Romic (2010) conducted a study on twenty-one registered European companies from various sectors to analyse the accounting treatments and disclosures given in the financial statements. Following points were drawn from the results:

- A chaos in accounting practice was observed due to the lack of authoritative guidelines.
- Disclosures lacking in-depth knowledge, and mainly ignored in the context of emission allowances.
- Net-liability method of accounting stood out, where granted allowances (that were received for free by the State) were not at all recorded in the financial statements. Emissions liabilities were recognised only when the actual emissions exceed the granted allowances.
- Consistency in accounting applications were observed; entities prefer to apply same principles on an annual basis, often idealising industry standards.
- Variety of accounting treatments shed light on the significance of transparency and comparability in financial reporting.

Using PWC/IETA 2007 study as a basis, in 2010, another similar study was done by the Association of Chartered Certified Accountants (ACCA) together with IETA. The research reviewed twenty-six largest carbon-emitting European companies to explore the prevalent accounting treatments practiced by the industry leaders. Additionally, the study also

uncovered the underlying reasons of the variations in accounting policies. Results revealed the following:

- Multiplicities in accounting applications by the EU ETS participants, with no noticeable outline in practice. Former IFRIC 3 guidelines were remotely practiced.
- Intangible assets for initial recognition was adopted by 42% of the respondents, using 'cost' as the valuation basis, i.e. in the case of granted allowances, cost will be zero (nil value by 31%). Fair value recognition, as suggested by IFRIC 3 was followed by only 15% of the sample.
- Obligation to surrender emission allowances to the regulators was recognised on 'cost and market value' approach by more than half of the sample (58%). Where both granted and purchased allowances were recorded at cost, whereas allowances purchased for business-use were treated at market value.
- Disclosures were poorly presented, whether relevant accounting information was either not present or lacking ample information.
- Primary data collected by interviewing key participants blamed the absence of accounting guidelines for the variations in accounting practice, as the participating entities were free to choose accounting applications that fits their need. Also, uncertainty on the classification of emission allowances was raised by many interviewees.
- Comparability of accounting information was raised by all interviewees, where some mentioned about the possibility of material values being overlooked in the annual reports.
- Respondents unanimously expressed the industry's expectation of a uniform standard of accounting for emission rights (Lovell, et al., 2010).

Another research by Steenkamp, Rahman and Kashyap (2011), sampled seventy-five UK companies with similar objectives as previous researchers, i.e. to analyse the financial accounting practices in the annual reports. Following results were presented:

- Only eighteen out of seventy-five (24%) companies provided disclosures on carbon emission allowances, highlighting the density on non-disclosures on this area.
- Granted emission allowances were mainly recognised as intangibles at 'Cost' (i.e. nil value) by at least 72% of the surveyed companies. It followed by other valuation methods including market value then fair value.

- Intangible assets recognition method dominated for purchased emission allowances, pursued by the majority (seven out of eighteen that provided accounting information). Once again, 'Cost' valuation was the favorite, followed by market and fair value, similar to the granted allowances.
- Provisions were recognised by 33% of the sample for surrendering allowances back to the State.

Another study conducted by Warwick and Ng (2012), authors examined forty-seven EU ETS participant companies to explore the prevalent accounting practices in the absence of an official accounting standard. Key results obtained from the research were as below:

- More than half of the sample (55%) opted for intangibles method to record granted allowances in their financial statements, followed by inventory and other assets. Over 36% of the sample refrained from disclosing relevant accounting information.
- Nil value was the valuation criteria chosen by over 38% of the surveyed companies, followed by fair value (21%).
- Sample entities main intention to purchased additional allowances was to fulfil the legal obligation to surrender equivalent allowances, and trading was the secondary reason.
- Purchased allowances were predominantly recorded at 'Cost' by approximately 60% of the sample. Similar to the granted allowances, at least 38% did not reveal accounting information on purchased allowances.
- Obligation to deliver allowances to the regulators was recognised as a provisional liability by almost 80% of the surveyed companies.
- A higher rate of non-disclosures and inconsistent accounting treatments were highlighted in the study.

A case-study research by Mookdee (2013) on three Australian carbon-emitting companies explored the accounting treatments used for emission allowances in their financial statements. Additionally, the study was aimed to map out the experts view on the reasons behind the chosen accounting policies in the industry. Key results drawn from the study were:

- Various accounting policies were observed, without any correlation to each other. However, disclosures were highly incomparable and not to the best of the standards.

- Institutional pressures were believed to the be the reason for compliance with existing standards and the pressure from external auditors.
- Among all qualitative characteristics of useful accounting information, *relevance* dominated the charts, as supported by all participants. At least 67% of the interviewees believed *reliability* was important, followed by approximately 50% that vouched for *verifiability* and then *comparability* of accounting information.
- As per the interviewed experts, emission allowances were either intangibles or financial instruments, valued at either Cost, Cost or NRV or FVTPL.
- Experts were of the view that consistency in accounting treatments was significantly important, and updates in accounting estimates were valid based on the existing standards (i.e. IAS 8).
- Materiality is a key distinguishing feature between disclosures and non-disclosures of relevant accounting information.

In 2017, a preliminary part of this study was published by the author. The research was conducted on twenty-eight European utility companies to review the current accounting practices for emission allowances, in the absence of an accounting standard. The research derived the following results:

- Intangible asset recognition method dominated the charts, as adopted by 39% of the surveyed companies to recognise granted allowances, valued predominantly at nil and fair value, followed by cost. Since, cost for granted allowances would be zero, ultimately, cost/nil value would be the most favourable method. Half of the sample did not disclose their policies on granted allowances.
- For the valuation of purchased allowances, once again, 'cost' method remained the favourite, pursued by 54% of the sample. Nine out of twenty-eight companies (32%) refrained from disclosing information on this area.
- Over 71% of the reviewed companies recognised provisional liabilities towards the legal obligation to surrender equivalent allowances. Remaining sample chosen to maintain silence on this subject. 'Cost' method stood out from the rest as being the preferred option among the selected companies.
- Wordings used in disclosures were ambiguous, and largely varied on a case-by-case basis. Due to the lack of a relevant accounting standard for emission allowances,

consistency and comparability in disclosure practices has been compromised (Ayaz, 2017).

Another study conducted by Allini, Giner and Caldarelli (2018) explored the emission rights (allowances) accounting treatments adopted by ninety-four European carbon-emitting companies. Below are the results from the study:

- Net-liability method was the most likeable option, adopted by over 56% of the sample companies, where free allowances were not recognised (on the basis of zero value). While the rest of the sample opted for 'market value' approach to recognise granted allowances.
- Those that disclosed granted emission allowances, mainly recognised them as intangible assets, while no entity pursued inventory or financial instrument method, and valued them mostly at 'Cost' (71%).
- Opinions were divided on the recognition of purchased allowances, where both inventory and intangible asset approaches were used by 51% and 49% respectively. Valuation was largely done on the basis on 'market value' option (63%).
- Exceptionally higher levels of non-disclosures related to carbon emission allowances were observed among the sample, highlighting the deprivation of relevant information for the key stakeholders.
- Comparability of financial information was highly affected.

Outside of the European Union, a survey was conducted by Earth Economics in 2018 on fifteen largest carbon-emitting companies enrolled in California's cap-and-trade scheme. Following results were drawn from the research:

- Only 39% of the total sample recognised granted allowances at either cost or nominal value (essentially nil value). A massive majority of 61% did not reveal their accounting practices for carbon emission allowances.
- Multiplicities were observed in the recognition of purchased emission allowances. Inventory method was adopted by 27% collectively, valuing the allowances at either Cost, Cost or NRV or Fair Value. About 20% opted for intangibles approach at fair value (similar to IFRIC 3), whereas the remaining identified the allowances as other assets. A vast population of 33% did not disclose information on this area.

- About 47% of the surveyed companies acknowledged their obligations to the regulators to surrender relevant allowances, and measured the liability at fair value. However, the rest did not recognise this obligation at all for various reasons (Batker and Harrington, 2018).

The most recent study conducted on emission rights was done by Montero, Calderon and Dias (2020). This research studied eighty-five European companies to understand whether the existing accounting standard ensures higher transparency in financial reporting in the context of emission allowances. This study explored the current accounting standards adopted by the sample under various accounting standards, to find the correlation with transparencies. The key points derived from the results were as below:

- Emission allowances were mainly recognised as intangible assets at market value for initial recognition among all accounting standards.
- Net-liability approach was more prevalent among IFRS companies, i.e. not disclosing granted allowances and only revealing the liability upon excessive emissions than the given quota, for example.
- IFRS companies disclosed less information on emission allowances in comparison with other local European accounting regulations (i.e. IFRS 69%, Portuguese GAAP 88% and Spanish GAAP 99% disclosures). Disclosure practices were scattered among the IFRS entities.
- Diversity in accounting treatments were mainly identified among the IFRS sample as compared with Portuguese, Spanish and French accounting regulations.
- It was argued that poor transparency in financial reporting on emission allowances were due to the absence of a relevant accounting standard, but it wasn't highly significant. The author envisaged that the presence of an accounting standard would ideally enhance comparability and transparency of accounting information. Author claimed that the lack of IASB guidelines were the reason for flexible accounting treatments, i.e. diversity in practice.
- Report identified less likelihood of disclosing information on emission allowances over GHG emissions under IFRS regulations.

As comprehended based on the results of past studies; major dispersions were observed in the industry's accounting practices for emission allowances. Several accounting methods were brought under review, including the most commonly denoted net-liability method,

IFRIC-3 method, and others (Ayaz 2017; Balatbat and Wang, 2010; Montero, Calderon and Dias, 2020). This section extends to shed light on various accounting methods, as highlighted in the past surveys, to gain understanding of the key approaches used in the industry.

2.3.2. Review of Current Methods Practiced by the Industry Participants

2.3.2. i. Net-liability Method

The netting technique recommends the use of nominal value to measure granted emission allowances, and to recognise a provisional liability only when the actual emissions level exceeds the granted quota. There is no concept of recognising deferred income, however the liability needs frequent revaluation (Mookdee, 2013). This method allows netting assets and liabilities, where both items are usually understated (Allini, Giner and Caldarelli, 2018, pp.2198). This method appears fairly sensible without the presence of comprehensive accounting guidelines. Any non-monetary grants or assistance by the government is valued at fair or nominal value (that would essentially be zero value for granted allowances) as per the guidelines by IAS 20 *Accounting for Government Grants and Disclosure of Government Assistance (*IAS 20, 2020). Net liability method is a lot less complicated in comparison to IFRIC 3 (Riley, 2007).

This method measures the purchased allowances, in a way, similar to other intangible assets. Granted emission allowances are used to compensate for necessary legal obligations due to the carbon emissions. If any allowances are sold to other entities, the difference between the price received and the fair value would be treated as either a gain or a loss in the financial statements. In case of a loss, further liability must be recorded (Krupova and Cerny, 2007).

This technique has gained enough popularity among the European companies (PWC/IETA, 2007). As per Ernest and Young (2008), twenty out of thirty-two entitles considered some form of netting techniques to settle liabilities. This technique is most commonly practice among European companies (Montero, Calderon and Dias, 2020).

2.3.2. ii. IFRIC 3 Method

According to the IFRIC 3 method, both granted and purchased allowances must be treated as intangible assets. Fair value must be used to record allowances issued at less than their fair value. Deferred income should be recorded (for the difference in the price paid and the

fair value of granted allowances), as a government grant, with income recognised subsequently on a routine basis over the completion period of carbon allowances, regardless as to whether the allowances were previously owned or not. The company has the choice to either adopt the cost or revaluation model for subsequent recognition. For the entity's legal obligation to surrender allowances back to the regulators, management must record a provision for the ultimate expenditures related to fulfilling present liabilities up to the date of reporting at its market value (Allini, Giner and Caldarelli, 2017, p.2198; Lovell, at al., 2010). Unlike the netting method, offsetting assets and liabilities were not allowed in IFRIC 3 *Emission Rights* (Warwick and Ng, 2012).

Although officially withdrawn in 2005 (Fornaro, Winkelman and Goldstein, 2009), recognition of allowances as intangible assets remained largely common as found in a few studies (Ayaz 2017; Steenkamp, Rahman and Kashyap, 2011). However, the entire IFRIC 3 guidelines were not completely adopted by the participants, especially pertaining to the valuation techniques, and complete suggestions were adopted by smaller samples, i.e. only two out of twenty-one as per Romic (2010) and 5% respondents as per PWC/IETA (2007).

2.3.2. iii. Remainder Value Method

This method is the same as IFRIC 3 approach (intangible assets and government grant recognition) except for the recognition of liability, where the cost of emission allowances is used to calculate provision. It is then recognised to the level that the entity holds a satisfactory sum of emission allowances based on their carrying value. In case the entity does not hold a necessary sum of carbon allowances, market value of the shortfall in the allowances would be used to measure the liability. A fine or penalty would be imposed in case the company cannot surrender the required amount of carbon credits to meet its legal obligation (Romic, 2010).

This method, although identical to the former interpretation presented in IFRIC 3, could jeopardise the liabilities as being valued on carrying and market value, dependent upon the circumstances of deficit or surplus in allowances.

2.3.3. Review of Potential Methods for the Industry Participants

Building on the practices of industry participants, several experts came up with alternative approaches to provide an accounting alternative. A few approaches are discussed in the section below.

2.3.3. i. Modified Net-Liability Method

As suggested by Krupova and Cerny (2007), the establishment of this technique is on the entity's trading reasons that involve plans to trade allowances at a nominal value below its market price. Typically, allocated allowances do not reach the financial statements (under the net-liability approach), and any shortfall in such allowances after sale is shown in a net-liability account. Income generated from trading of allowances, where revaluation is anticipated at the year-end, would be recognised as deferred income in the financial statements. Moreover, in the future, if the entity bought back any allowances at a nominal value, then it would be recognised by the reversal of the deferred income. Otherwise, in case of an increase in the selling price of emission allowances, the entity may need to cash in extra allowances to fulfil its legal obligations. The difference in the price paid would be a deficit requiring an entry in the Income Statement. Consequently, an additional liability is reported, plus the excess is below the expectations than otherwise (Ayaz, 2017; Krupova and Cerny, 2007; Mookdee 2013).

2.3.3. ii. ANC Method

In 2012, French accounting standard-setter (ANC) focused on the intentions to hold carbon emission allowances by separating its purposes for business-use and trading motives. Because of the obligations to surrender allowances to the regulators pertaining to the production process, allowances depict the nature of a commodity, therefore, inventory method would be the ideal alternative. However, granted allowances must be recognised as an inventory and the corresponding government grant at zero value (i.e. its cost only). For allowances held for trading purposes, fair value must be used, instead of cost for other valuations. The dependency on managements discretion on the appropriate criteria to be used for valuation of emission allowances would be removed, thereby, improving consistency and comparability in financial reporting (Giner, 2014).

For the recognition of liability to give-up equivalent allowances to the regulators, ANC claimed that the liability should be recorded before the additional allowances are purchased with the intention to surrender them to the State eventually, and not when they're actually surrendered. It is because surrendering does not involve finances, and it is only a compliance procedure at the year-end. Management must use their best independent judgement to value the related provisions (ANC, 2012, p.11).

2.3.3. iii. EFRAG Method

Following the ANC recommendation letter, in 2013, the European Financial Reporting Advisory Group issued their own suggestions for the accounting of emission allowances. The recommendations were derived on the basis of the responses received from eleven countries in total including the UK, Europe and Canada. Participants were highly experienced, representing national standard setters, professional accounting bodies, and more (EFRAG, 2013, p.4). All respondents unanimously agreed that an independent official guideline was required to resolve the emerging accounting issues, especially when these allowances are *materially* significant to the financial statements (EFRAG, 2013, p.5).

EFRAG believed that emission allowances are most likely to be classified as an inventory than other assets. Even though allowances do not fully possess the characteristics to be classified as inventory, since they're not actually consumed in the power-generation cycle, and the power can still be generated without having them in hand. EFRAG continued to explain that due to the fact allowances can be consumed for trading and business-use purposes, they are to be labelled as an inventory. Granted allowances must be recognised at fair value with the recognition of deferred income (grant), similar to the IFRIC 3 method (however an inventory instead of intangibles). Similarly, purchased allowances should also be valued at fair value.

With regards to emission liabilities, set-off between assets and liabilities are prohibited, however mismatches can be reduced by connecting liability measurement with the recorded asset in the financial statements. Both assets and liabilities must be separately identified and recorded, and the liability will be de-recognised upon the delivery back to the State. Provisions must be measured at a weighted average cost until there are sufficient allowances to match the emissions. In case excess allowances were required, market value must be used to measure them (EFRAG, 2013, p.6).

Only possession of emission allowances is not a ticket to emit, as an entity could still create emissions without holding sufficient allowances, (although fines may be incurred) and buy allowances later on to fulfil the obligation to the regulators. It shows that emission allowances are merely a compliance instrument than a commodity. Should the allowances be an exception to be identified as an inventory? (Giner, 2014). This creates an argument for the classification of allowances as a commodity in the production process as suggested by ANC and EFRAG above. However, the current practice of recognising allowances as intangibles, as per IFRIC 3 and Net-Liability methods, have also raised questions of inconsistencies in financial reporting.

Emissions are created not only during the power-generation process, but also indirectly throughout the life of a nuclear power plant (OECD, 2012). While there are some relevant and official guidelines by IFRS on fuel and decommissioning obligations respectively, emissions have largely been ignored. Could the authoritative guidelines bring better uniformity and higher transparency in accounting practice? Montero, Calderon and Dias (2020) found greater diversity in accounting and higher percentage of non-disclosures related to emission allowances, among the IFRS companies, as opposed to other standards. This could possibly be the result of principles-based approach followed by IFRS as opposed to the rules-based approach (such as the US GAAP) that offers greater flexibility to the participants. Could this statement be true if compared with the accounting treatments for other areas of the reactors, i.e. nuclear fuel and decommissioning?

By reviewing the current accounting guidelines by IFRS for other problematic areas, i.e. nuclear fuel and asset retirement obligations, in the nuclear fuel cycle; a pattern will be established to understand the connection between authoritative guidelines and accounting practice. This is to ascertain whether official accounting guidelines reduces comparability issues and improves transparency in financial reporting. Next section also creates a case for emission allowances, to work out whether the absence of particular accounting guidelines raises inconsistencies and multiplicities in practice, and to understand the reasons for selecting particular accounting methods by the participants in those circumstances.

2.4. Comparison of Accounting Guidelines for Nuclear Fuel and Asset Retirement Obligations with Carbon Emission Allowances

2.4.1. Accounting for Nuclear Fuel

Due to the usage of nuclear fuel in electricity production, financial accounting measures of IAS 16 *Property, Plant and Equipment* are applicable based on the extended stay of fuel inside the reactor. Conversely, IAS 2 *Inventories* is relevant due to the use of nuclear fuel elements in the power-generation cycle (PWC, 2011).

If the features of nuclear fuel are treated as parts of a tangible non-current asset, the total cost of the asset must include the decommissioning, demolition and site reconstruction cost as per IAS 16. Also, a liability for the decommissioning obligations is recorded as per IAS 37 *Provisions, Contingent Liabilities and Contingent Assets.* Any forthcoming changes in the measured liability are recognised under IFRIC 1 *Changes in Decommissioning, Restoration and Similar Liabilities*. On the other hand, if nuclear fuel is regarded as an inventory, similar accounting measurement for decommissioning and demolition obligation is applicable. There are some clarity issues in terms of accounting for nuclear fuel as IFRS has not differentiated nuclear fuel classification between a fixed asset or an inventory in an official interpretation, but rather offered the directions that the participants could take.

In 2014, IFRS discussed this issue in the annual interpretations public meeting. The IFRS staff claimed that nuclear fuel is unlike traditional inventories, and is **not materiality significant** to the financial statements. As per their survey, noted accounting treatment used in the practice was IAS-2 *Inventories*. The staff recommended the use of IAS-16 *Property, Plant and Equipment* based on the fact that fuel spends more than a year in the reactors. Also, the carrying value of the remaining fuel would not be consumed by the company at the end of reactor's life. Unless, the fuel will stay for less than a year, in which case, IAS-2 would be applicable (IFRS, 2014, p.4).

The matter pertaining to the initial recognition and subsequent measurement of fuel are given below in detail:

2.4.1. i. Accounting for Front-End Cycle

Nuclear fuel roads burn through nuclear fission in order to derive nuclear energy. The fuel usually stays in the reactor for over a phase of one to three years. The remains are extracted to process through the back-end of the nuclear fuel cycle, which involves recycling, extended storage (CGN, 2021) and final clearance of the waste items (EDF, 2021). If the power plant is permanently closed, the leftover quantity of the nuclear fuel (un-burnt fuel at shutdown) cannot be entirely consumed or sold (Pike, 2015).

Nuclear fuel is generally accounted for under IAS 2 Inventories recognised as an expense while used (burnt) within utilisation cycle, typically one to three years (IFRS, 2014, p.4). However, under the guidelines given by US GAAP, fuel used in the reactor must be regarded as an item of property, plant and equipment in the books as opposed to inventory, due to its extended lifespan (PWC, 2011).

The question stands, whether nuclear fuel meets the requirement to be classified as an inventory or a plant or both under IFRS guidelines? Two accounting standards that deal with both are IAS-2 *Inventories* and IAS-16 *Property, Plant & Equipment*.

(A) Inventory:

Because nuclear fuel is an essential ingredient to generate electricity, it would be fair to assume that it is a raw material that is also work in progress (for the time spent inside the reactor, usually over a year up to three years) for producing electricity. IFRS defines inventory in IAS-2 *Inventories* as:

"Inventories are assets held for sale in the ordinary course of business [finished goods]; in the process of production for such sale [work in progress]; in the form of materials and supplies to be consumed in the production process or in the rendering of services [raw materials]" (IAS 2, 2020, p.A961).

As per IAS 2, the measurement of inventories should be at the lower of cost or net realisable value. It covers most kinds of inventories except for any service or construction contracts, financial instruments and any assets related to agricultural activities. In addition to the purchase and conversion costs (including import duties, non-recoverable taxes, fixed and variable overheads and more), all other costs

associated with the inventory to bring it to the premises and present working condition makes part of the cost of the inventory. However, there are some **exclusion** such as significant wastage of raw material and labour, **storage costs** and admin costs not directly related to bringing the assets to its current location. Additionally, selling costs, exchange rate differences on buying inventory in international currencies and interest costs are also excluded from the cost of inventory in the financial statements (IAS 2, 2020, p.A963).

Following the requirements of IAS 2 *Inventories*, nuclear fuel can be treated as an inventory due to its involvement in electricity generation as a raw material. Once the fuel has stayed in the reactor for a period of up to three years, it is then transferred into a nearby pond to let it cool down before moving on to its temporary storage for the duration of up to half a decade. After that, it would be either reprocessed or disposed of permanently (Figure 1.1, p.33). That means there is a considerable *storage cost* involved in this process, which is not covered by the standard as highlighted above.

Several nuclear power plant operators record fuel as inventory in the financial statements. Canada's Energie NB Power Commission adopts the IAS 2 inventory measurement method by recording nuclear fuel at the lower of cost or net realisable value using the first-in-first-out (FIFO) valuation method (NB Power, 2021). Another example is taken from Finland's Fortum Power and Heat Company that claims most of their inventories include nuclear fuel utilised in either the electricity production or the fulfilment of their duties. They follow the requirements of IAS 2 Inventories for valuing their stock (Fortum, 2021). Furthermore, as per Electricite de France (EDF), their inventory consists of all forms of nuclear fuel, including raw materials, work-in-progress and finished goods in the nuclear fuel cycle. Additionally, parts of nuclear fuel stored in the warehouse also form part of the inventories. The amount of nuclear fuel introduced into the reactor is proportionate with the predicted result by considering its consumption levels. EDF values their inventories using the weighted average cost method (EDF, 2021).

Based on the recommendations by IFRS and the disclosures from industry participants above, it is noted that there's a strong case for utility companies to follow IAS 2 requirements

to recognise and measure fuel in the financial statements. Part (b) below addresses the perspective of fixed asset recognition for comparison of two accounting methods.

(B) Fixed Asset:

When the intention is to use an asset for more than a year, it is generally regarded as a fixed asset. Nuclear fuel stays in the reactor for more than a twelve-months period; which is why many companies believe it must be classified as a tangible non-current asset, instead of a current asset.

IFRS defines property, plant, and equipment in IAS 16 as:

"Property, plant and equipment are tangible items that are held for use in the **production or supply of goods or services**, for rental to others, or for administrative purposes; and are expected to be used for **more than one period"** (IAS 16, 2020, p.A1065).

As per IAS 16, in addition to the purchase price of the non-current asset, other costs related to bringing the asset to its present location and in the working condition make part of the cost of the asset. It includes any import and customs duties and non-recoverable taxes paid to bring the asset to the business premises, excluding trade discounts. With the purchase or use of specific property, plant and equipment, there is an **obligation to dismantle and decommission** the assets at the end of its useful life. Consequently, asset retirement obligations make part of the cost calculation (IAS 16, 2020, pA.1068).

When the intention is to use rather than to sell the assets for over twelve months, IAS 16 is applicable. Whereas, assets planned to be consumed by the entity within a year are out of the scope of IAS 16 (generally IAS 2 is applicable in such scenarios). Following the guidelines of IAS 16, nuclear fuel can be regarded as a non-current asset since it is a crucial tangible ingredient used in electricity production, which generally stays in the nuclear reactor for over one year. After storage, any leftover burnt fuel ready for disposal is also covered by the standard, as it allows estimations of decommissioning and the cost of site restoration to be considered as a component of the final cost of the asset.

A few nuclear power plant operators follow IAS 16 approach to record nuclear fuel as a long-term asset in their financial statements. An example from Europe is Czech Republic's Czech Power Co. that recognises nuclear fuel at cost minus accumulated depreciation as an item of Property, Plant and Equipment in their Statement of Financial Position. The level of output produced determines the depreciation of nuclear fuel installed in the reactor (CEZ, 2021).

While the current guidelines suggest the use of IAS 2 for fuel used in power-generation cycle, and as surveyed by IFRS that most of the participants have adopted inventory classification indeed, it is a question how many have followed IAS 16 application instead? The use of the latter was also suggested by IFRS staff on the basis of the duration of fuel in the reactor (IFRS, 2014, pp.4). As there is some clarity for recognition of fuel in the financial statements, results will uncover what percentage of the participants followed the identical accounting practice.

2.4.1. ii. Accounting for Back-End Cycle

Back-end of the nuclear fuel cycle results in the fuel waste that needs to be safely disposed. Spent nuclear fuel is incredibly harmful due to the fission by-product, which is why it is essential for fuel to be cooled down for several months in spent fuel pools to reduce the radioactivity. In the USA, the U.S. Department of Energy (U.S DOE) has the ultimate duty for the clearance of burnt fuel in the long-term, in addition to the removal of nuclear fuel waste (Nuclear Energy Institute, 2016). So far, the solution for long-term storage of burnt-fuel is still a work in progress by the U.S DOE even though the government is still collecting the funds by taxpayers (PWC, 2011; Nextera, 2019; Xcel Energy, 2019).

Since nuclear fuel storage is a decades-long problem, the costs involved in this process are huge that cannot go unreported. As discussed above, IAS 2 *Inventories* prohibits the recognition of storage costs; however, recognition of dismantling, decommissioning and site restoration costs are allowed under IAS 16 *Property, Plant and Equipment*. Various companies adopt the non-current assets approach and simultaneously follow the IAS 37 *Provision, Contingent Liabilities and Contingent Assets* to recognise provision for the estimated future liabilities related to spent fuel storage and disposal. Further guidelines are also addressed in IFRIC 1 *Changes in Existing Decommissioning, Restoration and Similar Liabilities*. Additionally, the questions regarding necessary funds for the decommissioning

process are discussed in IFRIC 5 *Rights to Interests arising from Decommissioning, Restoration and Environmental Rehabilitation Funds* (PWC, 2017).

IFRS states in IAS 37:

"An entity recognises a provision for the decommissioning cost of …. a nuclear power station to the extent that the entity is **obliged** to rectify damaged already caused" (IAS 37, 2020, p.A1402-03).

IFRS has pointed out the recognition of a provisional liability on the basis of the obligation of the participant to do so. Almost all of the owners of nuclear power plants are obliged to dismantle the entire asset, including the disposal of spent fuel. Plenty of standards and interpretations have provided ample suggestions on the accounting treatments. As stated by Canada's Energie NB Power, the company measures the cost of handling burnt-fuel and asset retirement obligations to record a provision in their financial statement. Furthermore, the cost of site restoration after the demolition of the nuclear power plant also makes part of the estimation (NB Power, 2021). As per Finland's Fortum Power and Heat, provisions include the estimates for the decommissioning and nuclear waste disposal costs according to the guidelines by IAS 37 *Provisions, Contingent Liabilities and Contingent Assets* (Fortum, 2021).

While IFRS has addressed spent-fuel more precisely by recommending provision on the basis of the obligation to decommission the plant, initial fuel criteria are somewhat hazy. As discussed in this section, initial fuel largely resembles the characteristics of inventories, but could also be regarded as fixed assets. IASB guidelines have provided ample advice on this area, however, there is a clarity issue. Based on the IFRS committee meeting in 2014, a widely noted accounting treatment for initial fuel was IAS 2, but there were hints given towards IAS 16 (IFRS, 2014, p.4). Because IFRS follows a principles-based approach, accounting requirements are not always fixed, and other options are mostly available. Results of this study will further address whether the industry has displayed unanimous accounting treatment for initial and spent fuel.

Emission allowances case is quite similar to initial fuel on the basis that the classification of both as current or non-current assets are questionable. Electricity can be generated without holding equivalent allowances, but emissions will be created, resulting in the obligation to

surrender necessary allowances to the regulators. This indicates that allowances are one of the production requirements, if not physically consumed in the production cycle. Does that reflect towards inventory recognition since allowances could also be traded? Or the physical absence of allowances would classify them as intangibles? On the contrary, fuel is the main item required for power-generation, however it usually stays in the reactor for more than a year. Should it be regarded as an inventory or a fixed asset? Although IFRS has distinguished the case of fuel based on the timing factor, there are still uncertainties for emission allowances.

To further understand the presence of accounting guidelines for complicated areas, and its prevalent practices in the industry, next section will shed light on IFRS instructions for decommissioning liabilities (as it is another complex area in the utilities sector).

2.4.2. Accounting for Decommissioning Liabilities, Discounting Rates and Retirement Funds

Decommissioning liabilities are one of the complex areas in financial accounting as it deals with present value estimations for assets with extended useful life. Decommissioning is a process by which the site of a retired nuclear power plant is cleared and cleaned-up to release the land for a limitless use.

Although some commercial-scale reactors were retired up to forty years ago, there is a minimal experience of completing decommissioning of commercial-scale reactors that were in operation for decades. By the end of 2019, about 186 out of 629 nuclear power plants have been completed halted, but not entirely decommissioned (IAEA, 2020, p.53). No plants have completed the decommissioning process outside of the USA. Stage 3 decommissioning is not expected to start in the UK before 2070 even though the oldest plant was shut down in 1987. Speeding up the decommissioning process is neither practical nor economical (BBC, 2013). France is also not expecting to start decommissioning its retired reactors for about fifty years. Assuming a reactor's operating life is up to sixty years, and a delay after closure is up to a hundred years before completing the decommissioning; the whole process would take over a century. From the operation until the cessation date, the entire decommissioning might take 150 years (Thomas, 2014).

The responsibilities to either demolish or eradicate tangible non-current assets or to refurbish the site to its original condition after decommissioning lies with the establishment of nuclear power plants. These commitments are commonly signified as 'asset retirement obligation'. A few accounting standards provide guidelines to deal with asset retirement obligations that includes IAS 16, IAS 37, IFRIC 1 and IFRIC 5.

As per IAS 37, provision must be recorded when:

"An entity has a present obligation as a result of a past event; it is probable that an outflow of resources embodying economic benefits will be required to settle the obligation; and a reliable estimate can be made of the amount of the obligation" (IAS 37, 2020, p.A1401).

When the nuclear power plant comes into existence, the obligation to remove the asset was created as well. The operators of nuclear facilities, therefore, record provisions towards the decommissioning obligations. Such provisions are measured at the present value of the projected cash outflows, included as part of the final cost of the power plant (Ernst &Young, 2009). IFRIC 1 *Changes in Existing Decommissioning, Restoration and Similar Liabilities* deals with the measurement of provision with the use and changes of a discounting rate in the current market (IFRIC 1, 2020).

Conventional accounting requires that future costs and benefits be 'discounted' to the equivalent sum today, i.e. the 'net present value'. Under this classification, a liability that must be paid in a year of £110 has a net present value of £100 if the real interest rate is 10% because a sum of £100 today will have grown sufficiently to pay the liability in a year. Similarly, the benefit of £110 in a year is only worth £100 today. Over relatively short periods, where the interest rate is predictable, this seems a sensible procedure, but over periods envisaged for nuclear facilities of more than a century, the impact of 'discounting' can be spectacular. For example, over periods of longer than eighty years, the British government assumed a real discount rate of only 2.2%. However, over 100 years, a sum of money earning interest at that rate would grow by a factor of nearly nine-fold. Eskom, up to 2012, assumed a real discount rate for long-term liabilities of 5.3%. Over 100 years, a fund growing at this rate would have increased 175-fold. In 2013, the rate was reduced to 4.6%, but even at this reduced rate, the fund would have grown ninety-fold. At this lower discount rate, assuming the decommissioning will cost £10 billion in 100 years (for example) after

the power plant started operations, an investment of only £100 million on the first date of the operations would require (Taylor, 2008).

Does this raise the question on the reliability of cost estimations used by businesses to measure the deferred costs? Absolutely! Due to the extended timeframes, there is a significant chance of error. Table 1 illustrates the consequence of discounting over extensive timeframes and shows the strong influence of compound interest rates.

Estimated Decommissioning Liability	£500m	£500m	£500m
Life span of a nuclear facility	50 years	100 years	100 years
Discounting Rate	3%	3%	4%
Net Present Value	£114m	£26m	£10m

Table 1: Discounting Over Extended Timeframes, Author, 2021.

It illustrates that the phase of over fifty years between the cessation of a nuclear power reactor and its decommissioning, a potential cost of £500 million will be incurred, which has a net present value of £114 using a 3% discount rate in real-time. Usually, the real extended discount rate free of risk ranges between 2% to 3%. The life span of a hundred years or more is entirely accurate for a modern power reactor with lengthier decommissioning timeframes. With that in mind, the present value contracts to £26 million at a 3% real discount. The total then decreases to only £10 million based on a higher discounting rate of 4%. More intense fluctuations in the real potential costs have a limited effect on the present value over such periods.

Expert estimations are required to calculate such provisions to reduce the space between the current and prospective cost figures; in other words, the discount rate, however which rate is the most appropriate remains challenging. According to the KPMG Survey (2008), only half of power and utility operators surveyed revealed the discount rate to calculate future cash flows for determining the total provision. Amongst those that did include such statements in their annual reports, the foundation of the actual discount rate was repeatedly vague, making appraisal extremely challenging. Additionally, the general level of disclosure by the power and utility operators regarding decommissioning and environmental provisions differs considerably, and barely one-third of the entities revealed a separate environmental provision (KPMG, 2008).

While the confusion lies around the suitability of the discounting rates, in the same year when IFRIC-3 *Emission Rights* came forward, IFRIC issued another interpretation to address the issues related to the **funds for decommissioning obligations.** Concerns regarding nuclear funds in order to fulfil decommissioning obligations are addressed in IFRIC 5 *Rights to Interest from Decommissioning, Restoration and Environmental Rehabilitation Funds.* Operators of nuclear facilities pay into their chosen schemes to accumulate funds for future responsibilities related to the cessation of nuclear power plants. Entities contribution in such funds might be either regulatory or voluntary, which can be in the form of both debt and equity instruments that could cover the cost of decommissioning. Independent administrators must fully manage decommissioning funds, with very limited or no access by the operators. The duty to incur the cost of decommissioning lies with the operators; however, they can use their right of reimbursement up to a specified limit. The operator of the nuclear facility must adopt IAS 37 guidelines to recognise a contingent liability where additional fund contributions are possibly required or a provision where such payments are probable (IFRIC 5, 2020).

Entities have the option to either record provisions for the funds required for asset retirement obligations, or plan future funding by pooling money into segregated or unsegregated funds. Under accounting provisions, the utility collects the money but uses it as investment capital, so the fund exists under the assets on the financial statements. In order to access the fund, assets, therefore, have to be sold. If the business goes bankrupt, the fund will permanently be lost because the value of the assets must be used to pay immediate creditors. Accounting provisions are, therefore, a highly risky way to keep the assets. A second option is to create a specified cash fund that is placed in specific investments. It will allow the funds to be invested in low-risk investments to lessen the chance that these will fail and lose money. However, if the company fails, this fund will have to be used to pay the company's creditors and, therefore, will be lost. The least risky and the most practical option among others are 'segregated' funds. The nuclear plant owner pays into the fund but has no access to, other than to pay for approved decommissioning activities. It is administered entirely separately from the company by independent trustees and is typically only allowed to make investments in the least risky ventures, which includes government bonds, for example. Though there are no guarantees that a government will not change the status of the fund and subvert its contents for other uses, plus one should not assume that government bonds are risk-free in the long-term; still, it is the most secure method of holding provisions so far (Thomas, 2014).

IFRS provided clear guidelines in IFRIC-5 for the accounting treatment of decommissioning funds in the annual reports, along with the disclosure requirements. Contingent liabilities must also be stated if the company assumes that the relevant funds would not be sufficient to complete the decommissioning obligations. Unlike the case of discounting rates, IFRS does prefer segregated funds that would guarantee payments towards the asset retirement obligations (IFRIC 5, 2020).

While the IFRS has carefully addressed the accounting treatments for asset retirement obligations, the issue of discounting needs more exploration. Since selecting a suitable discounting rate for the decommissioning provisions is not as easy as it sounds, there is a clear need for detailed guidance by accounting officials. For reducing the multiplicities and improving the comparability (one of the enhancing qualitative characteristics of the updated Conceptual Framework 2018) and transparency in the financial statements, there is a need to establish the most appropriate discounting rate method for decommissioning obligations across the industry.

2.4.3. Case of Nuclear Fuel and Decommissioning Accounting Practices for Comparison with Emission Allowances

As discussed in Section 2.4.1, IFRS has offered relevant guidelines to account for nuclear fuel in the financial statements. Spent-fuel is addressed in IAS 37 under decommissioning obligations, however the initial fuel classification remained questionable. Based on the IFRS survey, most of the companies have recognised initial fuel as inventories as per IAS 2, however there's a case for its recognition as fixed asset based on IAS 16 (IFRS, 2014, p.4). What are the recent accounting practices in the industry with regards to the initial and spent-fuel? Results of this study will test the consistency in financial reporting, along with the qualitative characteristics of useful accounting information.

Based on the discussion in Section 2.4.2, decommissioning liabilities and related obligations are thoroughly addressed by IFRS. However, there are questions about the suitability of discounting rates to value decommissioning liabilities for the owners of nuclear power plants. As per the KPMG survey, most of the entities refrained from revealing accounting information on discounting rates, plus limited or no disclosures were given (KPMG, 2008). While accounting treatments for asset retirement obligations exist, how are the entities currently valuing such liabilities? What discounting rates have been used? As the companies

are using their independent judgement to value such long-term liabilities, is there consistency in practice?

Both cases raised arguments for the main issue of this study, i.e. to ascertain the accounting practices for carbon emission allowances, as there are practically no official IFRS guidelines yet, unlike the case for fuel and asset retirement obligations. What is the basis for accounting treatments used by the participating companies? As disclosures on emission allowances have not been transparent and comparable in the past (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Montero, Calderon and Dias, 2020), what are the reasonings for disclosures in practice?

Next section will review the literature on the qualitative characteristics of useful accounting information, and its role in maintaining high quality accounting disclosures. Current official disclosure guidelines will be used to relate to the case of emission allowances. Due to the absence of an accounting standard on this area, are the companies maintaining good accounting practice to maintain stakeholders' trust and keeping them fully informed?

2.5. Influence of Accounting Regulations in ensuring the Usefulness of Accounting Information

2.5.1. Qualitative Characteristics of Useful Accounting Information

Consistency and understandability are the main purposes of the Conceptual Framework, besides providing support to the IFRS organisation for the development of accounting standards that will ensure transparency, economic efficiency and accountability to global financial markets. As stated in the framework, its vital purpose is to:

"Assist preparers to develop **consistent accounting policies** when no Standard applies to a particular transaction or other event, or when a Standard allows a choice of accounting policy" (Conceptual Framework, 2020, p.A13).

In the absence of an authoritative accounting standard for carbon emission allowances, surely, the concepts of Conceptual Framework must be honoured by the participating entities to provide an honest and true-and-fair view of the accounts. It is because the main purpose of financial reports is to offer useful information to its stakeholders. To protect the usefulness of the reports, financial accounting information must be essentially *relevant* and *faithful*. To

further enhance the quality of financial reporting, information must be *comparable*, *understandable*, *timely* and *verifiable* (Conceptual Framework, 2018, p.A25-27).

Past studies have identified inconsistencies and lack of transparency in information regarding emission allowances (Elfrink and Ellison 2009, p.33), as discussed in Section 2.3.1., where disclosures were largely either inconsistent or absent. Several qualitative characteristics of comparability and verifiability for example, were not present in the industry (Allini, Giner and Caldarelli, 2018; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020; Warwick and Ng, 2012).

The revised Conceptual Framework stated that investors decisions could be compromised for not receiving the relevant accounting information, thereby, pointing the importance of **relevancy** of useful information. Not only materially significant values, some information is material by nature, therefore, vital for informed business decisions (Steenkamp, Rahman and Kashyap, 2011, p.4). This would indicate that transactions related to emissions trading schemes, i.e. EU ETS must be material by nature due to the key interest of wider-stakeholders (Montero, Calderon and Dias, 2020). Additionally, information must be unbiased, comprehensive and without any errors or omissions (Conceptual Framework, 2020). The framework acknowledges the fact that management will use estimates and judgements in financial accounting, however it doesn't support omissions (i.e. non-disclosures) on purposes, unless it outweighs the benefits.

Considering the fundamental qualities of useful accounting information, transactions on carbon trading are prone to be relevant, not only **material** by nature (Montero, Calderon and Dias, 2020, p.5) but also material in values. IFRS observed emission values based on a survey, and the amounts were between 0.7 to 2.5% of total assets, which they classified as immaterial (IFRS, 2014, p.11). Lovell, et al., (2010) claimed that although overall materiality percentages of the selected sample were not significant, it probably was due to the higher levels of non-disclosures of key accounting information in the financial statements (Lovell, et al., 2010, p.27). Values for purchased emission allowances stood between 1% to 2% of the total liabilities, but are projected to increase notably within the next decade (Barker and Harrington, 2018, p.21). However, materiality percentages are judgemental, based on individual circumstances, and IFRS refrain from setting fixed benchmarks (Conceptual Framework, 2020, p.A28). Utility and Energy sector wide percentages were identified to be around 5% of Profit Before Tax, based on the FTSE 350 companies. Additionally,

materiality benchmark for related industry, i.e. Oil and Gas companies, included 1% of total assets (FRC, 2017, p.13). Due to the rising issues of climate change, clear and relevant disclosures must be presented in the financial statements to improve transparency and comparability in corporate reporting practices, and to maintain stakeholders' interests (PWC/IETA 2007, p.46). Does that mean emission allowances are indeed material by both quantitative and qualitative aspects? In order to verify the most recent materiality levels, this study has covered a few benchmarks to establish whether emission transactions are material to the annual reports. Profit, revenue and asset-based benchmarks are used in this research as mentioned in ISA 320 *Materiality in Planning and Performing an Audit* (ICAEW, 2017, p.5).

Besides relevance, information must be faithfully represented by the preparers of accounts. Given information must be complete, impartial and without any errors or omissions. The conceptual framework has used the word 'neutral' to elaborate **faithful representation**, i.e. the information must not be tailored to present a favourable or unfavourable situation. Even estimations should be clearly presented and thoroughly explained (Conceptual Framework, 2020). In the past, disclosures regarding carbon emissions were largely disregarded from the financial statements and gaps among the given information were quite noticeable (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Barker and Harrington, 2018; Cook, 2009; Lovell, et al., 2010; Warwick and Ng, 2012).

In addition to the fundamental qualities (i.e. relevance and faithful representation) of useful accounting information; enhancing qualities could further add value in financial reporting. In order for investors to make viable business decisions, an entity's published report must be **comparable** with its competitors, not only for the given period, but other periods as well. This is to ensure that users are able to understand key terms presented in the financial statements (Conceptual Framework, 2020). Consistency is about using the same accounting treatments, i.e. for emission allowances on an annual basis, within an entity or competition, to achieve the goal of comparability. Several studies have spotted comparability issues as a rising trend within the Energy and Utilities industry (Bebbington and Larrinaga, 2008; Montero, Calderon and Dias, 2020), that indicates the failures of upholding qualitative characteristics of useful information by the operators of nuclear power plants.

Financial information must be **verifiable**, whether directly or indirectly, so the users could reach a unanimous decision that the given information is faithfully represented. Judgements

and estimations are a big part of financial accounting; presented values in the reports should provide basis of verifiability, i.e. the assumptions and the chosen methods (Conceptual Framework, 2020). For example, in the case of discounting rates for decommissioning liabilities, various rates were used by the industry participants and the given accounting disclosures were ambiguous and vague (KPMG, 2008). Conversely, multiple accounting approaches were used to measure purchased emission allowances, and disclosures were limited, usually without ample details to enhance understandability of the treatments (Barker and Harrington, 2018, p.20).

Timely information helps the stakeholders make key decisions on time, whereas presenting financial information in an understandable manner would make the interpretation a lot easier. **Timeliness** and **understandability** are the other two enhancing qualities of useful information (Conceptual Framework, 2020). Financial reporting is generally quite complex, many experienced professionals often need to review key disclosures to get a better understanding of the situation. However, lack of disclosures won't help the situation, as without having information, it is difficult to assess the gravity of the situation. In other words, not providing information on relevant matters doesn't offer a true-and-fair view of accounts. Reporting on carbon emission allowances is a topic under consideration by accounting bodies and practitioners (Veith, Werner and Zimmerman, 2009), due to the absence of an official accounting standard on this area, disclosures are voluntary at this stage. Both fundamental and enhancing characteristics of useful information enhances the transparency and consistency in financial reporting, albeit, withholding information known to be an emerging concern (i.e. emissions reporting) is somewhat against the narrative of the revised Conceptual Framework (2020).

This study will test whether the accounting treatments for emission allowances were consistently applied, and relevant disclosures were given to maintain the superior quality of useful information. Interviews of accounting specialists will rank the abovementioned qualities from highest to lowest in terms of their relevance for emission allowances.

2.5.2. Current Disclosure Requirements

2.5.2. i. IAS 1 Presentation of Financial Statements

To ensure comparability in financial reporting, IAS 1 *Presentation of Financial Statements* sets out the basis for the presentation of financial statements, that applies to all companies following IFRS regulations. Similar to the Conceptual Framework, IAS 1 stresses the significance of disclosing material information, and advise the entities to avoid material misstatements (IAS 1, 2020). The framework ensures that participating businesses reveal a statement in the annual report about compliance with IFRS requirements (as per the existing standards and interpretations); and refrain from making such statement when regulations were not complied with. In case, where IFRS has not issued official guidelines, i.e. for carbon emission allowances, the framework advises the entities to maintain fair and faithful presentation that can be achieved by:

- Applying accounting estimates and policies as per IAS 8.
- Maintaining fundamental and enhancing qualities of useful financial information
- Providing necessary disclosures to improve understandability of particular accounting treatments where compliance only would not suffice. It is to ensure that users of accounting information were able to understand the impact of certain transactions (Conceptual Framework, 2020).

Based on the narratives of IAS 1, it is a reasonable expectation from the owners of nuclear power plants to reveal accounting disclosures pertaining to carbon emission allowances. In the recent company guidance issued by FRC considering the effects of COVID-19, material uncertainties are discussed in detail. FRC has emphasised on the disclosure of estimates and material judgements as per IAS 1, and asked the participating entities to provide necessary details even in these difficult times (FRC, 2020, p.6). Since, the level of non-disclosures remained exceptionally high in this industry (Allini, Giner and Caldarelli, 2018, Ernst and Young, 2008; Montero, Calderon and Dias, 2020; PWC/IETA 2007), it is questionable whether there's an open non-compliance with the requirements of IAS 1 in this industry? IFRS states that disclosures must be given unless it outweighs the benefits, does that mean disclosures on emission allowances are costly and not beneficial to the participating entities?

IFRS permit the entities, in extreme circumstances, to deviate away from the standard requirements if compliance would result in misleading outcomes, and would be in conflict with the Conceptual Framework. However, disclosures of such departures would still be required within the financial statements (Conceptual Framework, 2020). Assuming that compliance with the former IFRIC 3 *Emission Rights* (that faced backlash for mismatching issues in accounting) was inappropriate, and the entities chose to apply alternative accounting treatments, disclosures for the selective policies would still be required. However, that wasn't the case as per many prior studies where noticeable sample of entities withheld relevant disclosures on emission allowances (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Balatbat and Wang, 2010; Elfrink and Ellison, 2009; Lovell, et al., 2010; Mookdee, 2013; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020; PWC/IETA, 2007; Steenkamp, Rahman and Kashyap, 2011; Warwick and Ng, 2012). Having said that, as per Mikova and Valaskova (2013), almost all surveyed companies adhered to IAS 1 disclosure requirements with ample information about the chosen policies. Could it mean that entities are more likely to adopt IAS 1 requirements for compliance or non-compliance with existing standards, as long as there are separate guidelines (in the form of standards or interpretations) given by the IFRS? Since the framework remained silent on emission allowances, was that the reason for many entities that have not considered the implications of relevant non-disclosures? This study will address the motivation of entities behind disclosures or non-disclosures, and the implications of incorrect accounting treatments by interviewing experienced accounting professionals.

2.5.2. ii. GRI 305: Emissions 2016

Entities have the option to adopt the Global Sustainability Reporting Standards (GRI Standards) in order to prepare their sustainability reports. These standards are universally accepted, and divided into three categories of economy, environment and society. Focus has largely been given on disclosures and chosen policies, however the standard emphasises reporting on *material* areas. Emissions are addressed in GRI 305 that covers the guidelines of Kyoto Protocol, and therefore, cap-and-trade schemes also comes under the same umbrella. It is stated in the standard that management must provide disclosures of the entity's dealing of material areas and its associated implications, in light with stakeholders' expectations from the company. Although specific disclosures are emphasised repeatedly within the guidelines, materiality is mentioned alongside (GRI, 2016, pp.3-5). Does that

mean if the values are material (either in amount or by nature), companies are advised to disclose their accounting treatments for better transparency and comparability in financial reporting? Results of this study will reveal materiality levels for the sample IFRS companies to understand the significance of emission allowances in the financial statements.

2.5.3. Good Accounting Practices

A good accounting practice would adhere to the qualitative characteristics of useful financial information presented in the financial statements. The main purpose of financial statements is to offer its users information on the economic resources and forthcoming outlooks of the entity, so that the stakeholders are fully informed, and their interests are fully protected. Not only the information regarding the assets, liabilities and expenses; even judgements and estimates must be disclosed together with other useful information within the financial statements (Conceptual Framework, 2020). Effective communication between the agents and its principals, in the form of financial reports, augments the comparability and understandability of the financial statements on a global scale. However, IFRS also advises the management to ascertain whether the cost of providing information on certain areas outweighs the benefits (Conceptual Framework, 2020). This is counterintuitive, as certain disclosures must be made mandatory for the participating companies to maintain the vested interests of wider-stakeholders, on areas of common interests, i.e. climate change nowadays.

In a report prepared by European Securities and Markets Authority (ESMA) to review the prevalent accounting policies by financial institutions in thirty-nine European countries, comparability issues were observed. It was advised by ESMA that transparency in financial reporting would improve if disclosures on chosen accounting policies and judgements were improved by IFRS (ESMA, 2013, p.35). Ahmed, Neel and Wang (2013) claimed the lower quality of IFRS disclosures was probably due to the involvement of managements' discretion (judgements) in their selective accounting policies, rather than the updates in accounting standards. Authors assumed that adoption of IFRS doesn't necessarily enhances the quality of financial accounting, and there are other factors that would improve the comparability in reporting (Ahmed, Neel and Wang, 2013, p.1369). Compliance with IFRS doesn't always bring uniformity in accounting practices (Horton, Serafeim and Serafeim, 2013, p.419), which is probably either due to the principles-based approach to accounting or the management's involvement in protecting public opinion of the entity, i.e. by averting negative publicity (concealing disclosures that are not mandatory for example).

The former IFRIC 3 *Emission Rights* did not impose mandatory disclosure requirements in the interpretation, and assumed that existing standard requirements would be sufficient. Currently, all IFRS companies must follow IAS 1 *Presentation of Financial Statements* guidelines in disclosing all relevant policies and judgements. IFRS did not mandate disclosures, as IFRIC 3 was only an interpretation, and not a standard. Additionally, a prior IFRS survey assumed that allowances were not highly material to the financial statements (IFRS, 2014, p.11). Since the withdrawal of IFRIC 3 in 2005, IFRS didn't actively pursue this issue. While the agenda for carbon reduction continued to gain more awareness among wider-stakeholders, accounting issues remained untouched, as the standard-setters relied upon voluntary accounting measures. If a good accounting practice is to adhere to the revised Conceptual Framework and to follow the mandatory guidelines in individual standards, the necessity for a standard on emission allowances requires further support, i.e. either material significance or peer-pressure or more. This study will test the materiality benchmarks for emission allowances to understand the significance of this issue.

IASB's main objective is to promote comparability in financial reporting and global harmonisation of accounting practices. However, the option to select independent accounting policies (i.e. at management's discretion) jeopardises its main objective (Nobes, 2011, p.281). It doesn't mean that principles-based approach to accounting reduces the quality of reporting, but the option of managements' judgement, especially in case where accounting standards doesn't exist (i.e. for carbon emission allowances), could be a bold expectation from the participants. How many companies have offered voluntary disclosures on emission allowances in the absence of a relevant accounting standard? Results of this study will elaborate more on this issue to establish whether the participating entities have offered voluntary disclosures or not. How do the companies maintain good accounting practice? Interviews from accounting specialists will further highlight the elements of a good accounting practice later in this study.

2.5.4. Summary

The key points to summarise the literature review is as below:

- Prices for carbon emission allowances (EUA) are rising to their highest level, making the trading market more competitive and pricier than ever before.

- Based on the IFRS survey, value of EUAs are somewhere between 0.7% to 2.5% of total liabilities, but they're projected to become more **material** in the coming years.
- Since the withdrawal of IFRIC 3 *Emission Rights* in 2005, there's currently **no accounting standard** for carbon emission allowances. Companies are currently relying on voluntary accounting and disclosure practices. This project was renamed to ***Pollutant Pricing Mechanisms*** by IFRS in 2015, since then, no further news came forward and the project has been pushed back from the active agendas.
- Literature reflected upon the guidelines of the existing accounting standards to establish the classification of emission allowances (whether allowances are inventory, intangible assets, financial instruments or government grants), and its obligations to the State.
- Several studies were conducted, mainly in Europe, to analyse the prevalent accounting practices for emission allowances. All studies revealed **multiplicities** in the accounting treatments. Particularly, lack of relevant disclosures was the pressing issue.
- However, there hasn't been a study (as per the author) that has explored this practice on a global scale, especially in comparison with accounting practices for other complex areas in the life of nuclear power plants, i.e. nuclear fuel and decommissioning obligations. There are guidelines available for both, however there lies a little confusion regarding the classification of fuel as either current or non-current asset. Similarly, there isn't a **standardised clarity** on which discounting rates should be used to value extreme long-term liabilities, i.e. for decommissioning. This study will benchmark accounting practices for carbon emission allowances with fuel and asset retirement obligations among IFRS and NON-IFRS entities to review the trends.
- The revised Conceptual Framework 2018 reflects on the **key qualities for useful accounting information.** In the absence of official guidelines, entities are expected to consider those qualities, and also refer to IAS 1 *Presentation of Financial Statements* for the preparation of financial reports. In the absence of official standards (i.e. for emission allowances), are the companies adhering to the Conceptual Framework? Expert interviews will elaborate the motivation of companies behind selective accounting policies.

III. THEORETICAL FRAMEWORK

3.1. Background

As emphasised in the literature review, there are numerous accounting practices for emission allowances within the energy and utilities industry; raising comparability and transparency issues in financial reporting (Montero, Calderon and Dias, 2020). Based on the prior studies, a minor percentage of the surveyed companies have partially or fully adopted accounting practices from the withdrawn IFRIC 3 interpretation, but many have deviated away from it by adopting alternative techniques (Elfrink and Ellison, 2009; Cook, 2009; Haupt and Ismer, 2013). Mainly, diversity was seen in disclosure practices as the majority have remained silent from revealing their accounting treatments for emission allowances. As there isn't yet an official accounting standard or interpretation by IFRS to address these issues, disclosures remained voluntary, and most participants seemed to have opted-out of voluntary measures.

Due to the rising concerns of climate-change, stakeholders have become more aware of carbon footprints on the environment, increasing the *societal concerns* of this issue. The entity's decision to give carbon disclosures and select specific accounting policies can be a plan to obtain social acceptability. It is a way to connect to and convince society that the entity will live up to their hopes and expectations (Fonseca, 2014). Accounting bodies have general expectations from the participating entities, for example, to adhere to the revised Conceptual Framework in all accounting procedures; i.e. *professional expectations*. As IFRS follows a principles-based approach, companies are expected to present a better quality of annual reports by improving voluntarily disclosures to maintain the professional standard. Campbell (2007) claims that it is more probable for entities to act in a publicly accountable manner when they are involved in an established interchange with stakeholders, which is more likely to happen in harmonised market economies. Besides, in liberal market economies where stakeholder participation is not intensely recognised, the lack of established stakeholder involvement might persuade entities to provide more information about their practices. We can also say that an environment of minimal regulations might induce more stress from stakeholders on the improvement of matters, i.e. carbon reporting at the business level. Moreover, businesses have an option to stand out in the market by collaborating more in terms of their carbon proposals (Campbell, 2007). Additionally, there are industry standards to match, adding extra pressure on the entities to perform one way or the other. Official regulations, such as the Kyoto Protocol, are also in play to control the

overall emissions level, which would have an impact on the operational activities of the owners of nuclear power plants, leading to *economic pressures*. All the measures are pointing towards various kinds of institutional pressures surrounding this industry.

While Kyoto Protocol has been focusing on reducing overall emissions (EU ETS Handbook, 2015), IFRS has largely neglected the accounting related issues. This has left the practitioners in exercising their own independent judgement to apply accounting policies that they thought were fit for the purpose. As observed in the literature review, past studies have revealed variations in accounting practices for emission allowances. Several reasons could underpin the management's choice for such policies that may include professional expectations, societal concerns, economic measures, industry practices, and many more. The aim of this study is not only to establish the current accounting practice for emission allowances, but also to figure out the reasons behind the applied policies. Additionally, this study has focused on the qualitative characteristics of useful accounting information to represent good accounting practices. The Conceptual Framework 2018, and other related measures in various countries are enforced by accounting bodies to keep the reporting standards of superior quality. Professional standards have exerted institutional pressure on all operating entities to adhere to the norms of financial markets to protect the stakeholders' interests. Justifiably, institutional theory that covers numerous institutional pressures, is a suitable theoretical perspective for this study.

Scrutinization of external forces related to stakeholders in the macro-environment; as well as their impact on businesses in determining the connection between organisational practices and the social environment where the business operates, is related to the institutional theory (Mookdee, 2013). In particular, there are institutional pressures that have developed a trading market for carbon emissions to decrease the fears of global warming and contributions from major carbon-emitting businesses. Zucker (1977) explains that academics must contemplate broader environments and their effects on organisational activities, for example, both macro and micro environments must be taken into consideration for a deeper evaluation. Conversely, institutional theory reflects upon the changing institutional impacts (Carpenter and Feroz, 2001; Scapens, 1994) and offers an appropriate theoretical framework to support this research.

On the basis of the literature review, it is easy to understand that accounting bodies have a major role in bringing uniformity in financial reporting. Several studies have raised the

transparency and comparability issues in the European market (Ayaz, 2017) and the impact of institutional pressures on businesses (Mookdee and Bellamy, 2017); hence, the suitability for this research. The concept of accounting in this complicated industry can be understood by using institutional theory. A detailed description of this approach, and its application in this study is explained in this chapter.

3.2. Institutional Theory

Establishments plays a vital role in providing permanence and value to everyday life as it covers normative, regulative and societal elements, along with their related actions, and means to the community (Scott, 2013, p.56). Normative element enlightens not only the goals and objectives, but also the direction towards the achievement of such goals. Regulative elements are based on the implementation and examination of official legislations, whereas, the social elements shed light on an individuals' response to the outer-environment that are formed by the societal norms (Comyns, 2018; Scott, 2013). It is a belief that institutional surroundings force the entities to react in a particular direction, as well as to embrace publicly accepted techniques as being pertinent. It mainly tackles the impression of how authority becomes institutionalised within an entity (Hoffman, 1999; Wooten and Hoffman, 2008; Zucker, 1977). On the other hand, administrative choices are typically not a consideration for competence, but are somewhat an effort from the entity to act in the widely acknowledged way, which assists the entity to shield itself against the views of absurdity (Meyer and Rowan, 1977). The unofficial institutional stresses created from peers, industry leaders, and contacts, push the company to conform its conduct to those prevailing within its environment. When confronted with ambiguity concerning the effects of a particular entity's performance, a company may lead its competitors who have faced a similar situation (Pfarrer, et al., 2008).

Hall and Taylor (1996) stated that purpose of institutional theory is to enlighten the pattern of organisational development in a specific manner. The representative and authoritative procedures determined by institutions govern the entities by determining their own version of normality (Scott, 1995). From a rational standpoint of this theory, an individual's response to the administrative authorities is primarily dependent on their own environmental acknowledgment. So, in order to design or alter their communal existence in the societal normality, entities will imitate their institutional surroundings, laws and governance procedures that in their opinion are impartial. Following the imitation of their local

surroundings, entities groom as independent role-players, and try to follow the societal norms and beliefs to become more inclusive (DiMaggio and Powell, 1983). The reality of an organisation is underlined by their actions towards the communal acceptance. The enduring and successful future of an entity is dependent upon the pedals of public support towards its relevance and contribution for the wider-stakeholders. From a theoretical standpoint, companies that protects its stakeholders' interests and respond well to its changing environments would surely endure (Scott, 1995). Over the time, competitors start to replicate their actions due to the limitations imposed upon them by the structural norms. Organisational beliefs generally become a shared practice among the competitors, which in the long run results in structural isomorphism. In brief, to run a successful business model is to mimic the leading competitors in the market to defend their practices and be known as the compliant organisation that conforms to the societal beliefs (DiMaggio and Powell, 1983).

As said by institutional theory, the fundamentals of the formal organisational arrangement, rules, and practices mainly come from general public's belief about what comprises a suitable economic and social practice. Therefore, it is easy to predict that carbon operators may espouse accounting procedures that are in proportion to very efficient professional theories. It foresees that such performance will lead to consistency in organisational arrangements and applications, which will be considered a legal standard for all participants within the same industry, often referred to as Institutional Isomorphism. Conversely, it must be stressed that societal arrangements and practices relating to institutional theory achieve significance and steadiness on its own, exclusive of the reflection to the definitive conclusions of the practices (Lincoln, 1995). It indicates that entities in a specific industry may have identical reporting arrangements, e.g. carbon emissions reporting in the energy and utilities industry. Furthermore, entities with better institutionalisation face lesser consistency issues, and have more uniform practices in the society (DiMaggio and Powell, 1983; Zucker, 1977). As in this study, all entities are from carbon emissions industry; they must have comparatively similar accounting treatments as projected by accountants.

Additionally, this theory explains how non-selected actions can happen and continue through the practice of custom, agreement, ease, or communal responsibility (Oliver, 1991). Selections of accounting techniques by operators of nuclear power plants might be credited to custom, agreement, ease, or communal responsibility as well. It explains why an entity's

features and actions in the same industry gradually become similar or dissimilar. Furthermore, this theory explores in what ways practices of particular businesses' might be implemented to convey acceptability in the community (Mookdee, 2013). Pressures can force entities to participate in cultural norms and practices to conform to the routine. For example, if it is considered a normal practice to disclose an entity's measures against their carbon footprints on an annual basis, i.e. in the annual report, simply repeating the same disclosure every year would tick the box of an acceptable normality. However, the oversight towards technical and relevant details is the real issue, that needs improvement. This implies that only conforming to seek public acceptance by adopting homogenous procedures might earn public acceptability, but the key stakeholder's interest would not be protected. Whether an entity discloses a true-and-fair view of their accounts to protect its wider-stakeholder's interest or to protect itself from public scrutiny is a critical question (Maqruis, Toffel and Zhou, 2016, p.484). Abrahamson and Park (1994) stated that companies refrain from offering disclosures that would attract negative publicity, unless there are strong internal controls and scrutiny by the shareholders and investors in place. The author mentioned that companies react to their operational surroundings and the public acceptance is all that matters, so the disclosures are selective based upon how it reflects on the company's public appearance.

Conceptual beliefs and philosophies to recognise and examine both inner and outer environment of an organisation are explained in the institutional theory (Zucker, 1983). As per DiMaggio and Powell (1983), companies exhibit multiplicities in practice during the early stages of the administrative field, until the awareness and acceptability reaches the maturity level, is when uniformity in practices are promoted (Currie, 2012). This reflects upon the case of carbon emission allowances, as the growing significance towards revealing accounting practices on this area still hasn't reached its maturity levels. Only a few studies have been conducted on this field that have identified miscellaneous accounting treatments among carbon emitting companies in Europe. Does that mean institutional pressures from the macro and micro environment of the operating entities would direct the participants towards homogenisation in the coming future?

Various types of institutional pressures are exerted upon the businesses that shapes their operational activities and reporting practices. Such pressures could be either or both formal, i.e. from the regulations, and informal, from the professional bodies or the society and

cultural norms (Comyns, 2018, p.68). This study embraces the definitions and possibilities of institutional theory by considering the two vital scopes of institutionalisation, i.e. isomorphism and decoupling, as both of them help in clarifying voluntary accounting and disclosure practices very well.

3.2.1. Isomorphism

Isomorphism is a compelling process that encourages one component to look like another component in a population facing parallel external circumstances. It is either a method of standardization or inclination towards the implementation of identical business practices by corporations (DiMaggio and Powell, 1983). Entities are 'restrained' by other organisations through the authoritative procedure of institutional isomorphism, because of the notion that circumstances are shared and interrelated, and in order to endure, businesses should react to outer demands and prospects. Institutional isomorphism can shape the organisational internal and external environment to uphold its various commitments, i.e. reporting on carbon emissions or reducing harmful carbon footprints (Dubey, Gunasekaran and Ali, 2015; Luo, et al., 2017; Zhu and Sarkis, 2007).

As per Kostova, Roth and Dacin (2008), large companies adopt their own unique rules and regulations, and have their own culture that can be identified as their individual arena. Such internally created environment becomes institutionalised for their subsidiaries and other associates. In a sense, subsidiaries of large and global businesses deal with isomorphic pressures not only from the external environment, i.e. the local legislation or the country of its operation, but also from the internal environment, i.e. within the parent group (Comyns, 2017; Rosenzweig and Singh, 1991). Multinational companies where pressures are high to improve consistency; financial reporting within the group structure results in minor variation due to internal environment to match the group standards. Conversely, in case of a weaker internal controls and standardization policies within the group, companies are prone to be affected by local legislations, as they become more dominant (Comyns, 2017; Rosenzweig and Singh, 1991). Because of the various kinds of institutional pressures, large companies are prone to be affected by some form of isomorphism. Considering the case of carbon emission allowances, due to the involvement of wider-stakeholders on the issue of climate change in the recent years, businesses are possibly controlling the level of institutional pressures that they can handle (Kostova, Roth and Dacin, 2008).

Isomorphism covers three main types of institutional forces, which includes coercive, mimetic and normative pressures. All three pressures are explained below:

3.2.1. i. Coercive Pressures

Both official and unofficial burdens applied to entities by other entities, at which point they are reliant, and by social prospects in the organisational functioning environment, are called coercive isomorphism (DiMaggio and Powell, 1991).

The more superior level of reliance and centralism, the more comparable it will be to that company in the arrangement, environment, and interactive attention. For example, subsidiary companies should implement accounting techniques, practices and financial policies in harmony with the plans of the parent group of companies. Additionally, acceptability from the **government** and other **authoritative organisations** is a measure of guaranteeing the existence, as competence is not the only trick for an organisation's survival. Both cultural and regulative pressures are actively adopted for the long-term existence of the business (DiMaggio and Powell, 1991).

Participant with a **stronger position can dominate** and **intimidate the weaker** participant to fulfil the dominant partner's requirements, where substitutes are either not accessible or requires determination to trace. For example, higher carbon emitting entities or those with the majority market-share in a country could pressurize smaller entities to implement its accounting procedures, as they are domineering the society (Mookdee, 2013). Companies tend to accept the external pressures applied on them via competition, governmental organisations, regulators, and others, due to coercive isomorphism (Luo, et al., 2017; Villiers and Alexander, 2014).

Coercive pressures are implied in many forms, one of them is dependence on financial reserves, which was possibly the situation in the case of hasty implementation of United States General Accepted Accounting Principles (US GAAP) by its government (Carpenter and Feroz, 2001). The higher the dependency on financial reserves, the higher the coercive pressures would be exerted on the dependent company (Comyns, 2017; Filatotchev and Stahl, 2015; Hah and Freeman, 2014). In the case of carbon emission allowances, many companies receive free allowances from the regulators, which would otherwise need to be purchased from the marketplace. Such governmental assistances usually come with particular rules and regulations to be adopted as per attached conditions. Conversely, if there

aren't any special requirements with the allocation of emission allowances, receivers would roam free. Due to the upsurge in the awareness of climate-change, sustainability reporting has become more prevalent among the carbon emitting entities. Many countries, for example the United Kingdom, Mexico and Spain require the companies to disclose their carbon emissions level on an annual basis (KPMG, 2012). Additionally, governments ability to fine or pose sanctions on businesses is a common control mechanism to ensure compliance with the local regulations (Shahab, et al., 2018). As there are pressures on reporting through various frameworks, i.e. Kyoto Protocols, companies are more likely to consider reduction in their emissions and report the usage by surrendering the used-up allowances. This is to avoid being sanctioned by the regulators or in the fear of applicable fines that are stated by EU-ETS in their recent phases (Europa, 2021a).

Carbon operators have to follow national principles in the Australian carbon industry, for example. They face coercive pressures of financial reserve reliance and ruling to implement a specific rule and action. Similarly, professional associations, national government policies, irrepressible economics and business nature might influence the implementation of specific policies in the private sector as well. The national government examines both the obligatory and voluntary carbon markets in Australia, as the carbon emissions industry is still in its developing phase (Oliveira, et al., 2017, p.175). In many countries, businesses are even required to substantiate their deviation from the local good governance code of conduct. Such policy practiced by numerous stock exchanges reassures transparency in the financial markets (Aguilera and Cuervo-Cazurra, 2004).

Due to the lack of an appropriate accounting regulation concerning the nuclear power plants as a whole, the carbon operators may implement a specific accounting technique through suggestions from carbon emissions advisors or accountants. The compliance could come from coercive pressures from the regulation, superior competitors or other administrative organisations. Therefore, these external forces are coercive pressures under the institutional theory.

3.2.1. ii. Mimetic Pressures

Doubts or disbeliefs are an influential energy that reassures simulation. Mimetic pressures are forces to **imitate other entities practices,** which ascend in the absence of certainty or clear strategy. Doubts lead an entity to check competitor's practices, and several

investigators have provided evidence that in the absence of certainty, businesses tend to imitate the largest competitors in the industry (Deephouse, 1996; Greve and Taylor, 2000; Haveman, 1993).

Mimetic pressures frequently follow the implementation of specific administration actions for which there is tiny pragmatic proof of performance paybacks (Ashworth, Boyne and Delbridge, 2007). Principally, this means that when leading competitors adopt a strategy concerning a specific fact or hazard, other entities might react by purely copying the leading competitors in the same industry. Owing to the aspiration to achieve public acceptability that guarantees the entity's lasting existence, other entities might be driven to copy a specific course of action (Suchman, 1995; Villiers and Alexander, 2014). Greve and Taylor (2000) evidenced that in case of uncertainties, entities are more likely to mimic identical but more prosperous companies. Conversely, as in the case of emission allowances, if the large companies are not disclosing their accounting practices, smaller companies are least likely to disclose as they feel less obliged to offer voluntary disclosures.

For example, the US financial services industry implemented non-financial performance measures because of the involvement of mimetic forces (Hussain and Gunasekaran, 2002). Firms imitated the best actions from other firms related to procedures of assimilation of performance management systems with a managerial approach (Mookdee, 2013). Smaller companies are more likely to mimic larger companies in an environment of ambiguity, in order to learn from the best, but also to portray the practices of market leaders in the industry (Villiers and Alexander, 2014, p.57). As per Kolk, Levy and Pinkse (2008), sustainability reporting practices by the Carbon Disclosure Project (CDP) were encouraged by the use of dominant industry leaders to promote awareness of environmental disclosures in financial reporting.

Carbon operators are prone to imitate their competitors in the carbon industry due to the lack of official guidelines on accounting for carbon emissions and nuclear power plants. That means, controlled uniformity could be practiced in the presence of regulated accounting standards for emission allowances.

3.2.1. iii. Normative Pressures

These forces develop from **professional standards** or **society** in the grid of the entity. These pressures enlighten that an entity is projected to follow the professional benchmarks that are

believed to be genuine in the entity's industry. These principles connect through teaching, expert training, and certification. Professional connections in the industry come across as a self-regulating method, which leads the entity to be induced to follow identical practices as their partners (Abrahamson and Rosenkopf, 1997). Professional connections in the legalised arena have facilitated dispersed private practices concerning business adjudication process into actual laws, albeit no official rules concerning these measures have ever been approved.

In a study conducted by Oliveira, et al., (2017), disclosures not officially required by the national accounting regulations (i.e. for organisational and Board structure), were less revealed by large Brazilian companies than disclosures that were officially required. However, in case of sustainability reporting, CSR disclosures that were endorsed by the Brazilian Stock Exchange were still present even without any legislative burden. Author identified the recommendation by the stock exchange as a silent coercive and normative pressure that compelled large companies to be more transparent in their social responsibility for better public acceptance (Oliveira et al., 2017, p.189).

Villiers and Alexander (2014) stated that the presence of coercive and mimetic isomorphism can result in normative pressures, thus highlighting the connection between all kinds of isomorphism pressures creating institutional environment for the companies. The authors studied the case of the mining company, BHP Billiton, who had adapted to the GRI framework for disclosure practiced. It was found that many smaller South-African entities in the mining section also started to adapt GRI guidelines, which then became a new normal in the society. However, the results of the research stated that carbon disclosures among all sizes of the companies remained identical to each other, reflecting to the fact that BHP may have helped in designing the industrial standards, which have later reached the stage of maturity. This suggest that coercive and mimetic pressures could lead to normative pressures. If accounting administrators are vigorous in professional relations that endorse precise guidelines for carbon emissions trading, an educational method in the carbon industry will soon emerge. Accounting profession could exercise a normative force to shape a draft for carbon emissions disclosures due to its established settlement, and a closer working partnership with the national accounting bodies. Harmonisation of accounting standards would ensure transparent and faithful representation of accounts to its wider-stakeholders. For that reason, institutionalisation of homogenous disclosure practices makes

benchmarking and comparison a lot easier and results in an improved governance system (Kolk, Levy and Pinkse, 2008, p.726).

When entities adapt to the culture driven by professional standards, normative isomorphism starts to materialise (Suddaby and Viale, 2011). Private consultants, practitioners, auditors and other experts offer recommendations to the companies seeking advice on disclosures regarding carbon emissions. However, most of the advice is originated from regulative frameworks such as Global Reporting Initiative (GRI), due to its worldwide dominance. The mission of GRI is to normalise the culture of transparency in environmental reporting, and to have an open-discussion regarding the impacts of climate-change by asking the participants to act responsibly (GRI – Mission and History, 2020). Such normative pressures design the culture of acceptable normality within the global society. As found in the reports prepared by KMPG (2008 and 2012), most of the entities have followed the guidelines given by GRI because they consider that as global normalcy.

When emerging arenas are being developed, such as the awareness of carbon reporting, evolution can be seen naturally (Tuttle and Dillard, 2007). Uniformity in practice begins when the participants react to the uncertain situation, for example the lack of guidelines on accounting for emission allowances, by mimicking their competitors. Over the period, public viewpoint and strict legislation creates coercive pressures on the participating companies. In a short while, standardisation by professional bodies results in normative pressures, which then becomes the major game changer (Suddaby and Viale, 2011). Nevertheless, there isn't a precise sequence to how the forms of isomorphism operate in a situation. It could be the pattern where coercive and mimetic pressures resulting in normative pressures, or all forces can function concurrently (Tuttle and Dillard, 2007). Villiers and Alexander (2014) believed that disclosures on carbon emissions and other environmental measures could get to a point where normative forces overtake other pressures; however, all forms of isomorphism are present at a time.

3.2.2. Decoupling

Meyer and Rowan (1977) first identified decoupling as administrative cushioning to guard technical activities from institutional pressures. Decoupling discusses the formation and continuation of breaks between official guidelines and real managerial practices, i.e., conditions where policies are not incorporated into the entity's management procedures

(Lim, 2017). Firms might 'circumvent' the need to follow the institutional stresses by hiding their non-obedience or altering their practices. Few entities might resist rules and regulations by rejecting or opposing them, whereas other entities might change the rules and regulations by trying to regulate them. This theory explains how non-selected behaviours can appear and endure because of routine, ease, and suitability in practice by its users (Mookdee, 2013, p.76).

With regards to the trade of emission allowances, because of the shortage of an official accounting standard by the IFRS, entities might cherry-pick their accounting techniques from current accounting standards for wider-acceptance. Conversely, an internal managing system of those entities is likely to be decoupled from current accounting principles. Decoupling in modern businesses has become less practical due to the rationalisation of external forces, shaping its direction towards what is socially acceptable versus the available means to achieve that standard. For example, sustainability reporting in a standardised format has become more common for almost every company, even if their carbon-footprints are negligible. Companies are expected to meet the societal norms, even if they have less resources to achieve that (Wijen, 2014). Such practices have a cost, that may have diverted the business resources from the commitment towards its shareholders (Bromley and Powel, 2012). This means that institutional pressures from the outer environment would prompt the businesses to comply with what is considered as publicly acceptable, i.e. to report on carbon emissions. However, to fulfil the primary commitment to its shareholders, entities might decouple from the acceptable standards, and hide certain practices to avoid negative publicity for cost-benefit reasons (for example, non-disclosures on carbon-emission allowances in the financial statements, as seen in the literature review).

Reform of accounting and economic practices is a crucial element upturning the application of accounting techniques. Research conducted by Bing on accounting restructurings in China exposed the implementation of accounting techniques chiefly consistent with the standards set out by IFRS. Highlighted in the study was the absence of specialised auditing, which suggests the projected full IFRS-based principles could be unfavourable in China - besides the projected principles that let the businesses to follow their specific interests. Because the projected accounting principles offers the flexibility to select accounting options that are more suitable for an entity's interest, this occurrence reassures decoupling accounting practice in the corporate nature of China (Mookdee, 2013).

Therefore, it can be said that the non-existence of an official standard to deal with the issues related to nuclear operations will support decoupling, and institutional disagreement in accounting practice.

3.3. Critical Analysis

As per the highlights of the literature review, all forces of institutional theory inspire entities to implement strategies for carbon emission accounting and reporting. The application of a carbon strategy by the industry frontrunners would strengthen other entities to adopt them, whether symbolically or seriously. The sensitive nature of carbon reporting makes it more vulnerable to simulation; management might decide to mimic industry leaders to avert disapproval on their accounting techniques. A research of the factors of carbon disclosures conducted on 337 German entities, the inspiration of institutional forces was tested. The researchers discovered that the quality of carbon disclosures was habituated and simulated by the industry. It was also established that the firms were more concerned about the pollution cut disclosures, instead of the other carbon-related info (Cormier, Gordon and Magnan, 2004).

However, there is little disapproval to institutional theory. It was cautioned that many types of research over-elaborate managerial likenesses by exploiting this theory, but entities are not convict of their environmental settings, and can reasonably react to the environmental stresses using their industrialist outlook (DiMaggio and Powell, 1988). The theory has been condemned for primarily focusing on the organisation's external effects, while overlooking the internal effects that might have an impact on entity's environmental decisions. Rao and Giorgi (2006) also enlightened that entities are informational means that interpret and decode practical communal methods. Organisations are copied through intermittent practices of its management; so, the human factor in managerial response to its environmental pressures need no prominence (Rao and Giorgi, 2006). Prior studies advised that organisational features play an essential part in regulating an entity's reaction to its external forces, particularly in the case of environmental reporting (Lewis, Walls and Dowell, 2013).

Notwithstanding the censures, institutional theory suggests that all three isomorphic pressures affect entities to implement carbon reporting. Coercive pressures were considered to be the most dominant among all three pressures of isomorphism (Delmas & Toffel, 2004). It is specified that carbon reporting can be considered as an action and arrangement that over

time become institutionalised (Scott, 1995). Larger companies are usually the primary source of mimetic pressure for smaller companies in the same industry. It is because the industry frontrunners are considered to have a wider-acceptance in the society, for that reason, small competitors want to follow suit. Reid and Toffel (2009) observed that the entities in the same industry responded analogously to governmental forces and pressure groups. A total of 45 Brazilian corporations was conducted to analyse the effect of the mining company 'Vale S.A' environmental disclosures on its competitors. The results revealed that Vale's carbon disclosures had outstanding inspiration on its industry competitors' disclosures (Sampaio, et al., 2011). Mimetic pressures could equally be responsible for an imbalanced financial reporting practices within the energy and utility industries. As there isn't an official guidance by IFRS on emission allowances, larger companies for various reasons, i.e. cost constraints, averting negative publicity, etc, would not feel obligated to voluntarily disclose all steps taken to report emissions, unless required by law. Following the mimetic pressure, smaller companies would mimic the multinationals, which then becomes a normal practice until regulators comes in the picture by introducing official interpretations.

On the other hand, the backing for voluntary carbon emission disclosures can be seen as an institutional pressure from the societal arrangements, aiming to promote environmental reporting as a governing measure. The influence and interests of participating entities can be reflected through institutionalisation, as it is basically a political arena, endeavouring to bring changes in the operational activities (Maguire, Hardy and Lawrence, 2004). Such an administrative process to convert or alter the existing practices could look like societal changes geared towards unrooting the conventional practices by challenging and restructuring the norms of the community (Rao, Morrill and Zald, 2000, p.276). In such an environment, participants often hold differing viewpoints instead of a common narrative, where the progression would likely to be a feud of institutionalisation instead of an isomorphic discussion (Hoffman, 1999). Politics is heavily involved in changing the business objectives, from conventionally financial to environmental, by shaking the corporate governance structures (Kolk, Levy and Pinkse, 2008). This could mean, in the environment without legitimate standards, such as the case for emission allowances (as there isn't an accounting standard by IFRS), communal norms would also institutionalise entities. This suggest that normative pressures can heavily shape the actions of carbon-emitting companies if there's enough awareness of the issue in the society.

Civilian directive, could be another word to describe corporate disclosures practices (i.e. for carbon emission allowances), whereby the community enforce its demands on entities to maintain and submit to the societal definition of normality (Murphy and Bendell, 1999; Cormier, Gordon and Magnan, 2005). Global Reporting Initiatives or similar standards would possibly represent a public mandate for the emitters to adhere to the highest global standards by voluntarily reporting their carbon footprints (Brown, York and Kushler, 2007, Cashore, Auld and Newsom, 2004; Kolk, Levy and Pinkse, 2008). In theory, standardisation of carbon reporting is the goal of governance initiatives, such as GRI, as it implies higher accountability of carbon emitters towards wider-stakeholder. Such frameworks can also be used for benchmarking of companies against their competitors, in addition to offering positive publicity to the participating entities that may result in improved profitability levels (Kolk, Levy and Pinkse, 2008). However, the effectiveness of environmental reporting would only be useful if it provides relevant, reliable and verifiable information to its shareholders by offering insights of carbon emissions, and its related risks and rewards on the company's assets (Hassel, Nilsson and Nyquist, 2005). As found by Kiernan (2008), minimal corporate disclosures on emission allowances restrict information provided within the annual reports regarding the reported emissions. Given narratives are not even enough for some very knowledgeable experts in the area of environmental reporting, as it offers limited view of company's commitment towards Carbon Disclosure Project (CDP) (Kiernan, 2008). Stakeholders scrutiny of company's affairs would exert pressure on the management to reveal information related to their carbon footprints, as well as the entity's response towards curtailing emissions and its relevant costs. Reduction in carbon emissions may or may not reduce costs to the company, however compliance with the stakeholder's expectations might result in long-term success of the company due to the public approval of its operations. This suggests that institutional pressures from the society may have a major role to play in the accounting practices for carbon emission allowances by the emitters in the absence of official guidelines by IFRS.

Nevertheless, the institutional theory is contemplated to have an incredible impact in explaining carbon accounting practices and related disclosures. Carbon reporting is a complex task, and superficially expensive to introduce management techniques for operational and reporting purposes; the management's attraction to copy the disclosures of its competitors is quite high. Hence, it proposes that the inspiration of industry actions on the selection of carbon techniques and reporting procedures is supreme. Moreover, a vast

range of voluntary disclosure strategies is available, if adopted by the entities, would result in diverse arrangements of disclosures. Therefore, debatably any likeness of the carbon accounting practices and reporting among the entities in the carbon industry would explain the influence of institutional theory (Chithambo, 2013).

To summarize, it has been stressed by DiMaggio and Powell (1991) that social standard, views and customs are the main dynamics, instead of technical and physical essentials that stem in the managerial environment. As per Chithambo, et al., (2020), regulatory, market and societal pressures have a positive influence on disclosures regarding carbon emissions. Hence, the institutional theory provides a critical theoretical viewpoint in this research.

3.4. Summary

To summaries the main points from the theoretical framework for this study, following points should be noted:

- Two main branches of **Institutional theory**, i.e. isomorphism and decoupling are used to provide a theoretical lens for this study.
- Institutional isomorphism covers three types of pressures, i.e. coercive, mimetic and normative pressures.
- In the context of nuclear power plants, **coercive** pressures would come from the government, cap-and-trade scheme regulators, and other administrative organisations.
- **Mimetic** pressures would prompt the owners of the nuclear power plants to imitate the accounting and disclosure practices of the market leaders, or simply the main competitors.
- **Normative** pressures could come from the societal norms, such as the general expectation from carbon emitting companies to provide sustainability reporting, or reduce carbon footprints. Providing necessary disclosures of their practices would be expected by the public. Additionally, pressures from accounting bodies to live up to the professional standards would also come under the normative factors.
- The gap between the actual practice and the official guidelines could come under the umbrella of **decoupling**.

IV. RESEARCH METHODOLOGY

By adopting a pragmatist approach, the author has used mixed-methods research methodology for this study, so that the conclusion could be drawn by using both, qualitative and quantitative research techniques. Essential data is collected by surveying the annual reports of the owners of nuclear power plants around the globe, using the content-analysis method. As there isn't yet an official accounting standard or interpretation by IFRS to account for emission allowances in the financial statements, it is important to understand the basis of accounting techniques applied by the relevant entities. Similarly, disclosures regarding accounting techniques are presently on a voluntary-basis. How do the companies decide what and what not to reveal to the wider-stakeholders? Primary data is collected by conducting semi-structured interviews of accounting specialists, with several years of experience in financial accounting, to understand the reasonings behind the selection of the accounting policies for emission allowances in the energy and utilities industry.

In this exploratory research, one of the aims is to map out the current financial accounting practices for carbon emission allowances by the owners of nuclear power plants. Since this issue started gaining little attention from 2005, after the enforcement of Kyoto Protocol (UNFCCC, 2008) and the withdrawal of IFRIC 3 *Emission Rights* interpretation, not many studies have been conducted on this area. In fact, most of the recent studies only explored European entities, and the author could not find any research done on a global scale. This study is expanded to collect worldwide data by focusing on all IFRS following entities (owners of nuclear power plants), followed by a moderate benchmarking against NON-IFRS entities in the same industry. Main focus has been given on the initial classification and recognition of carbon emission allowances in the financial statements. Considering the complexity of classifying whether emission allowances are current or non-current assets (for example); classification and recognition of nuclear fuel and asset retirement obligations by the same entities were also tested to perform benchmarking against other complex accounting measures in this industry as well. Additionally, the other aim of this study is to understand good accounting practices; experts' viewpoints on such accounting measures, disclosures and qualities of useful financial information are included to draw upon the conclusions.

This chapter outlines the research design, methodology, data collection technique, data sample and analysis. Author's contribution to this research area is also discussed at the end of this chapter.

4.1. Research Philosophy

Pragmatist approach is the philosophical idea for this study's research design. Many researchers have worked on pragmatic approaches in several forms (Creswell, 2003). Actions, circumstances and results offer knowledge as opposed to forerunner conditions (Patton, 1990). Rather than paying attention to the approach, the problem needs attention as per pragmatist researchers (Rossman & Wilson, 1985). Directing all the devotion towards the research problem, and using various methods to originate an understanding of the issue is a moral foundation for mixed-method studies (Tashakkori and Teddlie, 1998; Simpson 2018).

According to Cherryholmes (1992), Creswell (2003) and Murphy (1990), pragmatism offers a basis for the claims about knowledge as under:

1. Only a single method of viewpoint and truth is not dedicated to pragmatism. The same applies to the mixed-methods approach when a researcher concludes by conducting a study based on both qualitative and quantitative methods.
2. Every researcher has the privilege to choose. They are imaginative, and are open to select the procedures, practices and ways of research that fits best for their requirements.
3. The world is not an outright union as per pragmatist researchers. Similarly, inquirers using mixed-methods approach look for several methods to collect and analyse data rather than advocating a single approach.
4. 'Whatever floats your boat' at the point in time is the principle behind the pragmatist approach. Instead of relying on a rigid set of rules between a thought and a truth, pragmatism is a self-governing approach of intellect. For that reason, researchers look at the bigger picture by employing data collection techniques involving qualitative as well as quantitative methods to gain an ideal perception of a problem.
5. Researchers using the pragmatism acknowledges that political and social-historical perspectives always appear in the study. Like this, a mixed-methods approach might

incorporate a contemporary mode. It is an academic idea that is instinctive of political objectives and social justice.

6. According to Cherryholmes (1992), the pragmatist researcher believes that we must end by asking ourselves questions regarding truth and nature. A pragmatist would merely like to alter the subject (Cherryholmes, 1992).

Pragmatism is a way to open-ended ideas, diverse viewpoints and distinctive assumptions for mixed-method researchers. For this study, 'notes to the financial statements' were the starting point to gather data regarding the accounting policies by the owners of nuclear power plants. Numerical data within the financial statements were used to calculate the significance of emission allowances on profitability, revenue and net assets. Collected data will be compared with the literature review to analyse the recent trends in this area. Detailed interviews will further add experts' viewpoints of their take on the accounting policies for emission allowances. Experts will also be asked to share their opinion on the constituents of good accounting practices to build a case for emission allowances.

4.2. Research Methods

4.2.1. Research Design

Both quantitative and qualitative research approaches are employed to conduct this study. Qualitative research provides insights using a visionary proposition, i.e. data beyond numbers to analyse the bigger picture (Hammarberg, Kirkman and Lacy, 2016). It can particularly be useful in investigating dynamic contextual subjects, that cannot be effectively done by using numbers (Su, 2018, p.19). For this study, it is vital to understand the official guidelines on the nature of assets and liabilities, followed by the related standards to envision the likely classification of emission allowances. Annual reports, particularly the 'notes to the financial statements' will be thoroughly reviewed to map out the accounting procedures adopted by the owners of nuclear power plants. Additionally, in-depth interviews of accounting experts will highlight their perspective on the accounting measures for emission allowances. Furthermore, experts will also reflect upon the qualitative characteristics of good accounting information, which is help in understanding the reasons of the surveyed entities for selecting their accounting procedures (as there currently isn't an official accounting standard, and companies are voluntarily accounting and disclosing it in their accounts). Investigation of annual reports and expert interviews to derive contextual data will help build the qualitative aspect of this study.

Conversely, reliance on statistical data to utilise time and means well is the primary basis of the quantitative method, which helps in analysing the trends and variances using numbers (Daniel, 2016). Financial statements of the selected entities will ascertain the numerical analysis of the chosen accounting procedures as a source of quantitative data. Financial values will mainly help in determining the material significance of emission allowances, i.e. if the material misstatement would result in unfaithful representation of the financial statements. Materiality will also determine the severity of a need for an official standard that deals with carbon emission allowances.

In order to avoid the fundamental bias in the chosen research method, employing convergent parallel strategy using a mixed-methods approach that covers both qualitative and quantitative data would offer a comprehensive viewpoint. Given the representative sample of the owners of nuclear power plants covers 76% of the entire population (Figure 5, p.129), results would represent the first impression of accounting for emission allowances in this industry. The idea behind this study is to obtain a fundamental knowledge concerning the accounting policies practiced by the owners of nuclear power plants around the globe, and generalisation of the findings to the entire population. Also, this research aims to highlight the significance of relevant disclosures towards the entity's commitment for a more transparent and comparable financial reporting system in this industry to reflect upon good accounting practices. Therefore, the intended methodology, mixed-methods approach, would be the excellent choice to address the research enigmas.

4.2.2. Mixed Methods Approach

The choice between qualitative and quantitative methodologies has faced several controversies, especially in studies on business and management arenas (Azorin and Cameron, 2018, p.102). This methodology is a blend of both techniques that can offer a wider perspective to the research issue than it would otherwise achieve using either qualitative or quantitative alone (Creswell and Creswell, 2017). In 1959, Campbell and Fiske examined various strategies to understand psychological traits, encouraging other researchers to adopt the multiple-method model, to find the solution using all perspectives in research. Other researchers started using this approach in a short while, making it a simplified research approach, by combining both the qualitative and quantitative data (Sieber, 1973). It is a kind of research where the investigator uses qualitative and quantitative perspectives to collect data, perform analysis and deduces the results for the more extensive

scope of magnitude and gravity of knowledge (Schoonenboom and Johnson, 2017). The benefits of two approaches can be enjoyed in a single mixed-methods approach (Johnson, Onwuegbuzie, & Turner, 2007). Quantitative approach investigates detailed and inferential data, whereas qualitative approach examines descriptive data with precise details to assess the research objectives. Not only numerical data but also narrative data are considered under this dual method approach to conducting research (Williams, 2007).

Because all approaches have restraints, the biases associated with a qualitative method would counterbalance the biases related to the quantitative method as per the researchers. After some time, a method for obtaining convergence across both quantitative and qualitative methods, triangulating data sources was born (Jick, 1979). Later, several other concepts came up with supplementary details for combining various kinds of data, such as the result from one approach can help advance another approach (Greene, Caracelli and Graham, 1989); the installation of one system within another system in order to present knowledge regarding different stages or sections of study (Tashakkori & Teddlie, 1998). Because of the option to combine both qualitative and quantitative data for research studies, researchers can now experiment and shape theories. Researchers, using a mixed-methods approach, can design a study that offers solutions regarding the complexities between diverse viewpoints and connection between estimable elements (Williams, 2007). The combination of dual research segments strengthens the research outcomes and improves contribution to the existing literature. The ultimate goal is the achievement of a detailed understanding and gravity of the issue (Schoonenboom and Johnson, 2017).

4.2.3. Convergent Parallel Design

Among the major prototypes of mixed-method approaches, the commonly known, convergent parallel design, is chosen for this study. Also known as triangulation (Morse, 1991) and concurrent triangulation (Creswell, 2003; Creswell and Plano Clark, 2011), this model relies upon both quantitative and qualitative data collection simultaneously, to provide conclusion by merging the two datasets (Table 14, p.194). Results of qualitative are independent of the quantitative datasets and vice-versa, and both remains separate, however relevant, and combined during the interpretation stage (Doyle, et al., 2019). This would mean that both data collection methods would probably address two different, but relevant sets of research questions. Both data sets are compared to find similarities or dissimilarities (Creswell, et al., 2003). This strategy helps in increasing the validity and efficiency of a

research by offering a multi-dimensional outlook and reducing biasness of the researcher (Mookdee, 2013).

Archival data will be collected from the annual reports of the owners of nuclear power plants. Researcher will observe the prevalent accounting techniques practiced in the utility and energy industry to answer the first research question. To understand the reasonings of the surveyed companies behind their chosen accounting practices (as there isn't an official accounting standard on emission allowances), experts in financial accounting will be interviewed to understand their perspective on the applied accounting techniques. This is to understand the expert viewpoint on the key sources of accounting information when there isn't an official accounting standard, together with the implications of incorrect accounting treatments. Interviews will supplement the narratives derived from the archival data in order to answer Research Question 2. Interviewers will be asked to share their opinion on the disclosures in the annual reports. Additionally, experts will identify the qualities of useful financial information for good accounting practice to answer the remaining Research Questions, 3 and 4. Interviewee's responses will shed light on the significance of disclosure practices to present a true-and-fair view of the financial accounts.

By employing a critical benchmarking perspective, research questions will not only answer the current accounting practice on emission allowances (main area), but also compare other complex areas including nuclear fuel and decommissioning liabilities. This is to understand the connection between the official accounting guidelines and its application in the industry. Experts' viewpoints will reflect on the practices of the surveyed companies'; whether the applied accounting techniques adheres to the Conceptual Framework (by possessing the qualities of useful accounting information). Results will be useful in determining whether uniformity in accounting practices comes due to the presence of official guidelines.

4.3. Criterion for Sample and Data Collection

Based on the literature view, past studies have largely explored the accounting practices of European companies to recognise emission allowances in the financial statements. Generally, very limited amount of studies has been done on this niche area. It is mainly due to the lack of awareness of this issue, besides the disregard from the accounting bodies for not releasing an accounting standard or interpretation since 2005 (the time when the Kyoto Protocol was enforced, and IFRIC 3 *Emission Rights*, accounting interpretation was

withdrawn). As per the past studies, disclosure practices were poorly in the carbon industry, keeping the stakeholders uninformed on this issue at its entirety.

As per the author's research, no study has been conducted that has explored the global accounting practices on this area, for not only carbon emission allowances, but also nuclear fuel and asset retirement obligations in a single study. Additionally, past studies have not covered the benchmarking of IFRS vs NON-IFRS accounting practices pertaining to emission allowances, as well as fuel and decommissioning obligations in a research to establish the connection between official accounting guidelines and general practice. As the industry participants have been relying on diverse accounting and disclosure practices; transparency and comparability issues in financial reporting have continued to materialise. Management of carbon-emitting companies have been exercising their own independent judgements in determining their accounting policies. Therefore, it is important to consider whether such judgements in the financial statements have adhered to the qualities of useful accounting information and represented good accounting practice or not.

To address the gaps in the literature, and to spread awareness of this issue on a global scale, the data collection criterion for study is designed to explore the following areas: -

- Accounting practices for carbon emission allowances, benchmarked against nuclear fuel and asset retirement obligations, to understand the various accounting treatments applied globally, under IFRS and NON-IFRS frameworks.
- Material significance to the financial statements to verify whether non-disclosure practices (as per the literature review) under IFRS framework were justified.
- Viewpoints of accounting experts (accountants, auditors, directors, professors, etc., with long-term experience) on the disclosure criteria, and the qualities of useful accounting information to relate to the carbon industry's practices.

4.3.1. Data Collection & Analysis Technique

By employing mixed-methods research approach, secondary data, both numerical and textual, were collected from the annual reports of the owners of nuclear power plants that follows IFRS and NON-IFRS accounting guidelines. Annual reports, in particular the 'notes to the financial statements' were thoroughly reviewed to understand the companies' accounting practices, and to analyse the given disclosures. Additionally, primary data was collected by conducting interviews of experts in various industries who have extensive

knowledge of financial accounting. Both datasets were analysed using content analysis method as described in the section below. NVivo software was used to run queries for the interview responses.

4.3.1. i. Content Analysis

It is a research tool that helps in determining the appearance of specialised jargons, key words, and models within the relevant textual data (Elo, et al., 2014). With the help of this technique, it is easy to measure and scrutinise the occurrence, connotations and association between the key words or concepts under consideration. Data could be extracted from any source, from interview scripts, research notes, text books, newspapers, legislative documents, annual reports, and other mediums. Content analysis can be useful in identifying the popular trends, communication responses and behavioural issues. It can help in reviewing the global content, by breaking down the borders, and various patterns of communication used in different countries (Harwood and Garry, 2003). This technique also helps in analysing interviews of small focused groups or samples by adopting broad-minded question script to supplement other collected date (Kleinheksel, et al., 2020).

Written textual content can easily be sorted and interpreted with the help of content analysis. It doesn't matter whether the research is quantitative or qualitative or both, this technique can still be applied without issues. This study is based on a mixed-methods approach, which would rightly fit in this spectrum. Among the various advantages of this technique, extracted past data could be valuable in the future (Schreier, 2012; Vaismoradi, Bondas and Turunen, 2013). Complex models and languages can still provide useful insights. There aren't budget constraints as it can be done without major techniques, as long as the researcher applies the codes correctly. Textual data could also be analysed statistically if required. Interviews in combination with archival data provides highly valuable insights about the researched topic, making this tool more influential (Neuendorf, 2002; Rourke and Anderson, 2004)

Together with the advantages, comes disadvantages in every arena. The major con of using this technique is time-management, as it could take quite long to complete data analysis, depending upon the gravity of the extracted data. It is hard to automate this process, however software's such as NVivo and SPSS could come in handy at the later stages. Researcher could easily overlook the context and select data once the relevant key word (for example)

is found in the text. This would require a detailed revision of the extracted data to avoid errors and to improve reliability.

In order to attain an understanding of the standard procedures adopted by the owners of nuclear power plants, starting from the valuation of nuclear fuel to emission allowances and the decommissioning obligations; content analysis methodology is chosen for this research. Publicly available annual reports, including the financial statements of the selected entities are examined to establish the chosen accounting policies for the recognition and measurement of emission allowances, in comparison with nuclear fuel and asset retirement obligations. Summarising secondary data, especially that is available online, i.e. annual reports or PDF documents, can be quickly done using the content analysis approach (Colton and Covert, 2007, p.235). Coding of datasets into designated groups is done to present the conclusions in an easily interpreted template. Data analysis can be done faster using this technique; however, to get the optimum results, certain elements must agree, i.e. unit of analysis (Guthrie and Abeysekera, 2006).

4.3.1. ii. Unit of Analysis

As per Walter (2006), the unit of analysis refers to any published or unpublished piece of work related to findings, observations, questions, or illustrations included within the official document. Even though accounting research has supported this model, investigators can choose to either present complete disclosures or examine the level of the disclosures to reveal (Gray, Kouhy and Lavers, 1995; Haslam and McGarty, 2003). The focus of this study is the understanding of standard accounting practices by the owners of nuclear power plants, and their widely available annual reports are the 'unit of analysis' within the secondary data. Annual reports are generally a validated source of data, as independent auditors usually audit them, and are easily accessible online at all times (Ayaz, 2017). For this study, audited annual reports are used to improve the credibility of the published document. As businesses account for the changes in accounting policies retrospectively, in order to reflect the change in all the related periods; annual reports are a crucial source of data for its stakeholders regarding an entity's operations for all prior periods (Warwick and Ng, 2012).

Primary data is collected using interviews of accounting specialists to accumulate the necessary knowledge about the recognition of emission allowances within the financial statements. Interview responses were also used as 'unit of analysis' to answer research

questions 2, 3 and 4. To enhance the significance of primary data, interviews were conducted by selecting participants from diverse industries who could contribute a huge wealth of their experience.

4.3.1. iii. Coding of Accounting Disclosures

To advantage from the coding technique for analysis, relevant sections from the annual reports of the selected entities were digitally copied to an MS Word file to apply codes after a few modifications, and to complete the process comfortably. For each sampled company, a small booklet of collected extracts from their annual reports was prepared and then copy-pasted to an MS Excel file, as sorting the list would be easier on a spreadsheet. This study is mainly geared towards the IFRS accounting framework, but in order to perform competitive benchmarking, NON-IFRS companies were also examined. The extracts from the following documents were gathered for analysis:

- Annual Reports of IFRS companies for the Year-Ending 2017, 18 and 19.
- Annual Reports of NON-IFRS companies for the Year-Ending 2019.

Since IFRS vs NON-IFRS benchmarking is done to analyse the various accounting procedures applied on a global scale, only one year of annual reports were sufficient. Therefore, year-end 2019 reports were used for the comparative analysis. However, in order to perform a deeper analysis, to establish the materiality issues and to test consistency in accounting applications, IFRS companies' annual reports were used for the most recent three-year period, i.e. year-end 2017, 18 and 19 (Figure 7, p.139).

Before the coding procedure could be started, relevant disclosures drawn from the annual reports were extracted by using the 'Search' option on Adobe PDF files. **Keywords** were used to search for the research topics, i.e. nuclear fuel, emission allowances and decommissioning liabilities. Paragraph skimming procedure was used to quickly read through the lines to ascertain whether required information was presented in the highlighted paragraph or not. Following keywords (Table 2) were used to gain attention towards the required areas of the annual reports:

	Keywords		
Nuclear Fuel	Nuclear	Fuel	Spent
	Inventory	Property	Fixed
	Current	Used	Burnt
Carbon Emission Allowances	Carbon	CO2	Emission
	Allowance	Certificate	Obligation
	Surrender	Inventory	Intangible
	Environment	Provision	Green
Asset Retirement Obligations	Decommission	Demolition	Retirement
	Obligation	Liability	Provision
	Discount	Rate	Fund

Table 2: Keywords for Research Question 1, Author 2021.

Keywords were mainly derived from the research questions. However, prior studies (Ayaz, 2017; Lovell, et al. 2010; Mookdee, 2013; Warwick and Ng, 2012), in addition to authors professional expertise in accounting, were also considered for inspiration while selecting relevant search terms for this study. As the topic of this research unfolds accounting practices in the area of nuclear fuel, carbon emissions and decommissioning liabilities; keywords were designed to capture every relevant aspect related to those research areas. The author has paid key attention towards accounting jargons, synonyms and forms of verbs. For example, the keyword 'decommission' would capture decommissioning and decommissioned both. However, it would not pick up alternate accounting jargons (words) that might be used in other countries. To avoid the chances of overlooking disclosures related to the decommissioning of nuclear stations (as an example), other search terms, such as 'demolition' and 'retirement' were also used. The author was of the opinion that the use of these terms would capture almost every disclosure regarding decommissioning of nuclear stations. With regards to the recognition aspect of the research question, search terms of 'liability', 'obligation' and 'provision' would ultimately cover almost all liabilities of the company. Although 'liability' keyword would show numerous obligations of the company, the search would be narrowed down using the keyword 'provision', as companies often have limited number of provisions in their accounts. Similarly, keywords for carbon emissions were designed to capture all dialogues and narrations in the annual reports. Search terms of 'carbon', 'CO2', 'emission', 'green' and 'environment', would look for emissions that might be discussed using alternate keywords in the reports. Even if these terms didn't capture the

relevant sections of the annual reports, other relevant terms would have surely worked. The author has tried several possibilities to avoid the chances of overlooked disclosures. For example, 'carbon emissions' might be denoted as 'nuclear emissions', hence the word 'nuclear' was also included in the keywords list.

Once the relevant sections were copied on to an MS Word file to prepare a collection of relevant disclosures for all sampled companies, all extracts were then copy pasted to an MS Excel spreadsheet to begin the coding process.

The importance of gaining awareness regarding the accounting procedures used by the surveyed entities to value nuclear fuel, carbon allowances and decommissioning obligations, was developed in the research questions already. In order to make the coding process an easy exercise, every relevant disclosure related to the research questions were given a code. To answer Research Question 1, three major parts were considered, classification of assets and liabilities, recognition basis (whether fair value, cost, nominal value, etc) and their respective values in the annual reports for materiality purposes. These three areas were labelled, for example, Classification as '1', Recognition as '2' and Values as '3'. All the codes were determined by the author using the above explained method. All the allotted codes are given in Table 3 below:

	Classification	**Recognition**	**Values**
	1	**2**	**3**
Nuclear Fuel			
Initial Fuel	NF1	NF2	NF3
Spent Fuel	SF1	SF2	-
Carbon Emission Allowances			
Granted Emissions	GE1	GE2	CE3
Purchased Emissions - Business Use	PE1	PE2	
Purchased Emissions - Trading	PT1	PT2	
Emission Allowances Obligation	EA1	EA2	EA3
Asset Retirement Obligations			
Decommissioning Liabilities	DL1	DL2	DL3
Discounting Rates	-	DR2	-
Asset Retirement Funds	AR1	-	-

Table 3: Codes for Research Question 1, Author 2021.

Because spent fuel values are mostly stated as a single value under decommissioning liabilities in the financial statements, materiality could not be tested for it separately, hence no code allotted for that purpose. Similarly, values for emission allowances could not be distinguished between granted and purchased versions, for that reason, only a single code 'CE3' was given to test for their material significance. Discounting rates are usually stated in percentages; classification and materiality would not apply. Lastly, funds separated for decommissioning obligations were only reviewed for their classification in the financial statements, as the focus was on the liabilities that whether the companies are recording the key aspects related to asset retirement obligations or not.

Each relevant accounting disclosure was given a code for a simple coding procedure. In order to complete the reaction sheet, several codes were generated using the initials of the relevant topic followed by a number as explained above. For example, to search for 'initial nuclear fuel', letters 'NF' was used followed by the numeric digit for classification, recognition or to determine the value in the financial statements. An example from a surveyed company, CEZ (2019) is given below:

"The Group presents nuclear fuel as part of property, plant and equipment, because its useful life exceeds 1 year".

As the said disclosure is related to the first research question, pertaining to the classification of nuclear fuel in the financial statement. It is assigned the code 'NF1'. The follow-up disclosure from that company is as below:

"Nuclear fuel is recorded at cost, net of accumulated amortization and possible impairment in value".

Because of the relevancy of abovementioned narrative to the recognition of nuclear fuel as per the research question 1, it was assigned the code 'NF2' as per Table 3 above. Coding process was completed by allocating the initial codes to the extracted disclosures from the examined companies. The next step of the coding process was to draw all the allotted codes to complete the response summary in order to move to the second stage of coding (Appendix 1 represents all the responses from the annual reports with the given codes). After that, on the basis of similarities in the surveyed accounting practices, all the responses were labelled with the use of given **coded terms**.

Coded terms were recorded from the extracted disclosures of the surveyed entities. Using the author's own expertise in the area of carbon emissions accounting, and the most identified responses in the prior studies (Ayaz, 2017; Lovell, et al., 2010; Mookdee, 2013; Warwick and Ng, 2012), all the coded terms were compiled to form a summary sheet. While the author had created a checklist of possible coded terms, room for adjustments were considered based on the analysis in case onerous terms were found during the research analysis. Table 4 below summarises all the pre-determined coded terms for research question 1 for this study.

	Classification	**Recognition**
	1	**2**
Nuclear Fuel (Initial and spent fuel)	Inventory	Cost or NRV
	Property, Plant and Equipment	Cost
	Provision	Present Value Estimate
	Not Disclosed	Average Cost
	Not Applicable	Best Estimate
	Not Accounted For	Not Stated
Carbon Emission Allowances (Granted/purchased allowances and obligations to surrender)	Intangible Assets	Cost
	Inventory	Cost or NRV
	Property, Plant and Equipment	Fair Value
	Other Current Assets	Market Value
	Provisions	Nil Value
	Not Disclosed	Nominal Value
	Not Accounted For	Not Stated
	Expenses	Carrying Value
	Receivables	
	Government Grants	
	Financial Instrument	
Asset Retirement Obligations (Decommissioning liabilities and asset retirement funds)	Provisions	Best Estimate
	Non-Current Liabilities	Cost
	No Provisions	Cost or NRV
	Segregated Funds	Not Stated
	Unsegregated Funds	Fair Value

Table 4: Coded Terms for Research Question 1, Author 2021.

For example, to interpret the classification of 'initial nuclear fuel', observed responses were identified as 'inventory', 'property, plant and equipment' or 'not disclosed' from the responses under code 'NF1'. In the absence of appropriate disclosures in the annual reports of the sample entities, the response 'not disclosed' determined the lack of disclosure. As identified in the literature review (Allini, Giner and Caldarelli, 2018; Romic, 2010; Warwick and Ng, 2012), level of non-disclosures was exceptionally higher in the cases of emission allowances. For that reason, giving a coded term of 'not disclosed' would also add value to the research analysis.

Because disclosures were drawn from more than one year of annual reports, i.e. in the case of IFRS entities, same steps were repeated for the year-end 2017, 18 and 19. To avoid complications, codes were not changed based on the years, simply, separate columns were prepared for each year's responses. Conversely, in the case of NON-IFRS companies, same codes were assigned for all sections, except for the column 'values' (Table 3, p.115) as materiality was not tested for benchmarking purposes. Benchmarking would have been a lot easier using identical codes, however extra care was given to make sure the codes were not mixed up. In order to improve the reliability and validity of the coding procedure (Ayaz 2017; Ryan and Ng, 2000), allocated codes were triple checked by the author.

Final summary sheets included in Appendix 1 determines the allotted codes, as well as the disclosures analysis in an understandable format for the readers of this study. Only summarised verdicts extracted from the annual reports are showcased in the appendices, followed by the coded-terms (keywords used to draw the results). For detailed explanations of the extracts, references have provided direct links to the reports that can be read online on the surveyed companies websites (where applicable). An example of a coding sheet is given below for illustrative purposes.

As it can be seen from Table 5 below, disclosure extracts from three sampled IFRS companies for the Year-End 2017, 18 and 19 are presented for Research Question 1 (as an example). Firstly, general extracts from the annual reports were sorted on MS Excel using the codes NF1 and NF2 for classification and recognition of initial nuclear fuel, respectively. After that, coded terms were given to analyse the responses. In this case, two companies classified (NF1) initial nuclear fuel as inventory, whereas the third company as non-current asset. In terms of recognition (NF2), Cost or NRV method was more preferred than only

Cost method. In the similar manner, all the summary sheets were curated to complete the research analysis for this study.

Research Question: 1								
			YE 2019		YE 2018		YE 2017	
Code	**S.NO**	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
NF1	1	ANPPCJSC	Nuclear fuel is recognized in the statement of financial position under inventories.	Inventory	Nuclear fuel is recognized in the statement of financial position under inventories.	Inventory	Nuclear fuel is recognized in the statement of financial position under inventories.	Inventory
	2	EBL	The consumption of this nuclear fuel inventory is recorded	Inventory	The consumption of this nuclear fuel inventory is recorded	Inventory	The consumption of this nuclear fuel inventory is recorded	Inventory
	3	ELETRONU	Nuclear fuel …… are classified in non-current assets.	Non-Current Asset (PPE)	Nuclear fuel …… are classified in non-current assets.	Non-Current Asset (PPE)	Uranium ore …. are acquired and classified as non-current assets	Non-Current Asset (PPE)
NF2	1	ANPPCJSC	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV
	2	EBL	Inventories are measured at the lower of cost and net realizable value	Cost or NRV	Inventories are measured at the lower of cost and net realizable value	Cost or NRV	Inventories are measured at the lower of cost and net realizable value	Cost or NRV
	3	ELETRONU	Composed of the uranium concentrate….. .are recorded at acquisition cost.	Cost	Inventories are recorded at average acquisition cost	Cost	Comprised of uranium concentrate….. . are recorded at acquisition cost	Cost

Table 5: An Example of Completed Research Analysis using the Codes and Coded Terms for Research Question 1, Author 2021.

4.3.1. iv. Coding of Expert Interviews

Primary data collected by interviewing accounting specialists was used to supplement the archival data from the annual reports. The interviewees were asked to conform, in their independent judgement, the accounting practices for emission allowances (as there are detailed guidelines on nuclear fuel and decommissioning liabilities, experts were not asked to recommend on asset retirement obligations). This was to benchmark expert viewpoints against the industrial practice as identified in Research Question 1. Participants were also inquired about the disclosure criteria, qualities of useful accounting information, and the characteristics of good accounting practices to answer the remaining research questions.

Following codes (Table 6) were assigned against interviewees responses in order to answer Research Questions 2:

	Classification	**Recognition**
Carbon Emission Allowances		
Granted Emissions	GE1	GE2
Purchased Emissions - Business Use	PE1	PE2
Purchased Emissions - Trading	PT1	PT2
Emission Allowances Obligation	EA1	EA2

Table 6: Codes for Research Question 2, Author 2021.

As per Table 6 above, coding criteria remained identical to accounting disclosures from the annual reports, as it would be easier for comparison purposes. Once again, similar coded terms (as per Table 4 p.117) were allocated to complete the reaction sheet. Coded terms such as 'inventory', 'intangible asset', 'government grant', 'financial instrument' and 'not disclosed' were identified from the coded sheets to complete the final reaction sheet for research analysis.

Other research questions were directed towards the reasonings behind the chosen accounting practices by the surveyed companies, and the qualities of useful accounting information; content analysis was a straightforward procedure. Because the responses were already sorted within the pre-designated interview questions, coding was not required for sorting purposes. No keywords or coded terms were mentioned or discussed during the interviews. The author has assigned coded terms using NVivo software to the interview responses to complete the

reaction sheet. Following coded terms were assigned to the responses towards Research Questions 3 and 4:

Research Question	Description	Coded Terms
3	Sources of Accounting Information	Accounting Bodies, Industry Experts, Regulators, Competitors.
3	Disclosure Criteria	Publicity, Legality, Materiality, Profitability, Accountability, Understandability, Not Identified.
4	Qualitative Characteristics of Useful Accounting Information, and the Elements of Good Accounting Practice	Relevance, Faithful Representation, Verifiability, Comparability, Timeliness, Understandability

Table 7: Coded-Terms for Research Question 3 and 4, Author 2021.

The author prepared the abovementioned checklist (Table 7) of the coded terms using his own expertise, as well as the IFRS guidelines. Qualitative characteristics of useful accounting information are determined by the IFRS in the revised Conceptual Framework for financial reporting; designated into fundamental and enhanced characteristics (Conceptual Framework, 2020). Most of the accounting professionals are aware of the instructions given in the Conceptual Framework, which is why, it was easier for the author to prepare coded terms for research question 4. Whereas, for research question 3, the author exercised his own knowledge and logical assumptions of what the possible responses could be. However, the author simply matched and did not change or alter the meaning of interviewees' responses to fit them into the predetermined coded terms.

Once the interview replies were highlighted using the coded terms above, NVivo helped in running queries to understand relationships between the responses.

4.3.2. Accounting Ratios for Materiality Test

In order to understand whether the values for carbon emission allowances are material to the financial statements, accounting ratios are used to calculate the various materiality levels as highlighted in the Financial Reporting Council (FRC) 2017 report on 'Audit Quality Thematic Review Materiality' (FRC, 2017). This report covered the most common

materiality benchmarks used by FTSE350 companies in various sections. Selected materiality benchmarks for this study are derived from the FRC's report pertaining to electricity, gas, water and multiutilities sector, in addition to oil and gas producers. Formulae are calculated to determine whether the cost (i.e. emission allowances or decommissioning liabilities) meets the materiality benchmark. Following ratios are calculated on the IFRS surveyed companies for the Year-End 2017, 18 and 19. Not only for emission allowances values, nuclear fuel and decommissioning liabilities are also tested for material significance to do a comparative analysis, i.e. if material values are highly likely to be disclosed in the financial statements. It is because entities are expected to disclose all material information in their financial statements (PWC, 2008, p.17). Ratios used in this study are as under in Table 8:

Materiality Benchmark	**Ratio**	**Formula**
Profit Before Tax > 5%	PBT	Cost / Profit Before Tax x 100
Revenue > 1%	REV	Cost / Total Revenue x 100
Operating Profit > 2%	OPT	Cost / Operating Profit x 100
Net Assets > 1%	NA	Cost / Net Assets x 100
Total Assets = 1%	TA	Cost / Total Assets x 100

Table 8: Accounting Ratios for Research Question 1, Author 2021.

4.3.3. Semi-Structured Interviews

Qualitative data is best received directly from human participants (Mookdee, 2013; p.91) so the primary data is collected by interviewing accounting specialists to provide recommendation on the accounting solution for emission allowances. Additionally, experts' opinions were used to supplement the secondary data to draw conclusions on the motivation of surveyed companies behind their chosen accounting policies.

Questions for semi-structured interviews were designed on the basis of the literature review. Because of the lack of awareness on the issue of carbon emission allowances, participants were recruited based on their extensive experience in financial accounting, and their involvement in environmental studies and similar issues. Familiarity with the allowances issue was asked during the interview to understand the popularity of emission allowances among the experienced participants.

Semi-structured format is a popular method of conducting interviews, as the interviewer has prepared a bunch of questions in advance, but the intention is to have a detailed conversation with the interviewee (Given, 2008). It is entirely based on the interviewer's discretion on how to proceed with the order of questions, and set the tone of the interview (Slayton, 2018). In order to make it more conversational, an interviewer might change the sequence of questions if it suits better along the dialect (Smith, 2018). The interviewer has full authority to seek clarification for responses that are not so clear, ask follow-up questions that are not on the prepared questions list, and to even extend the timing of the interview if the conversation is going well (O'Reilly and Dogra, 2017). This is to understand the responses really well, at the same time, not pressurising the respondent to provide an immediate answer to a question that they didn't understand so quickly. Expert's viewpoints in a semi-structured interview boost curiosity, which open doors to new ideas and concepts (Ahlin, 2019). Because of the long-term silence by the accounting bodies on this issue, practitioners have been using their own judgement in applying appropriate accounting treatments, and providing disclosures voluntarily. This type of interview would offer the experts a chance to share their perspective, and possibly revisit the issue in their practical life after the brainstorming conversation (Cassell, 2015). As per McIntosh and Morse (2015), interviewer must not enforce their opinion and thoughts on to the interviewee, and let the participant gather their thoughts in their time. Allowing the participant to exercise their freedom of expression would help in uncovering deeper insights of the issue under consideration.

4.3.3. i. Interview Criteria

Primary data sample is comprised of **twenty experts** who has longstanding experience in accounting. A minimum of ten years of experience was required to participate in this study, but the aim was to recruit participants with higher than fifteen years of experience in variable industries. As this study was started during Phase 3 of EU-ETS scheme, the experience criteria were determined to cover the EU-ETS initial phases as well (i.e., Phase 1, 2 and 3 from 2005-2007, 2008-2012 and 2013-2020, respectively). The author understood that long-term experience in environmental accounting would provide more useful insights from the participants. In order to invite a wide range experienced cohort, no stringent requirement was placed upon the industry, other than having knowledge of environmental and financial accounting issues and concepts, and close working relationship with financial accountants. Selected participants included external and internal auditors, chartered accountants,

professors and senior lecturers in accounting, directors, equity and financial analysts, and other professions. Other profiling factors, for example, racial background, religious or political beliefs, nationalities, age groups, gender and related features were not relevant for this study, therefore, disregarded for this study. Because the questions designed for this study did not seek to use participants opinion on environmental issues and climate change, profiling factors would not have changed the participants' response. The interview questions simply required the application of accounting knowledge using the IFRS guidelines. All focus was purely given to the research issue by inviting participants from any background, as long as they are still working and not retired (so their industry knowledge is not out of touch). Participants Information Sheet covering the necessary details about the project and participation, along with the Participants' Consent Guidance Form listing their rights and addressing ethical concerns, both documents were sent to the interviewees in ample time before the scheduled interview dates. All the data collected during the interviews were compiled in a pseudo anonymous format, i.e. the personal details of the interviewee was removed and a code was assigned to identify the respondent. This means that the researcher would still be able to identify the respondent should that be required. All of the participants data is protected by GDPR regulations and the author is the only data controller for this study. Anglia Ruskin University's ethics committee has authorised the Ethics Application to conduct this research (Ethics form is presented in the Appendices).

Due to the COVID-19 pandemic, all interviews were conducted online via Microsoft Teams, Zoom and a couple over phone calls. Although online interviews should be hassle-free, it was a challenging process, making sure internet connections weren't interrupted and dealing with distractions in the background (if applicable). Additionally, many participants simply opted out due to the ongoing distractions of the pandemic worldwide. However, twenty highly experienced participants were still a good number to gain valuable insights for this study.

4.3.3. ii. Interviewee's Profiles

Various experts were invited to participate in this study by sharing their opinions in online interviews due to COVID-19 restrictions. Shortlisted participants included professors, auditors, analysts, directors, and professional accountants. Each participant had a minimum of 10 years of experience in environmental accounting area in their respective field, which

was the essential criteria for this study. Figure 3 below is a graphical representation of the selected interview participants for this study.

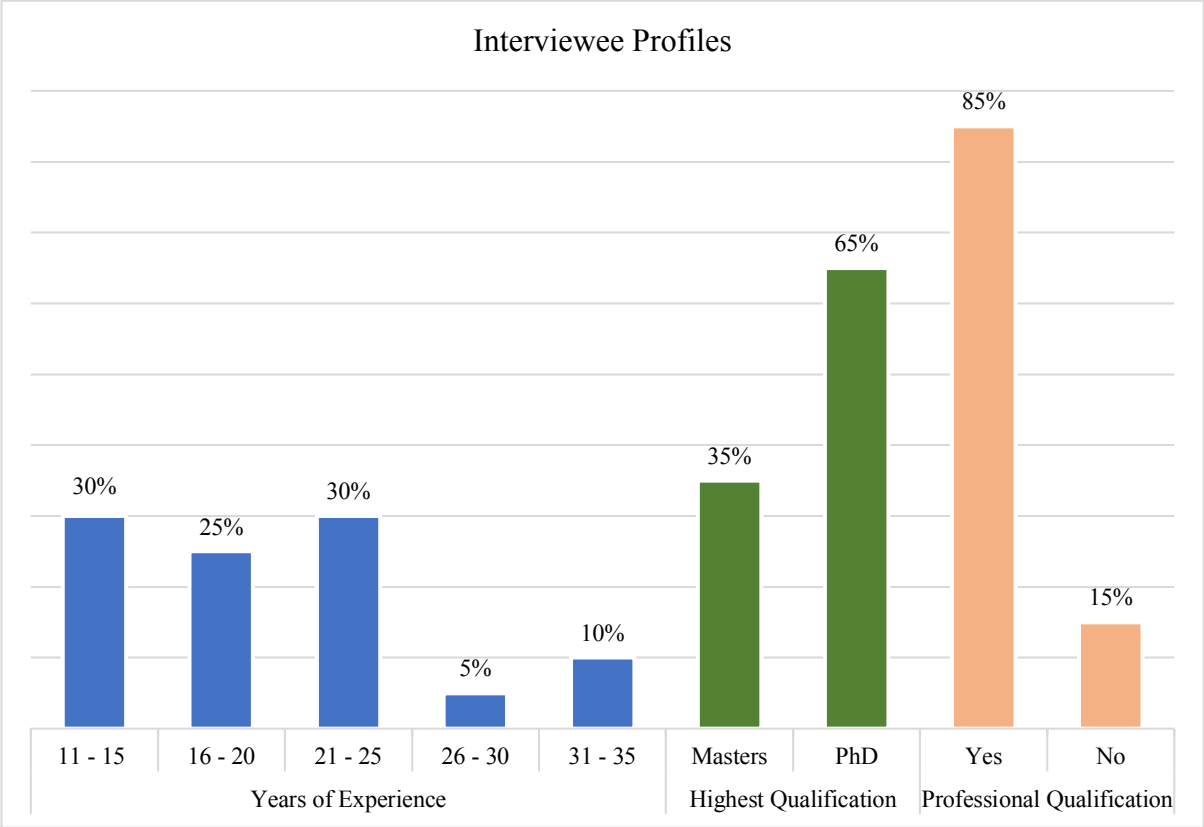


Figure 3: Interview Participants Profile, Author 2021

4.3.3. iii. Interview Questions

By adopting a semi-structured interview format, the questions given below were prepared beforehand, however the sequence of asking questions was dependent upon the conversation on a case-by-case basis.

(A) Accounting Issues

1. Have you thought about issues in accounting for nuclear power plants in the financial statements?
2. How should we record granted carbon emission allowances?
3. What should be the basis of measurement (recognition criteria) for granted carbon emission allowances?

4. How should we record purchased carbon emission allowances?
5. What should be the basis of measurement (recognition criteria) for purchased carbon emission allowances?
6. How should we record the obligation to surrender carbon-emission allowances?
7. What should be the basis of measurement for the obligation to surrender carbon emission allowances back to the regulators (State)?
8. Why are these your preferred accounting treatments?

(B) Good Accounting Practice

1. In your opinion, what are the key qualitative characteristics of useful financial information?
2. In the absence of an accounting standard, where should the companies look for guidance?
3. What are the implications of choosing an incorrect accounting treatment?
4. How do the companies decide what and whatnot to disclose in the annual reports?
5. What represents a good accounting practice?

Questions stated above were designed to firstly enquire how the experts believe carbon emission allowances should be recorded in the financial statements. It is to relate their viewpoint with the current practice in the energy and utilities industry to establish if there's any uniformity in the viewpoint and practice, or any preferential accounting treatment by a larger consensus. The second half of the questions were to establish whether experts' recommendation have any connection with the prevalent industrial accounting practices. For example, if an interviewee believed that comparability is the most important characteristic of useful accounting information, whether the data sample has revealed some form of comparability in practice. To complete the understanding of this concept, the follow-up questions were related to the implications of the imperfect accounting treatment to understand the gravity of the situation from a cohort of experienced professionals.

4.3.4. Data Sample

The procedure for selecting sample for this study was two-fold, i.e. the selection of a reliable database that list all the owners and operators of nuclear power plants around the globe, and the second step was the selection of companies from the database. Instead of relying on various online database that could potentially raise validity and reliability issues, this study

relied upon the legitimate source, i.e. the International Atomic Energy Agency (IAEA). It was selected due to their international presence in the nuclear industry, and close working relationship with various relevant organisations including the policies of United Nations. The long-term goals of IAEA are to promote peaceful and secure usage of nuclear technology through a deeper understanding of nuclear power plant operations, in close compliance with key global partners, and to make further contributions towards the energy discussions with the production of official data. The Power Reactor Information System (PRIS) is an extensive **database by IAEA** to provide detailed knowledge about the global nuclear energy data. IAEA publish reports annually, covering all nuclear power plants, whether operational, terminated or in the process of cessation. The most recent publication of IAEA is the 2020 Edition, published in July 2020, which is used for this study (IAEA, 2020).

Sampling procedure involves two steps, outlining a population to draw a final sample out of it, and to ensure that every subject has a balanced chance (greater than zero) for inclusion in the study (Emmel, 2013, p.14). Entire population of the worldwide owners of nuclear power plants were selected to draw a sample for this research. Amongst all, companies that follows IFRS were included in the final sample. To benchmark the practices of IFRS against NON-IFRS entities, a balanced sample of NON-IFRS companies were also selected to perform competitive benchmarking.

Because the aim of this study is to capture global accounting practices for emission allowances, random sampling method would not have been useful. While probability sampling method offers a relatively trustworthy depiction of the entire population, it would not be applicable for this study as the idea is to capture every company that follows IFRS framework. Although, under non-probability sampling technique, every subject has an unspecified chance of selection, and is relied upon the researcher's expertise only (Krysik, 2013, p.219); it is easier to manage and better suited to this study's model. Among both sampling techniques, probability and **non-probability sampling** (Trochim and Donnelly, 2008), the latter is chosen for this study, since the foundation is laid upon a non-random sample. As there are numerous accounting frameworks that entities are following around the globe, the sample for this study is based upon two criteria, i.e. selection of all companies that follows IFRS, and matching number of NON-IFRS companies. For the former part, **all population sampling method** is used, following upon the aim of this research to cover

global data. For the latter part of the sampling process, researcher's judgement was required to select a representative sample in order to benchmark again the former sample. **Subjective sampling technique** as opposed to random sample is selected under non-probability sampling techniques (Saunders, Lewis and Thornhill, 2015). Subjective sampling, also known as purposive, judgemental or selective non-probability sampling method, is a popular technique when handling a smaller sample. The idea for using judgemental sampling for NON-IFRS companies was to match the frequencies with that of IFRS, so both datasets were equal. Among the entire 443 operational nuclear power plants around the globe (IAEA, 2020), a huge number of reactors are located in the USA, that follows US GAAP (NON-IFRS) framework, instead of IFRS. For that reason, the total proportion of owners following NON-IFRS frameworks were slightly over the IFRS's. Researcher judgement was required to balance both datasets, hence the use of subjective sampling method.

From the population of 443 nuclear power plants, that are maintained by almost seventy-one companies, **twenty-seven IFRS companies** were selected for the final sample, that currently owns 174 nuclear power plants. In order to perform competitive benchmarking, **twenty-seven NON-IFRS entities** that owns 224 nuclear power plants were also selected to make a comparative analysis. About forty-five power plants maintained by seventeen owners were excluded from the final sample either because their websites or annual reports were not accessible via any online platform, or all of the given information was in foreign language that could not be translated via Google translator (Please refer to the criteria in Section 4.3.5, pp.132-33 below). Figure 4 below represents the selection and expulsion criteria in a graphical format.

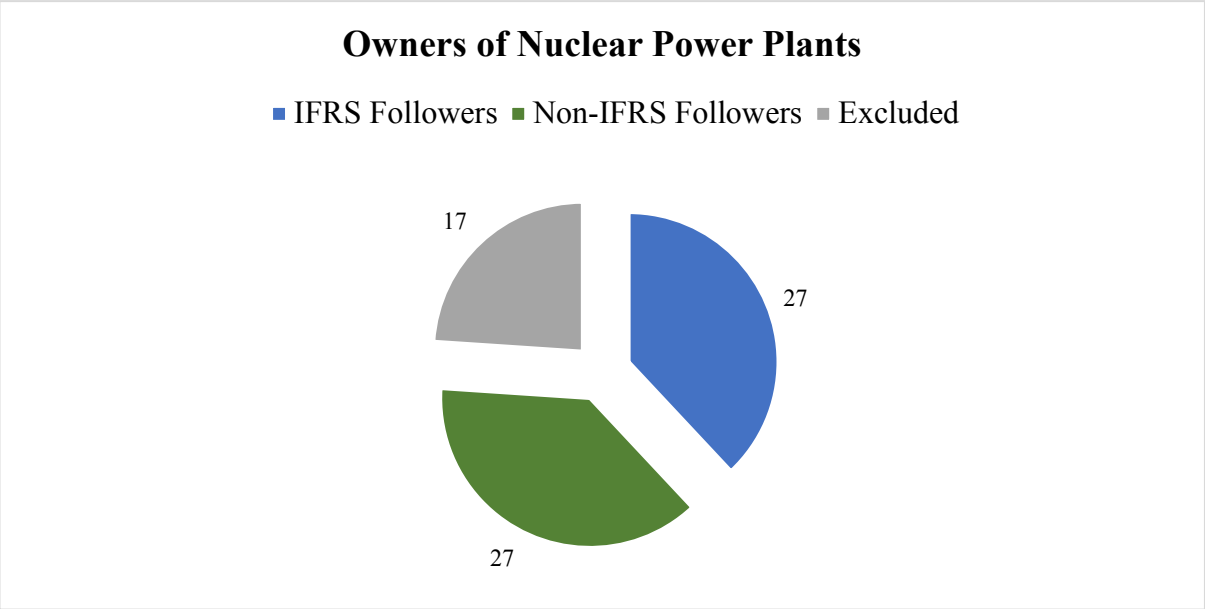


Figure 4: A Breakdown of the Owners Nuclear Power Plant used in this Study, Author, 2021

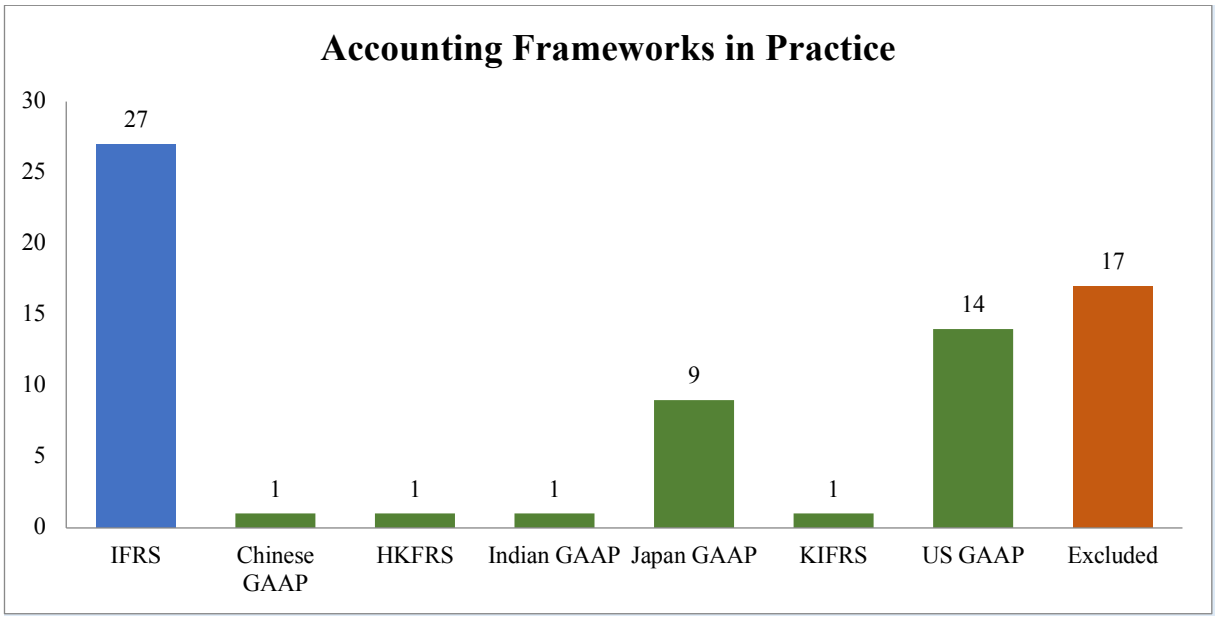


Figure 5: Accounting Frameworks Followed by the Owners of Nuclear Power Plants, Author, 2021

As per Figure 5 above, twenty-seven out of seventy-one owners follow IFRS accounting standards, represents a significant 38% of the entire population. Conversely, a total of twenty-seven NON-IFRS owners (combined) represents a similar percentage, making a total of 76% coverage of the population. It leaves seventeen companies out of the main sample as they didn't fulfil the selection criteria (as per Section 4.3.5, pp.132-33).

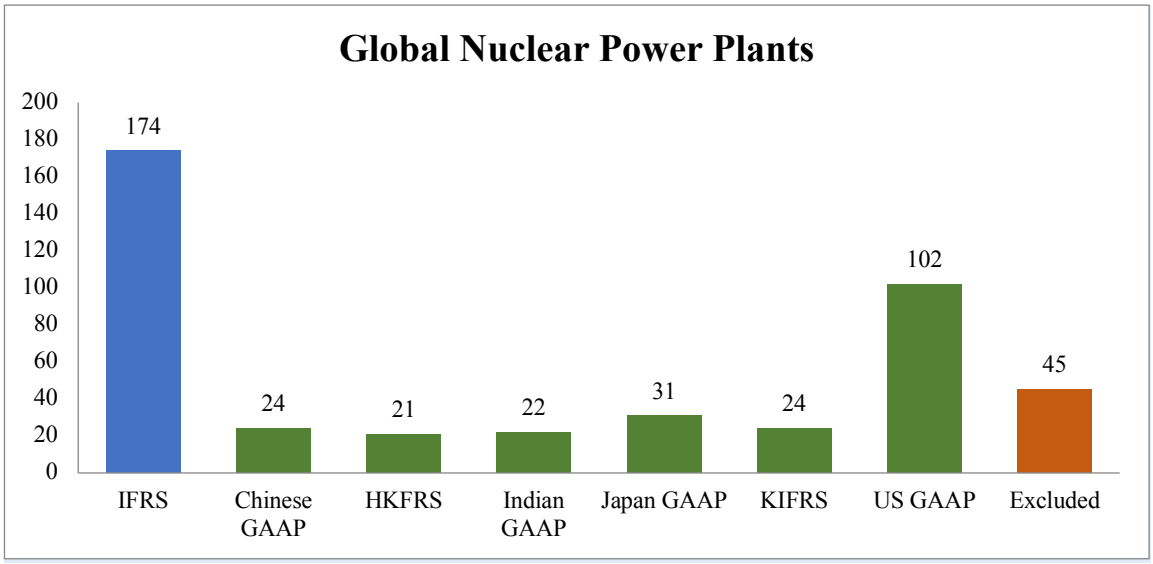


Figure 6: Analysis of Global Nuclear Power Plants that follows IFRS and other Accounting Standards, Author, 2021

Based on the number of nuclear power plants maintained by the selected owners, the percentage is a lot higher. As per Figure 6 above, 174 nuclear power plants (in blue colour) are maintained by twenty-seven operators (as per Figure 5) that represents a total of 39% of the population on the basis of nuclear power plants in the sample. Considering all NON-IFRS reactors as per Figure 6 above, a total of 224 power plants (in green colour), representing 51% are also in the final sample for competitive benchmarking, giving a total coverage of 90% of the global reactors in this study.

Table 9 below illustrates a country-wise statistical view of the companies that are selected for this study. Out of the total seventy-one owners of nuclear power plants, only twenty-seven that follows IFRS to prepare their financial statements has provided public access to their annual reports; hence, those operators fulfilled the criteria for concluding sample. To match the IFRS entities, a comparative sample of twenty-seven NON-IFRS companies was required. Initially, all NON-IFRS entities annual reports were searched online. Once again, reports that could not be downloaded online were excluded. Only a few US companies were remained that did provide access to their public information, but not all were required to match the IFRS sample. Using subjective sampling basis, those NON-IFRS American companies that owned the lowest number of power plants were excluded to bring the matching sample to twenty-seven companies.

The excluded companies in Table 9 below represents US companies where many did provide annual reports, but had to be removed to avoid sampling error. Entities from other countries, i.e. China, Iran, Japan and Pakistan did not publish their annual reports online. Argentinean company published reports in a foreign language, and not in an easily convertible format, therefore, had to be removed from the final sample. Finally, Hungarian company did publish annual report in English, but without financial statements. It was difficult to analyse disclosures and values without the presence of financial statements together with the annual report (Appendix 1 includes the list of included and excluded companies).

	Owners of Nuclear Power Plants							
	Total Population		Total Included				Total Excluded	
			IFRS		NON-IFRS			
	N = 71		N = 27		N = 27		N = 17	
Country	F	%	F	%	F	%	F	%
Argentina	1	1.41%	-	-	-	-	1	5.88%
Armenia	1	1.46%	1	3.70%	-	-	-	-
Belgium	1	1.46%	1	3.70%	-	-	-	-
Brazil	1	1.46%	1	3.70%	-	-	-	-
Bulgaria	1	1.46%	1	3.70%	-	-	-	-
Canada	2	2.92%	1	3.70%	1	3.70%	-	-
China	4	5.74%	-	-	2	7.41%	2	11.76%
Czechia	1	1.46%	1	3.70%	-	-	-	-
Finland	2	2.92%	2	7.41%	-	-	-	-
France	1	1.46%	1	3.70%	-	-	-	-
Germany	3	4.38%	3	11.11%	-	-	-	-
Hungary	1	1.41%	-	-	-	-	1	5.88%
India	1	1.46%	-	-	1	3.70%	-	-
Iran	1	1.41%	-	-	-	-	1	5.88%
Japan	10	14.55%	-	-	9	33.33%	1	5.88%
South Korea	1	1.46%	-	-	1	3.70%	-	-
Mexico	1	1.46%	1	3.70%	-	-	-	-
Netherlands	1	1.46%	1	3.70%	-	-	-	-
Pakistan	1	1.41%	-	-	-	-	1	5.88%
Romania	1	1.46%	1	3.70%	-	-	-	-
Russia	1	1.46%	1	3.70%	-	-	-	-
Slovakia	1	1.46%	1	3.70%	-	-	-	-
Slovenia	1	1.46%	1	3.70%	-	-	-	-
South Africa	1	1.46%	1	3.70%	-	-	-	-

Spain	2	2.92%	2	7.41%	-	-	-	-
Sweden	2	2.92%	2	7.41%	-	-	-	-
Switzerland	2	2.92%	2	7.41%	-	-	-	-
Taiwan, CN	1	1.46%	1	3.70%	-	-	-	-
Ukraine	1	1.41%	-	-	-	-	1	5.88%
UK	1	1.46%	1	3.70%	-	-	-	-
USA	22	31.66%	-	-	13	48.15%	9	52.94%
Total	71		27		27		17	

Table 9: List of Nuclear Power Plant Owners in the Population, and Inclusion in the Final Sample, Author, 2021.

4.3.5. Data Collection

Almost seventy-one owners currently own and operate the entire selection of nuclear power plants, currently standing at 443 operational reactors around the globe (IAEA, 2020). Due to the mergers of many companies, in many cases, reactors are owned by more than one company, however all partners have ended up in the sample as they are also the owners of other plants in the population.

Following the selection of the data sample from the IAEA database, classification of financial year-end was the next move for this study. Many prior studies were conducted using the data belonging to the period from 2004 to 2015 (as per the literature review), that relates to the first, second and third stage of the EU-ETS scheme. **Annual reports** for the **Year-End 2017, 18 and 19** together with the complete set of financial statements were used to conduct this research, which represents the crucial phase three of the EU-ETS scheme before transitioning to phase four in 2021 (Europa, 2021a). Also, 2019 financial statements were the newest reports available for collecting data for this research, as many companies have delayed their reports for 2020 due to the pandemic. Hence, reliance on the most recent available data was a perfect idea. Companies published their annual reports annually, that are audited and verified, serving the most authentic source of data for wider-stakeholders. As annual reports are the reliable source of information about the practices of an entity, they are primarily used to derive secondary data about the surveyed companies.

The drive of this research is to investigate the prevalent financial accounting practices for emission allowances by the owners of nuclear plants. Due to the lack of an official accounting standard; annual reports are the main medium of information that could provide

such information. Downloading annual reports of all sample entities was a very time-consuming exercise, as most of the information was extracted from secondary sources. The download of electronic copies of 2017, 2018 and 2019 reports were not all convenient due to the changes in the tax years following different jurisdictions, plus the issues related to non-accessible annual reports. Therefore, criteria were put in place to attain relevant disclosures for research analysis. In order to avoid exclusion from the final sample, entities in the final data sample must match the following requirements: -

- Investigator only has command on the English language; therefore, annual reports in any other language will face elimination, unless they can easily be translated using Google translator, i.e. in the case of Russian company, Atomenergoprom, which was easy to translate online.
- All annual reports must be accessible online, either via official website or online financial market platforms such as Bloomberg, US SEC, etc. If not found anywhere online, they will be excluded from the final sample.
- Annual reports not in a PDF file and in a foreign language will face expulsion as scanned copies are not easily translated using Google translator.
- The International Financial Reporting Standard (IFRS) is the principal accounting body under consideration for this research, hence, operators in the main sample must follow IFRS guidelines. Other accounting standards are used for benchmarking purposes, and only Year-End 2019 annual reports (most recent) from NON-IFRS companies are used for competitive benchmarking.
- Since IFRS is adopted by several nations within their accounting frameworks after minor or no modifications, such as Hong Kong, South Korea and Pakistan. For that reason, countries that have fully adopted IFRS framework wholesale in their standards are included in the final sample selection to look at the bigger picture. However, local version so IFRS are kept separate under the NON-IFS sample, i.e. Korean IFRS, Hong Kong Financial Reporting Standards and Pakistan IFRS. Where the law permits more than one accounting frameworks in a jurisdiction and the author could not establish the entity's preference in the sample, either due to the absence of annual reports or language barrier; the author did not assume the ultimate choice of the entity. They were simply excluded from the final sample of both IFRS and NON-IFRS datasets

Primary data is collected from the **interviews of twenty experts** in financial accounting, working in various industries with long-term experiences, and familiarity with environmental accounting (as explained in Section 4.3.3.i). Participants were searched via LinkedIn, published papers in environmental accounting and related areas in peer-reviewed journals and business contacts. After receiving an initial agreement from the participant to collaborate in this study, potential candidates were sent ARU's Participant Information Sheet and Consent Form containing necessary details about the project. Upon receiving the consent form, mostly via email or LinkedIn messenger, interview dates and timings were arranged based on their availability. Each interview was proposed to last between half-an-hour to an hour. Where the candidate could not attend a video call, telephone interview was arranged instead. Responses to the interview questions were recorded on an MS Word file that were later transformed into a pseudo-anonymised format. That means the personal information of the interviewers was hidden from the analysis. All of the participants details were kept confidential due to GDPR regulations. After the coding process, NVivo was used to prepare the query the results.

4.3.6. Data Analysis

Secondary data extracted from the annual reports (including the financial statements) was analysed using content analysis technique. Annual reports for the Year-End 2017, 2018 and 2019 were used for IFRS to perform a detailed analysis of prevalent accounting treatments used to recognise nuclear fuel, emission allowances and asset retirement obligations. Whereas, Year-End 2019 reports were used for NON-IFRS companies to conduct a comparative analysis against IFRS entities.

Primary data collected from interviewing twenty experts in accounting was used for two purposes. Firstly, to analyse whether the expert's viewpoints on the recognition of emission allowances is in coordination with the industry's' practice. Secondly, participants were asked to reflect upon the qualities of useful accounting information and the implications of incorrect accounting treatments. This was to supplement the collected secondary data in order to reflect on the research issue from an experienced cohort. NVivo software was used to analyse the interview responses by assigning coded terms to the answers first, then running queries to prepare results.

4.3.7. Ethical Limitations

This study has adopted the guidelines laid out by the Ethics Committee at Anglia Ruskin University, and received the **ethical approval** by the committee (approval document is available in Appendix 1). As this study is based on a mixed-methods research approach, both qualitative and quantitative aspects are adopted to complete this research. Primary data is collected using **human participants**, whereas the secondary data is collected online, using the annual reports of the selected companies (as explained earlier in this chapter). All the necessary measures were taken to protect the **integrity and objectivity** of this research, and the author has completed the necessary **ethical training modules** over the course of this study. Additionally, the author has completed the ethics module offered by the professional accounting body, ACCA as part of the career advancement goals. This study did not require ethical approval from any external organisation, as the secondary data used is publicly available on the surveyed companies' websites and other online platforms, such as Bloomberg.

The author is the sole data controller for this study and has **no conflict of interest** to complete this research. All the interview participants' personal data is protected under the GDPR regulations (The Data Protection Act, 2018). The interviews very **confidential** to protect the invasion of privacy, and only the author has access to the contact details of the participants. Interview data was processed in a pseudo-anonymised format, i.e. the personal information is removed, however, the author would still be able to connect the results with the interviewer. The rights of the interviewees are protected in all possible ways, and the necessary details were communicated with the participant in ample time prior to the interviews. Participants were asked to complete the **consent** form (available in Appendix 1) to become familiar with their rights and to provide their written consent to proceed with their participation. This study does not require personal details of the participants, such as their religious and political beliefs, gender, sexual orientation and other sensitive information. For that reason, such questions were not asked at any stage of this study. Only the participants names, years of experience, job profile, educational qualifications and email addresses were asked used by the author for communication and results purposes. However, names and email IDs were removed from the analysed data to protect the identities of the participants. The author has behaved professionally in all communications and has maintained **professional competence and due care** throughout this study.

4.3.8. Potential Contribution to the Research

Because the accounting issues for carbon emission allowances had started coming to the surface only over a decade ago (from 2005, after the enforcement of Kyoto Protocol Agreement), not many studies have been conducted on this area. The author could not find any study that accounted for all the owners of nuclear power plants worldwide. Most studies have focused on European entities, probably due to the popularity of EU ETS (cap-and-trade scheme) that is the largest carbon trading scheme in the world. Additionally, the author could not find studies that have done benchmarking of emission allowances with other complicated areas in the lifecycle of nuclear power plant, i.e. nuclear fuel and asset retirement obligations.

This study has aimed to offer a complete picture of the research issue on a global level by providing insights on:

- Prevalent accounting practices for carbon emission allowances, in comparison with the accounting treatments for nuclear fuel and decommissioning liabilities, within the utility and energy industry on a global level.
- Experts viewpoint on the recognition criteria for carbon emission allowances in the financial statements.
- Whether the carbon emitting companies are adopting the qualitative characteristics of useful financial information, by offering a transparent and faithful representation of their annual accounts?
- Possible reasons behind the current accounting practices of carbon emission allowances.
- Theoretical contribution underpinning the various types of institutional pressures that derives companies in adopting certain financial accounting practices for carbon emission allowances.

4.3.9. Summary

Following points can be summarised from the research methodology for this study:

- By adopting a pragmatist research philosophy, this study has adopted a **Mixed-methods research approach** to offer a multi-dimensional view of the research issue, by collecting both quantitative and qualitative data using **convergent parallel design** or triangulation technique.
- Secondary data is collected from the **annual reports** of the surveyed IFRS and NON-IFRS companies, whereas primary data is derived from the **semi-structured interviews** of accounting experts.
- **International Atomic Energy Agency (IAEA) database** is used to gather information on the global owners of nuclear power plants.
- Data sampling is done with the help of two non-probability sampling methods, that includes **all population** (on IFRS companies) and **subjective sampling** (on NON-IFRS entities) methods.
- Out of the total seventy-one companies that maintains entire fleet of nuclear power plants across the globe, **twenty-seven companies each** of IFRS and NON-IFRS are used in this study.
- Archival data is collected by applying the **content-analysis technique**, where coding process is conducted on the disclosures in the annual reports of the surveyed companies to prepare a reaction sheet. With the use of coded-terms, summary is prepared to analyse the data. Similar coding process is done on interview responses; however, analysis was completed using NVivo software.

V. RESEARCH ANALYSIS

The notion of this research was to explore the existing accounting treatments and disclosures for carbon emission allowances, in comparison with nuclear fuel and asset retirement obligations, that are the main challenging areas relating to the operations of nuclear power plants. By interviewing qualified experts in accounting, this study has identified the experts' opinion on the recognition criteria for carbon emission allowances, likely sources of accounting information and disclosures criteria in the absence of particular accounting standards, implications of incorrect accounting treatments, and the constituents of good accounting practices in light of the qualitative characteristics of useful financial information.

Given the lack of an official accounting standard by IFRS pertaining to the lifecycle of nuclear power plants, particularly for carbon emission allowances; this chapter aims to present the results of empirical analysis.

Research sample (Table 10 below) was drawn from the entire population of 443 operational nuclear power plants as of July 2020 that were owned and operated by approximately 71 companies (IAEA, 2020). As IFRS accounting regulations was the main framework for this study, a final sample of 27 companies that currently owns 174 operational nuclear power plants, were selected. From those companies, a detailed analysis on three-years of Annual Reports for the Year-End 2017, 18 and 19 was constructed. In order to perform benchmarking of IFRS against other accounting frameworks, 27 NON-IFRS companies were also selected to do the initial comparison of accounting treatments, using the Annual Reports for the Year-End 2019 only. Altogether, 17 companies were excluded from further analysis due to either data access or representative sampling issues as explained in Chapter:4 Research Methodology.

Tables, graphs and charts are used to illustrate the variations in the chosen accounting regulations across the globe.

Operational Nuclear Power Plants	Owners	Accounting Framework	Final Sample	Note
174	27	IFRS	Included	Main Sample
224	27	NON-IFRS	Included	Initial Benchmarking
45	17	IFRS/NON-IFRS	Excluded	Not Applicable
443	**71**			

Table 10: Final Sample for Research Analysis – Data Collated from Appendix 1, Author, 2021.

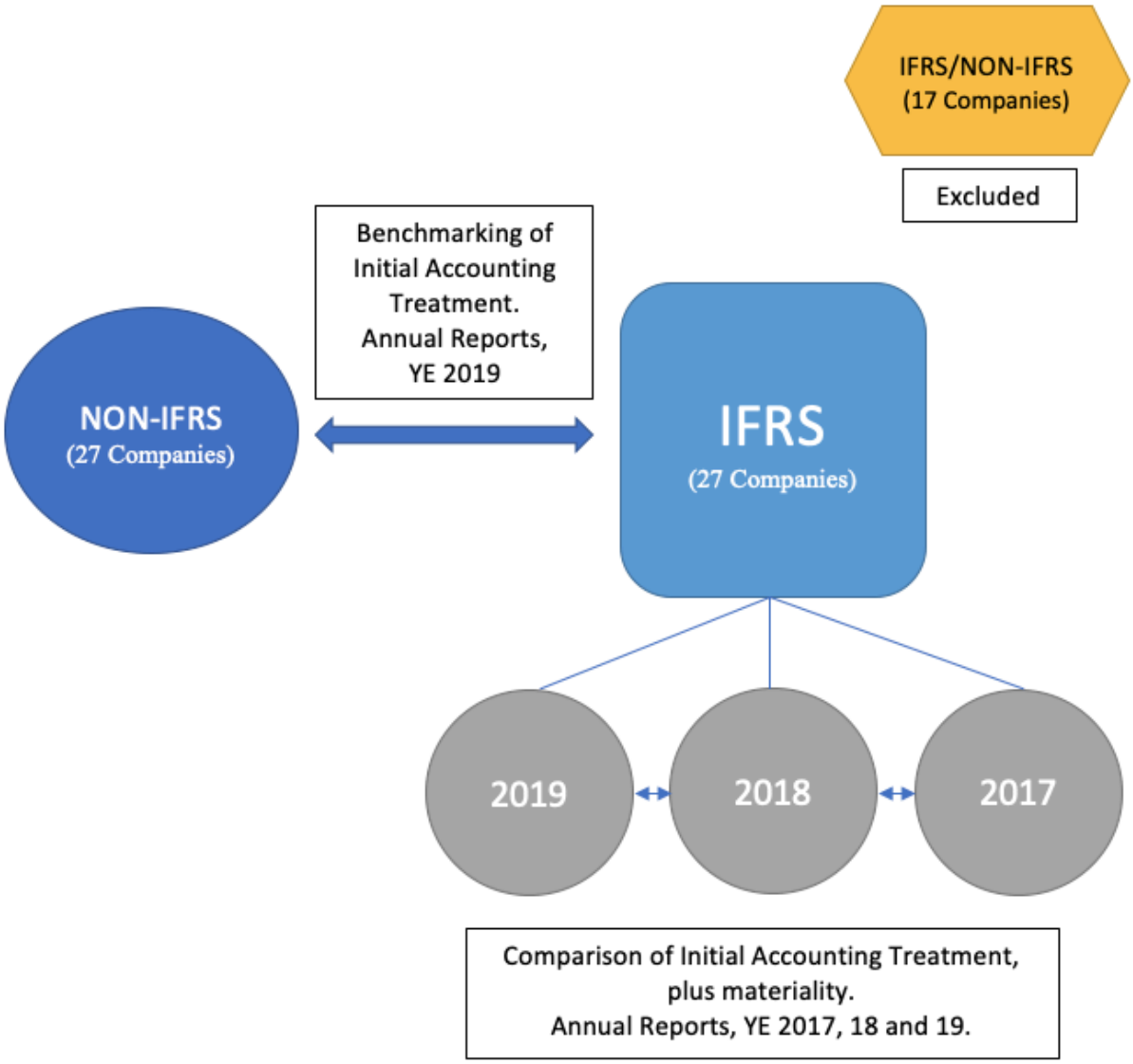


Figure 7: Graphical Representation of Final Sample for Research Analysis, Author, 2021.

In order to answer the Research Question: 1, *"How do the owners of nuclear power plants classify and recognise carbon emission allowances, in comparison with nuclear fuel and asset retirement obligations, in their financial statements based on IFRS framework?* empirical analysis is divided into the following parts: -

1. Nuclear Fuel
    - 1.1. Front-End (Initial Fuel)
    - 1.2. Back-End (Spent Fuel)
2. Carbon Emission Allowances
    - 2.2. Granted and Purchased Emission Allowances
    - 2.2. Emission Allowances Obligations
3. Asset Retirement Obligations
    - 3.1. Decommissioning Liabilities & Discounting Rates
    - 3.2. Asset Retirement Funds

Each section was analysed using three-years of financial statements to investigate consistency of accounting policies by the followers of IFRS accounting framework. Additionally, most recent one-year of financial statements (Year End 2019) were benchmarked against NON-IFRS companies, using an equal sample to investigate cross-border accounting policies and disclosure patterns. Various types of graphs were used to present the summarised results of research analysis, whereas the detailed empirical analysis is shared in appendices for further elaboration.

In order to answer the Research Question: 2, 3 and 4, "*What are the possible accounting solutions for carbon emission allowances based on the experts' opinion?", "What are the key sources of accounting information, and the basis of disclosures in the absence of a particular accounting standard for the owners of nuclear power plants?"* and *"What are the qualitative characteristics of useful accounting information for carbon emission allowances, in light of the constituents of good accounting practice?"*, twenty experts in financial accounting were interviewed to share their opinion on these matters. NVivo software was used to derive results, and the most easily understandable graphs and charts were prepared to present the results, followed by a detailed analysis.

5.1. Nuclear Fuel Accounting

5.1.1. Initial Fuel – Front End

The front end of the nuclear fuel starts from the mining of uranium to its burn-up and power generation in the reactor, where it stays for a period between eighteen to thirty-six months. After this period, used/spent fuel is transferred to the back-end cycle of the nuclear power plant.

The initial classification of nuclear fuel in the financial statements of the surveyed companies is provided in Figure 8 and 9. Data has revealed a higher dependency towards inventory, as opposed to property, plant and equipment method in Figure 8, i.e. current instead of non-current assets amongst IFRS companies. About 93% of the sample has classified initial nuclear fuel as 'inventory', and recognised using either Cost or Net Realisable Value, as per IAS-2 *Inventories*. Only two out of twenty-seven companies (7%) opted for 'non-current asset' method at 'Cost'. Disclosures revealed the reason for the selection of property, plant and equipment method (IAS-16) was the long-term stay of nuclear fuel in the reactor (CEZ, 2019). Collectively, eleven entities recorded fuel using 'Cost', whereas the rest of the sixteen companies used the criteria of IAS-2 'Cost or Net Realisable Value' for the recognition (Appendices).

Figure 9 illustrates consistency in accounting practices among the surveyed companies in the Annual Reports for the Year-End 2017 to 2019. All disclosures remained coherent, pursing both fundamental and enhancing qualitative characteristics of useful financial information (Conceptual Framework, 2020). Surprisingly, a larger consensus is leaning towards a uniform method of accounting for initial fuel, improving transparency and comparability of the annual reports in the industry, as non-disclosures in this area were zero among the IFRS companies.

On the other hand, although similar methods were pursued by the sampled NON-IFRS companies as in Figure 8, the population was more favored towards 'property, plant and equipment' with the majority (74%) recognizing it as a non-current asset, similar to the suggestions by US GAAP due to its extended lifespan inside the reactor (PWC, 2011). It followed by the second most preferred method of 'inventory' adopted by 19% of the sample. Just over 7% of the companies didn't disclose their accounting practices in this regard. Amongst those that displayed their classification of initial nuclear fuel, a higher majority of twenty-three entities used 'Cost' to recognise the value in the financial statements. Only two

companies preferred the option of 'Cost or Net Realisable Value' for inventory recognition (Appendices).

Non-disclosures were found among Indian GAAP and Hong-Kong FRS, where the former was prohibited from disclosing detailed information regarding nuclear fuel due to security concerns, but it was unclear why the latter remained silent on this arena. The surveyed company in India stated that they do not maintain any inventory of nuclear fuel, while the fuel charges were recognised on provisional basis after confirmation from the Department of Atomic Energy. Quantitative details are confidential as per DAE Order no.AEA/18/1/89-ER/3345 dated 22.11.1989, and therefore, not disclosed in the financial statements (NPCIL 2019, p.71). In the case of the Indian company, it is understood, if there weren't such restrictions imposed upon the entity by the legislation, the management may have complied with the disclosure requirements. This scenario is reflecting on coercive isomorphism due to the existence of institutional pressure from the national administration.

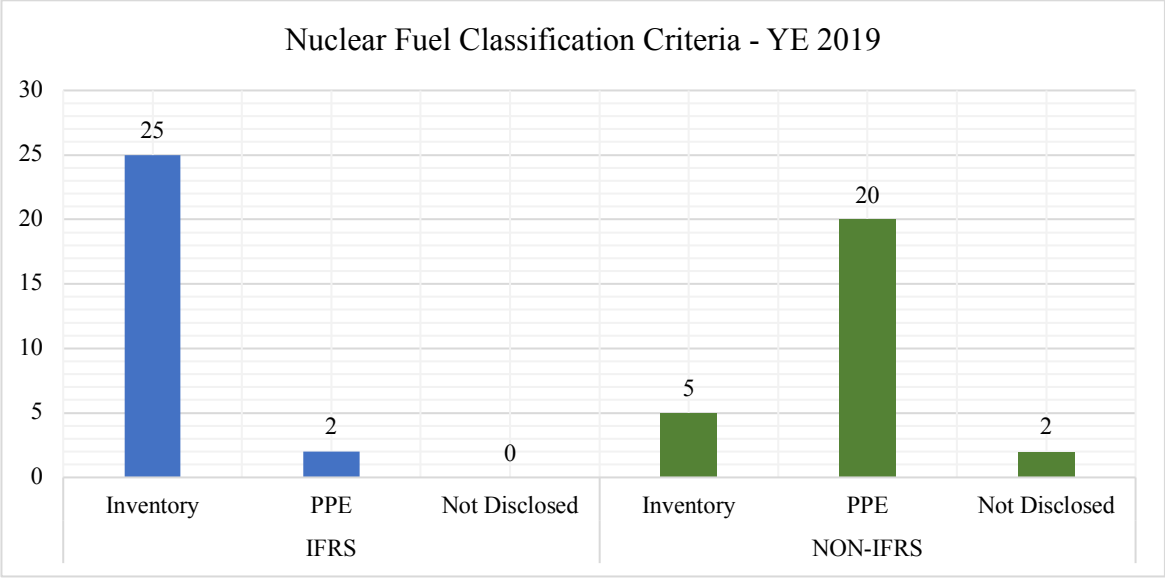


Figure 8: Comparison of IFRS vs NON-IFRS Classification of Nuclear Fuel in the Financial Statements for the Year-End 2019, Author, 2021

It was observed that all companies in Japan adopted uniform methods of accounting for nuclear fuel, as all nine companies in the NON-IFRS sample pursued 'property, plant and equipment' criteria for initial fuel recognition, using the 'Cost' method. In fact, disclosures were almost identical among all competitors (Appendices), shedding light on the possibility

of mimetic pressures; the surveyed entities might be imitating each other. Japan allows companies to choose from various accounting frameworks to produce their annual accounts; where US GAAP and IFRS both are the available options (EU-Japan, 2021). Japan GAAP is identical to US GAAP, where rules instead of principles are adopted; it is possible that it was the normative pressure on companies to adhere to the professional standards by stating identical disclosures in their annual reports, and embracing uniform accounting treatments. Alternatively, surveyed companies' application of identical accounting treatments, together with the relevant disclosures, even within the presence of several accounting options, possibly is the result of mimetic pressures in the Japanese society.

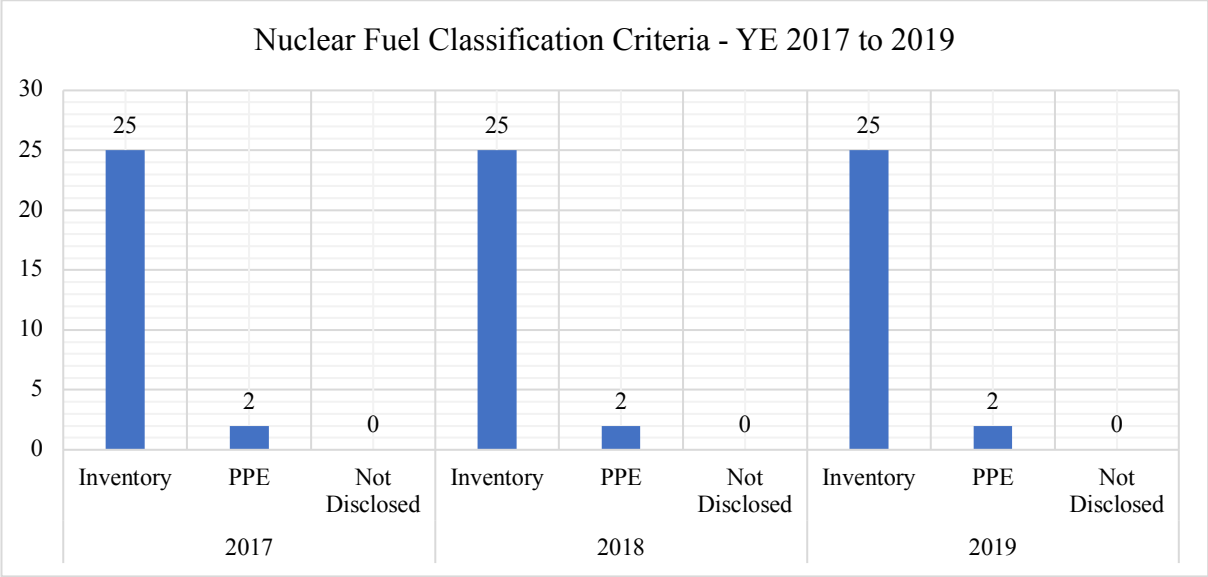
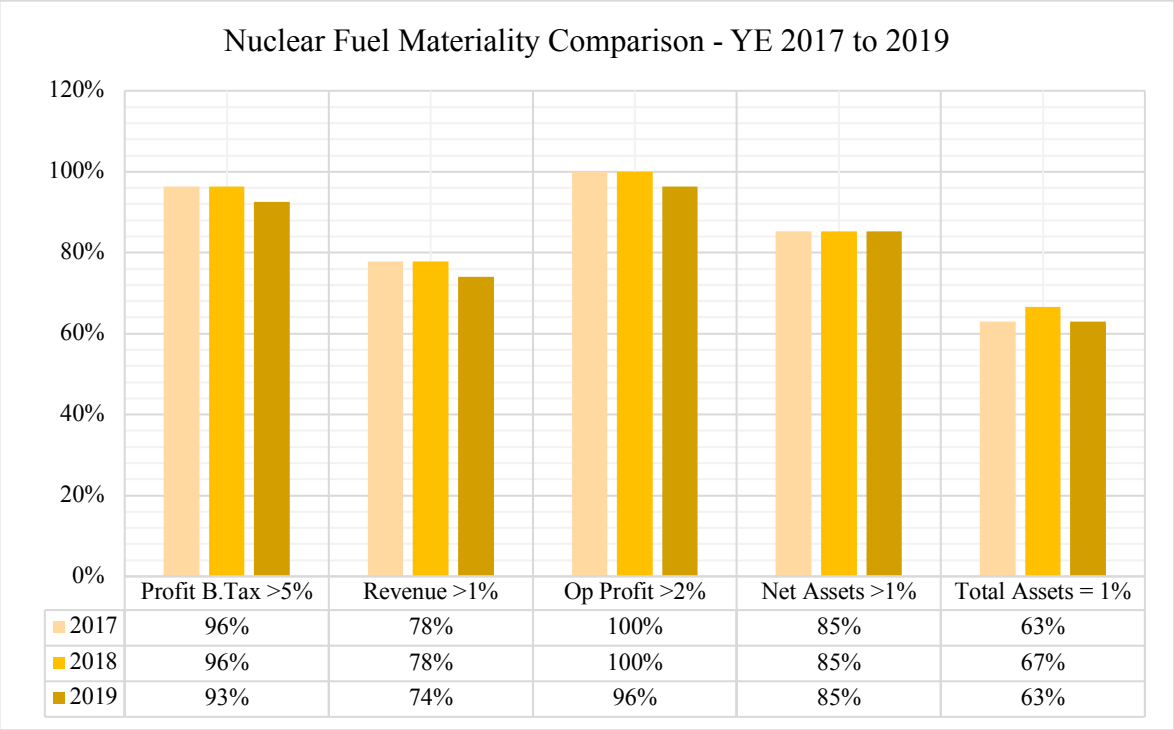


Figure 9: Classification of Nuclear Fuel in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Nuclear fuel is either an inventory due to its continuous usage in the reactor for power-generation, or an item of property, plant and equipment because of its extensive stay for over a year inside the reactor. IFRS existing guidelines for types of assets are given in IAS-2 *Inventories* and IAS-16 *Property, Plant and Equipment* (further explained in Chapter:2 Literature Review). As explained above, IFRS surveyed companies preferred IAS-2, whereas NON-IFRS sample mainly pursued the other option.

Materiality levels for nuclear fuel were tested for the IFRS sampled companies for the three-year period as in Figure 10. Amongst others, five key materiality benchmarks pertaining to

mining, oil and gas, and utility industry (FRC, 2017) were selected to analyse whether nuclear fuel values were material to the financial statements. Figure 10 below revealed exceptionally higher materiality levels for the year end 2017, 18 and 19 for the entire sample. At least 63% of the surveyed companies' nuclear fuel value was equal to 1% of their total assets in 2017 and 2019, which was the lowest percentage as compared to other benchmarks. Highest materiality scale was greater than 2% of their operating profits, where every company tailed to the top, with the lowest sample of 96% in 2019 being material. It was understood that nuclear fuel is a highly material figure for nearly every company in the utilities industry.



	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
2017	96%	78%	100%	85%	63%
2018	96%	78%	100%	85%	67%
2019	93%	74%	96%	85%	63%

Figure 10: Comparison of Nuclear Fuel Materiality Level for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Annual materiality levels for IFRS companies are also given in Figures 11, 12 and 13 for a comprehensive graphical analysis. Figure 11 below illustrates that the results of all five materiality scales passed at least 50% of the total sample, indicating that nuclear fuel is indeed a highly significant part of the financial statement. Accounting treatments related to nuclear fuel would have a material impact on the profitability levels, therefore, relevant disclosures are of utmost importance. For that reason, the entire sample revealed some

disclosures on this area to keep the stakeholders informed. All companies' nuclear fuel value was material in 2017 when tested against Operating Profit >2% benchmark, reducing to only 96% against Profit Before Tax >5% benchmark.

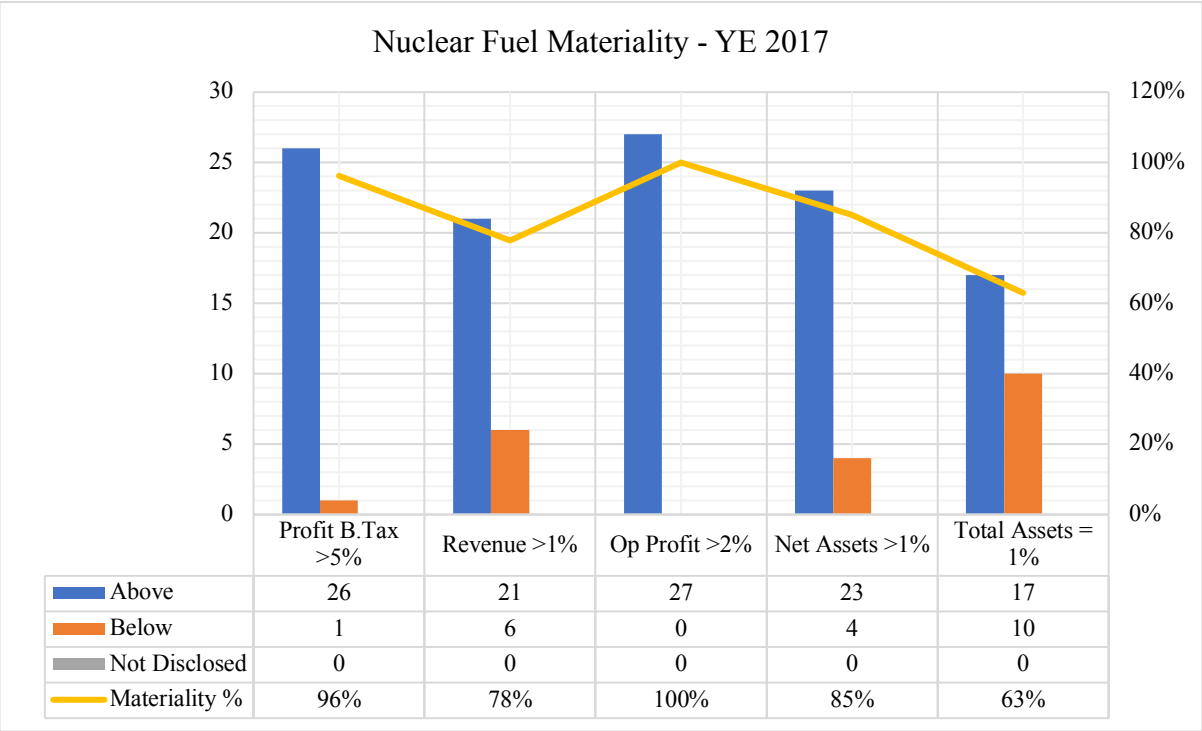


Figure 11: Nuclear Fuel Materiality Level for the Year-End 2017, IFRS Sample, Author, 2021

Similar trends were observed in the Year-End 2018 where the lowest materiality scales were found in Total Assets =1%, and the highest being Profit Before Tax >5% and Operating Profit >2% respectively. Figure 12 below shows almost exact statistics as seen in Figure 11 above, however the overall percentage for the lowest benchmark, i.e. Total Assets =1%, rose to 67% in 2018 from 63% in 2017. It was reassuring that all relevant disclosures were once again given in 2018, by maintaining verifiability, comparability and consistency of the financial statements on an annual basis. It depends which scales are considered more important by auditors, but all five key benchmarks for this industry, as pointed out by the Financial Reporting Council in their 2017 report, were highly noticeable (FRC, 2017). With the majority (93%) following similar accounting practices for recognising nuclear fuel as inventory (as in Figure 9) and providing relevant disclosures for such material values, could it be the reason that having a more defined guidance by the authoritative organisation, i.e. IFRS, lead the industry towards a unanimous accounting practice? Is it the institutional

pressure that has caused similar trends and pressured the companies to disclose key information regarding nuclear fuel in the notes to the financial statements?

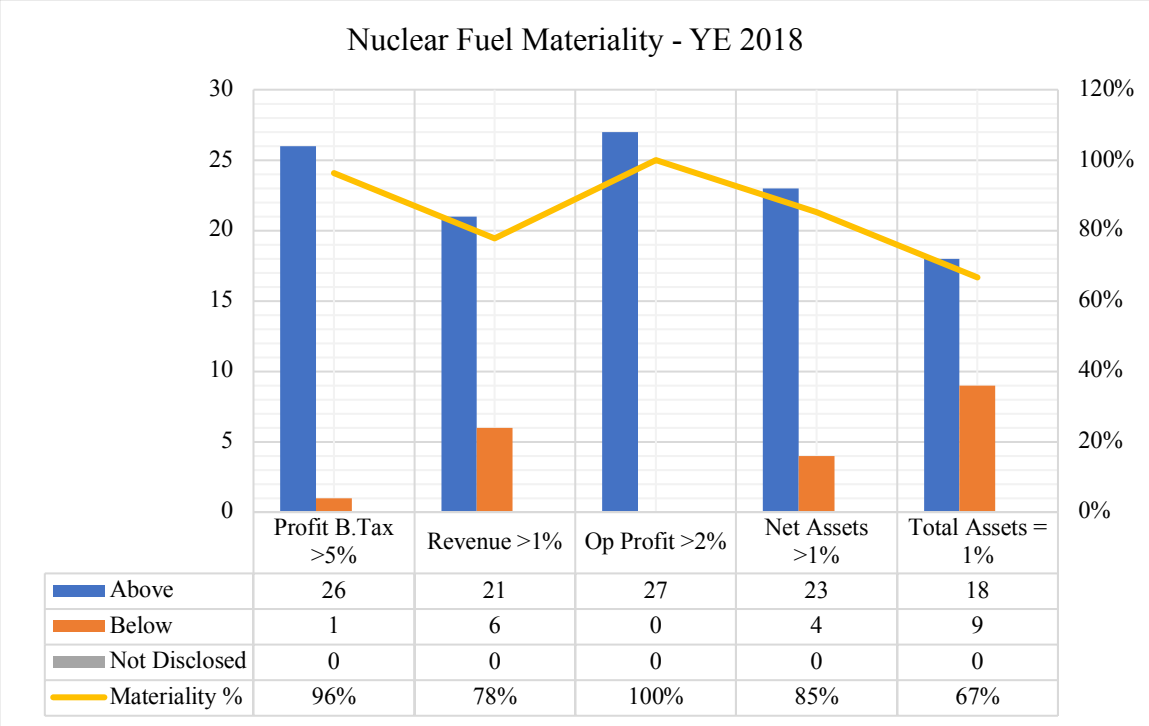


Figure 12: Nuclear Fuel Materiality Level for the Year-End 2018, IFRS Sample, Author, 2021

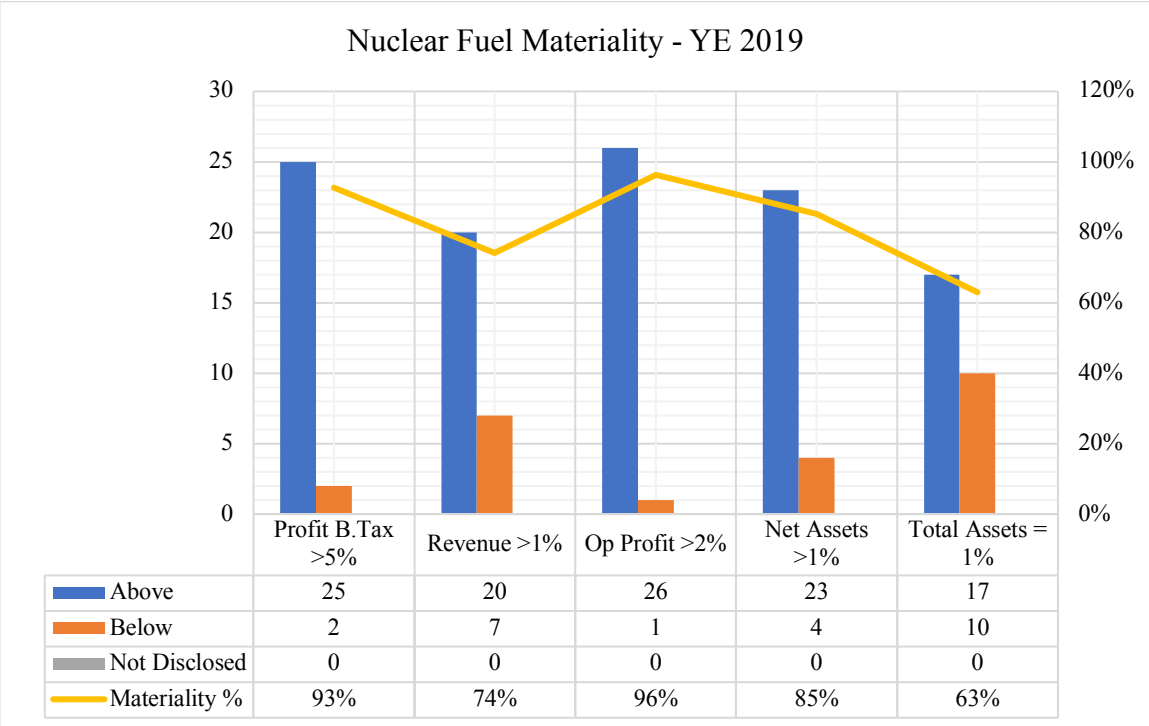


Figure 13: Nuclear Fuel Materiality Level for the Year-End 2019, IFRS Sample, Author, 2021

Between all materiality scales, profitability-based benchmarks revealed higher percentages as compared to the revenue and assets-based benchmarks. With a slight dip in Operating Profit >2% from the 2017 and 2018 levels, 96% of the surveyed companies' nuclear fuel value was material to their financial statements. A similar downward trend can be observed in the balance sheet materiality, where 63% of the sample, down from 67% in 2018, for the Total Assets = 1% benchmark (Figure 13 above).

Nevertheless, all three years of data painted a similar picture that nuclear fuel plays a key role in the annual reports of the owners of nuclear power plants. It is probably observed more closely by the auditors to verify the authenticity of its values and to fulfil the disclosure requirements. While the confusion lies in the part whether nuclear fuel is a current or non-current asset, IFRS surveyed companies predominantly opted for the inventory method by treating it as a by-product required for electricity production. Whereas, majority of the NON-IFRS companies pursued a different approach than IFRS, a three-quarter recognised initial fuel as a non-current asset. It should be noted that all NON-IFRS companies in Japan followed exact disclosure wordings and pursued similar accounting treatments[1]. Because of its material significance to the financial statements, both IFRS and NON-IFRS sample revealed ample disclosures in their annual reports, even in cases of confidentiality issues due to the legislative pressure (as in the case of Indian GAAP where detailed nuclear fuel information is a sensitive issue and the company needs governments approval on releasing information). Is it the materiality level, refined (if not precise) accounting guidelines by the accounting bodies or the institutional pressures that has displayed unanimous results among the competitors pertaining to the initial nuclear fuel? Carbon practices by the industry frontrunners may have influenced the competitors to adapt a similar accounting treatment, i.e. mimetic pressures, to maintain stakeholder's trust and to achieve public acceptability among the IFRS surveyed companies. In case of NON-IFRS companies, particularly in Japan GAAP, normative pressures by the economy, mimetic pressures of the competitors

[1] *Nuclear fuel is stated at cost less accumulated amortization. The amortization of loaded nuclear fuel is computed based on the quantity of energy produced in the generation of electricity (TEPCO, 2019, p.20).*

Amortization of nuclear fuel is computed based on the quantity of heat produced for the generation of electricity (KEPCO, 2019, p.83).

Both TEPCO and KEPCO are the leading owners of nuclear power plants in Japan, owing seven NPP each, with an overall market share of 42% in the industry. Both companies follow Japan GAAP as their main accounting framework.

and professional benchmarks might be the reason for identical accounting practices across the industry.

5.1.2. Spent Fuel – Back End

A highly fissile part of the nuclear fuel lies in the back-end of the power generation cycle, namely spent or used fuel. Once the fuel has been withdrawn from the reactor, it requires cooling down in the storage facilities before its disposal at restricted sites. As it is a long-term process, obligations to complete the production cycle stays with the operators of nuclear power plants from its origination.

Figure 14 below demonstrates a higher proportion of both IFRS (93%) and NON-IFRS (89%) surveyed companies recorded provisions for their future obligations towards spent fuel. Non-disclosures were presented, however not to an extreme level, with only two (7%) and three (11%) out of twenty-seven companies in both IFRS and NON-IFRS samples respectively, refrained from providing ample disclosures on spent fuel in the notes to the financial statements.

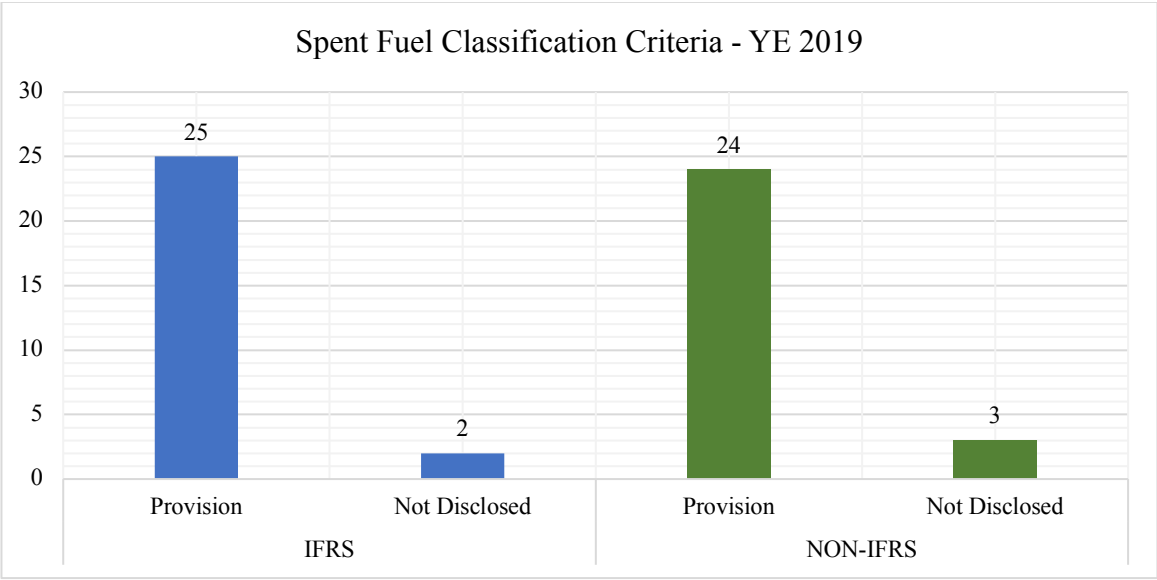


Figure 14: Spent Fuel Classification Criteria for the Year-End 2019, Author, 2021

Provisions, as described in IAS-37 *Provisions, Contingent Liabilities and Contingent Assets,* are recorded based on the probability of future outgoings, that entails uncertain timeframe

and monetary values (as described in Chapter: 2 Literature Review). Recognition of provision by the majority explains the acceptance of future commitment from both IFRS and NON-IFRS companies. All companies applied their own independent judgements in estimating the future costs towards the disposal and management of spent fuel, and recognised provisional liabilities in their accounts. Present value and best estimates were used by selecting appropriate discounting rates to calculate future outgoings by both IFRS and NON-IFRS surveyed companies (Appendices).

A deeper observation exposed, once again, an undisputed result among Japan GAAP where all companies publicised relevant disclosures and adopted identical accounting treatments (except for one company, Chubu, that didn't provide clear narrations), pointing towards isomorphism. Indian GAAP stated similar responses to the initial fuel, that disclosures of qualitative information were prohibited by the national policies. In that case, non-disclosing spent fuel information was actually in compliance with the industry standards, again reflecting on institutional pressures. Although Hong-Kong FRS is similar to IFRS, limited disclosures were questionable in that case; could it be the legislative pressure similar to Indian GAAP? In which case, non-disclosure was actually in acquiescence with the legislation.

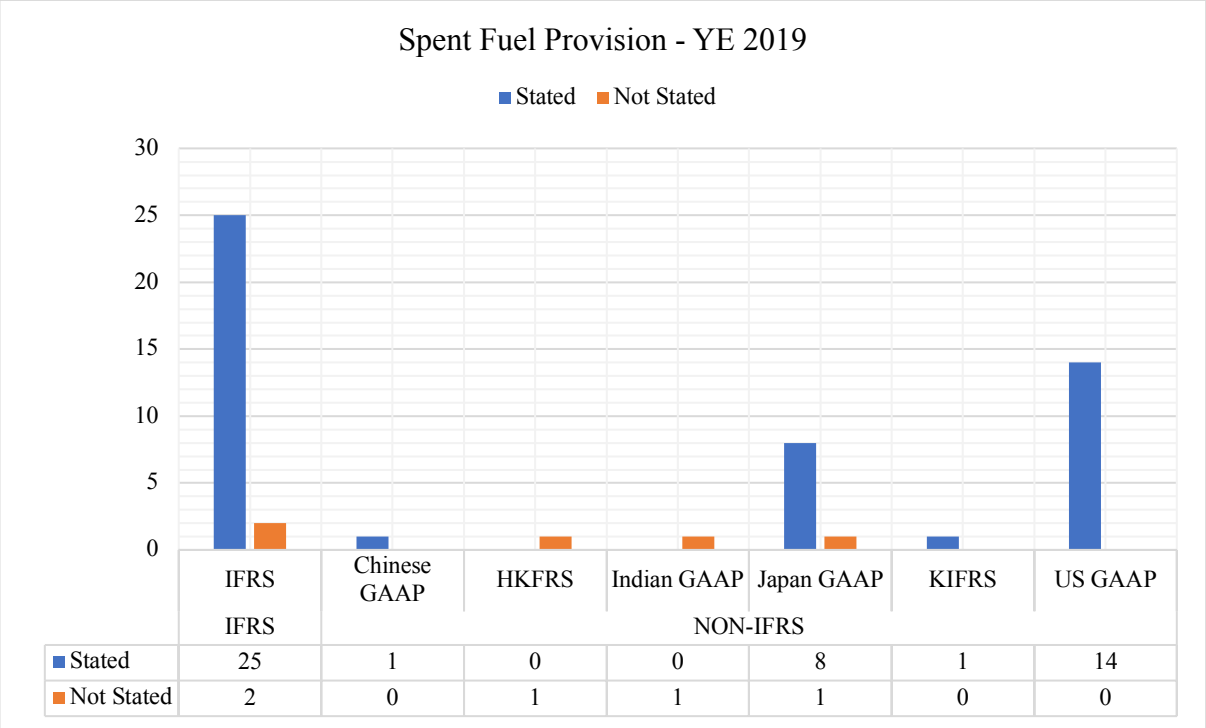


Figure 15: Spent Fuel Provision for the Year-End 2019, Author, 2021

Materiality levels for spent fuel were not separately calculated as most companies combine this provisional liability together with other decommissioning obligations. Additionally, initial fuel values already discovered the fact that fuel is indeed a materially significant cost for the industry.

Annual trends were uncovered using the three-years of annual reports for the Year-End 2017, 18 and 19. Figure 16 below demonstrates a consistently steady approach towards spent fuel by IFRS examined companies. Almost 93% of the sample disclosed necessary details pertaining to spent fuel in the notes to the financial statements, along with their accounting treatment, i.e. recognition of 'Provision' as per IAS-37 *Provisions, Contingent Liabilities and Contingent Assets.* Only two out of seventy-seven companies remained silent on their accounting practices for spent fuel. Spent fuel commitments were not identified as contingent liabilities by any company, was enough to highlight the likelihood of future expenses for the clear-out of used-up fuel. Similarly, NON-IFRS companies also deviated away from contingencies related to spent fuel, thereby, recognising their probable economic outgoings in the future.

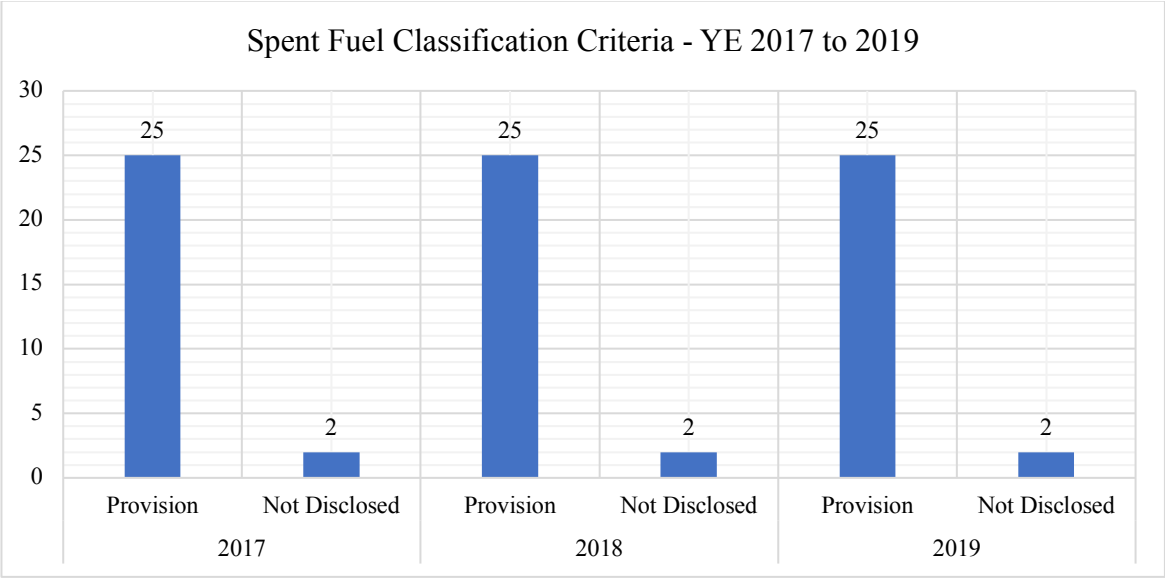


Figure 16: Classification of Spent Fuel in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

5.1.3. Summary

Combining both initial and spent fuel accounting treatments by the surveyed companies, the following points were noted from the results of empirical analysis: -

- A higher degree of **compliance with disclosure requirements**. Initial fuel recognition revealed a 100% and 93% disclosure by IFRS and NON-IFRS examined companies, respectively, in their financial statements.

- Initial fuel accounting treatment were chosen between current and non-current assets, i.e. **inventory** and **property, plant and equipment,** where the former was favoured by IFRS surveyed companies (93% of the sample) and the latter by NON-IFRS (74% of the sample).

- Initial fuel values were **significantly material** to the financial statements, using five different materiality benchmarks for this industry as given by the Financial Reporting Council Report on Audit Quality Thematic Review Materiality (2017).

- IFRS companies proved **consistency** of accounting information for nuclear fuel.

- **Provisions** were recognised by both IFRS (93%) and NON-IFRS (89%) sampled companies, thereby, acknowledging their obligations towards the future commitments.

5.2. Carbon Emissions Accounting

5.2.1. Granted and Purchased Emission Allowances

Quantification of emission levels in the form of allowances has limited the overall greenhouse gases and other carbon emissions across the globe, by making businesses accountable for their carbon footprints. Amongst other carbon-trading schemes, EU-ETS has a leading significance in the industry. Based on the quota, certain participants are given a percentage of allowances for free, otherwise, allowances need to be purchased from the carbon-trading market. In this context, free version of allowances is referred to as 'granted emission allowance', rest are 'purchased emission allowance'. Because the latter can be purchased either to fulfil the legal obligation to deliver allowances back to the authorities (matching the actual emissions level each year) or for buying-and-selling purposes, purchased emission allowances are identified separately for 'business use' and 'trading' purposes.

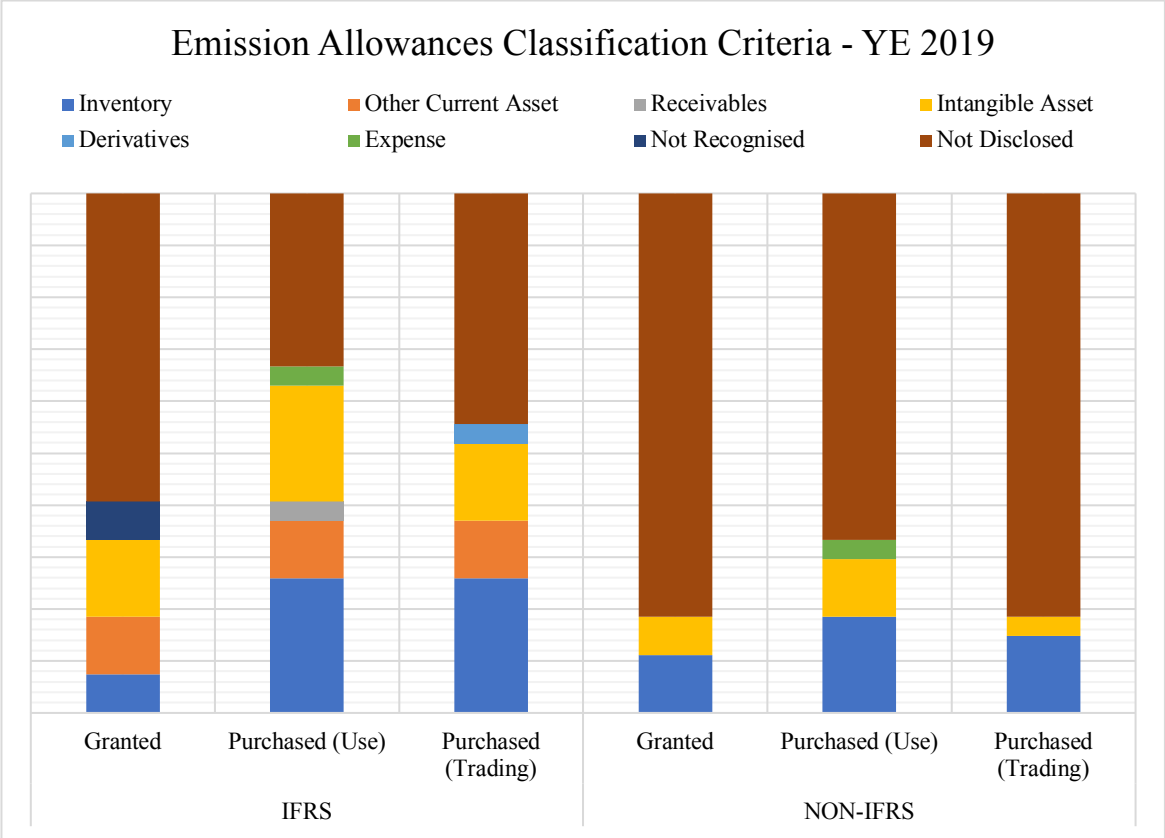


Figure 17: Comparison of IFRS vs NON-IFRS Classification of Emission Allowances in the Financial Statements for the Year-End 2019, Author, 2021

Figure 17 above explains the initial recognition of carbon-emission allowances in the financial statements of the examined IFRS companies. Accounting treatments for **purchased emissions allowances**, for both business-use and trading purposes, were almost identical to each other. Heavy reliance was placed upon 'inventory' method (26% of the sample), followed 'intangible asset' and 'other current asset'. A minority classified purchased emission allowances as either 'receivable' or an 'expense'. As per Table-11 below, current-asset recognition methods were clear favorites among IFRS surveyed companies, as a total of eleven out of twenty-seven companies classified purchased emission allowances as either inventory, other-current asset or receivables. One company classified allowances held for trading purposes as 'derivatives. Intangible assets, as identified by the withdrawn interpretation IFRIC-3 *Emission Rights*, was the second favorite choice based on the empirical analysis.

	IFRS							**NON-IFRS**					
Criteria	Granted		Purchased (Use)		Purchased (Trading)			Granted		Purchased (Use)		Purchased (Trading)	
Inventory	2	7%	7	26%	7	26%		3	11%	5	19%	4	15%
Other Current Asset	3	11%	3	11%	3	11%		0	0%	0	0%	0	0%
Receivables	0	0%	1	4%	0	0%		0	0%	0	0%	0	0%
Intangible Asset	4	15%	6	22%	4	15%		2	7%	3	11%	1	4%
Derivatives	0	0%	0	0%	1	4%		0	0%	0	0%	0	0%
Not Recognised	2	7%	0	0%	0	0%		0	0%	0	0%	0	0%
Not Disclosed	16	59%	9	33%	12	44%		22	81%	18	67%	22	81%
Expense	0	0%	1	4%	0	0%		0	0%	1	4%	0	0%
	27		27		27			27		27		27	

Table 11: Comparison of IFRS vs NON-IFRS Recognition of Emission Allowances in the Financial Statements for the Year-End 2019, Author, 2021

On the contrary, results for **granted emission allowances** discovered varied results, with the most preference given to 'intangible asset' method, adopted by 15% of the IFRS examined companies (Table 11). It followed by 'other-current asset' and 'inventory options for

recognition in the financial statements (11% and 7% respectively). Two out of twenty-seven entities chose not to recognise granted emission allowances by adopting the net-liability method (explained in Chapter:2 Literature Review, p.58), thereby, not recording free allowances and only recognising a provisional liability when the actual emissions by the company exceeded granted allowances[2].

In terms of the **disclosure** requirements, more than half (59%) of the IFRS companies remained silent on granted emission allowances, however the percentage reduced to 33% and 44% for purchased allowances, for business-use and trading motives, respectively. Overall, non-disclosures of accounting information related to emission allowances were leading the charts as per Table 2 and Figure 17 above. After the withdrawal of IFRIC-3 *Emission Rights* in 2005, there isn't an official accounting interpretation or standard for carbon emission allowances yet, companies are free to choose accounting treatments that are fit for purpose. Apart from the multiplicity in accounting practices as explained earlier, one would assume that at least disclosures must have been maintained to keep the good profile among various stakeholders, but that wasn't the case among IFRS surveyed companies.

Benchmarking IFRS sample with the NON-IFRS examined companies, Figure 17 earlier revealed identical accounting preferences, i.e., the most favorable classification method being 'inventory', adopted by 19% to 15% of the sample, followed by 'intangible asset' (11% and 4%) for purchased emission allowances. Choice of recognition criteria were either 'Cost' or 'Cost and Net Realisable Value' for purchase allowances, with an addition of 'Nil Value' for granted versions. However, the most preference was given towards 'Cost' when comparing all types of allowances (Appendices). Coincidentally, initial recognition for granted allowances also revealed similar trends, where a percentage of 11% pursued inventory and 7% of the sample chose 'intangible asset' methods. Unlike IFRS, there wasn't a variety of accounting methods espoused by NON-IFRS sample, as the choice remained between the two options as explained above. However, non-disclosures were exceptionally

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[2] *The Group accounts for the net liability arising from greenhouse gas emissions. This means that the allowances acquired for free are not accounted for and the provision is recognised only in the case and at the moment when actual greenhouse gas emissions exceed the emission allowances acquired for free (Slovenské Elektrárne, A.S., 2019, p.24).*

The allowances for greenhouse gas emissions (tonne of carbon dioxide equivalent) are reported in "net liability method" under which the Group recognizes a liability for carbon dioxide emissions when the emissions are emitted and are in excess of the distributed and additionally purchased allowances (Bulgarian Energy Holding, 2019, p.35).

higher, as majority maintained silence on both granted (81%) and purchased emission allowances (over 67%). Those that did disclose some information pertaining to granted allowances included Korean FRS (which is virtually similar to IFRS) and four out of fourteen companies in the US GAAP. Non-disclosures percentage was a little lower for purchased allowances, dropping to 67% for business-use allowances, however, trading allowances maintained the same non-disclosures level to that of the granted versions. Sample of Japan GAAP, once again revealed identical practices (as for nuclear fuel); all companies refrained from offering useful disclosures on this matter. Japan allows a variety of accounting frameworks that the companies can choose to prepare their annual accounts, and is similar in principle with the US GAAP. Japanese market's accounting practices, once again, pointed fingers towards mimetic pressures as entities might be impersonating the industry's practice for emission allowances. Currently, none of the major global accounting bodies have revealed an official standard on carbon emission allowances.

Many jurisdictions, such as the US GAAP follow rules-based approach, in contrast with IFRS which is principles-based. Considering the former method, non-disclosures in the absence of an official accounting standard is actually in compliance with the local regulations, as there wasn't any rule to follow. In contrast, expectations among the principles-based nations are generally more relaxed, however setting the bar higher for voluntary disclosures in similar instances. This factor was observed in Table 11 (p.153) that non-disclosures were higher among NON-IFRS (i.e. in the US and Japan GAAP as per Appendices) as compared with IFRS sample. Could it be the coercive and mimetic pressure that triggered a unanimous action among the participants in Japan for not disclosing information on emission allowances? Because a smaller percentage of US GAAP revealed their accounting practices, even though non-disclosures would be okay under a rule-based country, is decoupling the reason for that change (when a few entities pick and choose their accounting methods from current standards for wider acceptances)?

These results for accounting treatments were in contrast with some of the **prior studies**, i.e. Lovell, et al., (2010), Steenkamp, Rahman and Kashyap (2011) and Warwick and Ng (2012) where higher dependency for both granted and purchased emission allowances was found in 'intangible assets' as suggested by the withdrawn standard IFRIC-3, instead of 'inventory' based on the current results. Non-disclosures percentage remained substantial in all prior studies. As per Lovell, et al. (2010), 27% of the sample preferred silence on relevant disclosures, which rose to 61% as per Steenkamp, Rahman and Kashyap (2011). Over a third

of the sample didn't disclose emission allowances accounting treatments as found by Warwick and Ng (2012) and Mookdee (2013). Similarly, the empirical results of this study have exposed non-disclosures swinging between 33% and 59% among IFRS, increasing to 81% among NON-IFRS surveyed companies. This evidenced a dramatic shift in accounting treatment from intangible assets to inventory, whereas absence of relevant disclosures maintained its position for over a decade.

Consistency of accounting practices for carbon emission allowances was tested among IFRS sample for the year-end 2017, 18 and 19. Figure 18 below demonstrate a minor change in accounting policies over the span of three years. Almost steady preference in recognition methods were observed in all categories, including non-disclosures. However, a new category of 'receivable' emerged in 2018 from one company and continued since. Another individual addition was 'derivatives' as classified by an entity for purchased allowances for trading purposes.

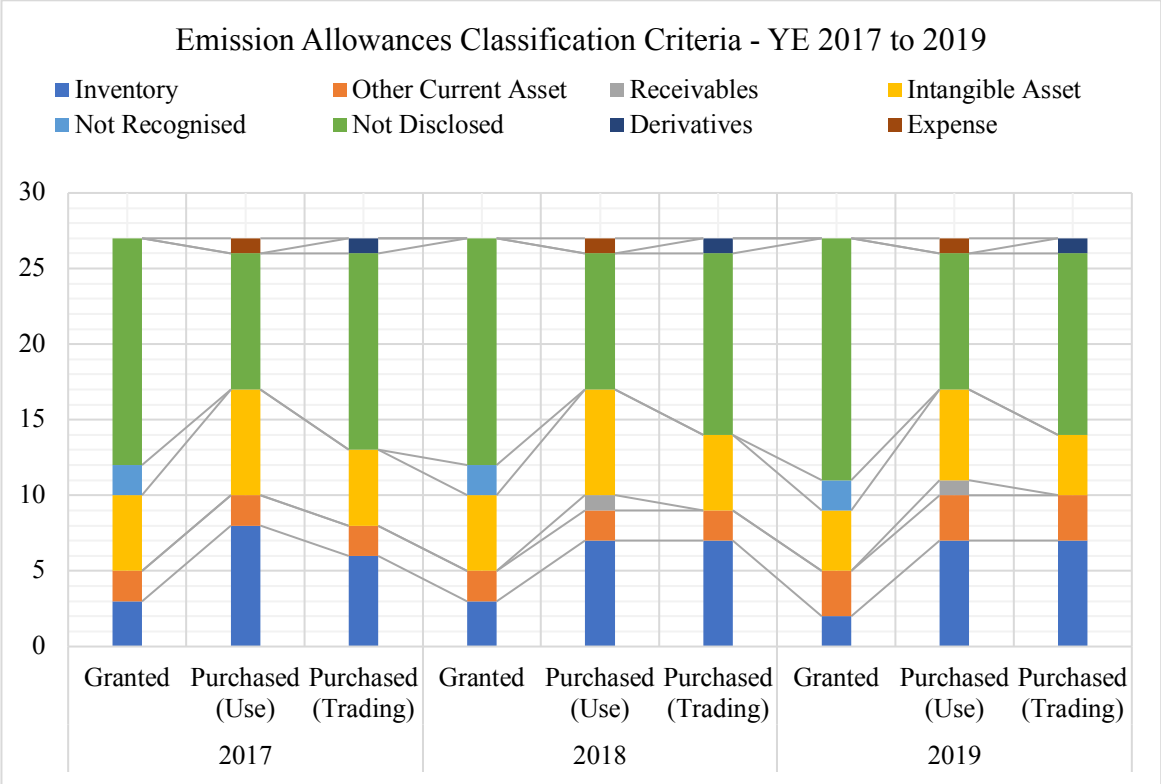


Figure 18: Classification of Carbon Emission Allowances in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

The two main recognition categories of 'inventory' and 'intangible asset' remained largely constant, except for the latter that has lost one company overall in 2019 (as the company switched from classification of allowances as intangible assets to other current assets in 2019).

For the most part, consistency wasn't the main issue, however multiplicities in accounting treatments continued to emerge with more additions in current asset methods (as observed in 2019, with one extra company recognising all types of allowances as other current asset, Figure 18 above). Does it mean the industry is very slowly moving towards current as opposed to non-current asset methods, opposing the withdrawn IFRIC-3 *Emission Rights* criteria*?*

Similar to the classification criteria, **recognition** methods for emission allowances largely remained consistent over the period of three-years. As identified in Figure 19 below, most categories maintained their positions apart from minor variations among a few items. Purchase allowances for business-use and trading purposes were treated differently; majority preferred 'Cost' for the former, but 'Fair-Value' for the latter. A parallel increase and decrease were observed between 'Cost' and 'Fair Value' respectively, with regards to purchased allowances for trading purposes. This specified that companies were gradually considering 'Cost' instead of 'Fair Value' as their recognition criteria each year. Several European entities have adopted 'net liability method' as reported in the prior studies (Fornaro, Winkelman and Goldstein, 2009; Romic, 2010, p.67), however only two companies have formally stated its preference towards such method in the disclosures. Cost for granted emission allowances is zero to the company, so recording it at 'Cost', would largely be at nil value, unless the company has paid minimal amount towards its acquisition or as part of the grant. In that respect, majority of the sample would not have shown any values for granted allowances if it's being recognised at nil value or cost. However, disclosures would be the most informative section in financial reporting. As identified in the literature, multiplicities in the classification and recognition criteria were creating verifiability and comparability issues in accounting. Conversely, majority opted for silence pertaining to the granted allowances, although some that did disclose their valuation methods, picked either 'Cost' or 'Nil Value'.

The results were fairly in consistency with Lovell, et. al., (2010) and Warwick and Ng (2012), where 'Nil Value' and 'Other' methods were leading for granted allowances, however only 23% lacked disclosures, which has now risen to 59% in this study. With regards to purchased allowances, 'Cost' remained the most favorable method (Lovell, et al.,

2010; Steenkamp, Rahman and Kashyap, 2011; Warwick and Ng, 2012) in the prior studies, so was in this research, however 'Fair Value' method topped the chart for allowances that were held for trading, gradually moving towards 'Cost' as observed in 2019. While the classification criteria seemed partially identical with prior studies, recognition methods reflected a completely different picture as stated earlier in this chapter.

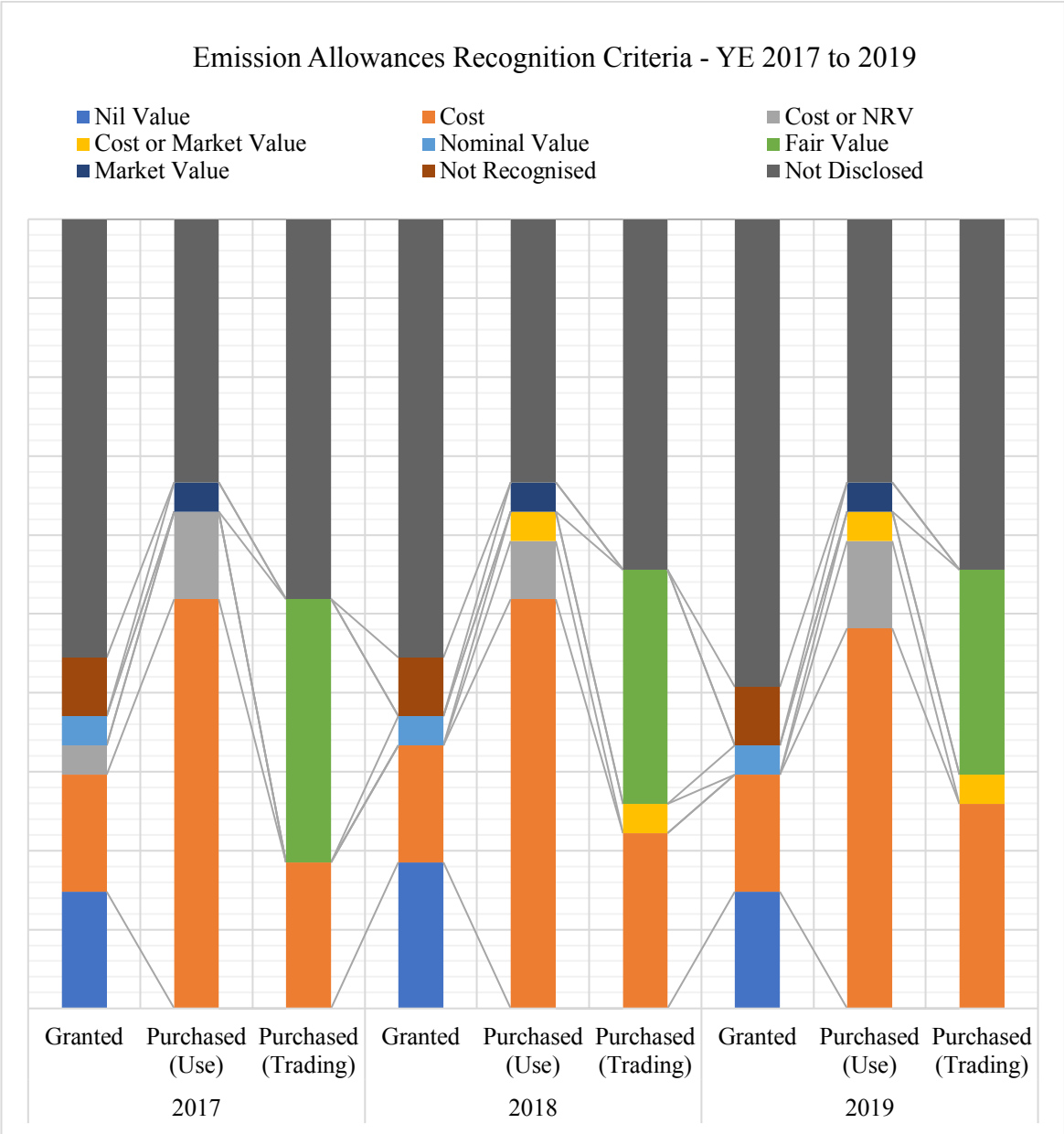
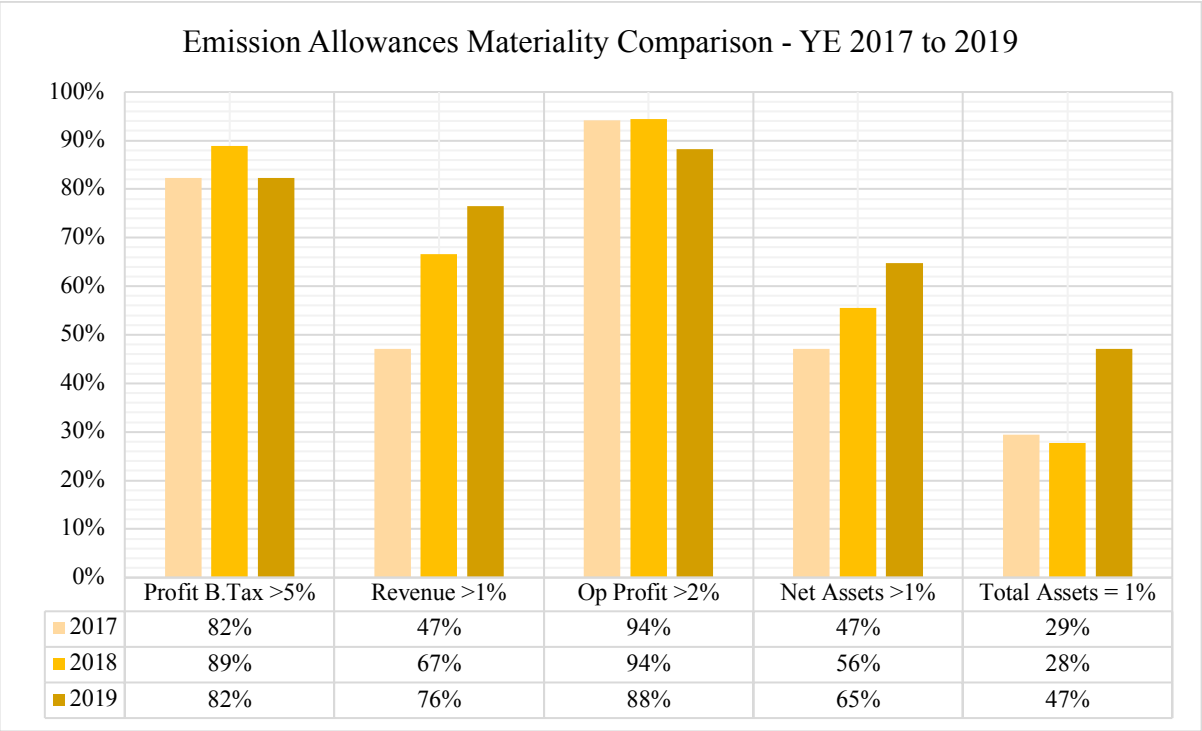


Figure 19: Recognition of Carbon Emission Allowances in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Carbon emission allowances were tested for **materiality** to verify whether non-disclosures

in this area were justified due to lower materiality levels. Figure 20 below illustrates mixed opinions, where profitability-based benchmarks maintained consistently higher materiality levels (always over 50% of the sample) as opposed to asset-based standards that were not as high in comparison. Having said that, Revenue >1% level is gradually towards an inclining trend, with an increase of 29% in the sample from 2017 to 2019. Similarly, Net Assets >1% and Total Assets =1% were also increasing, and has risen to 65% and 47% in 2019 respectively. Small decreases were observed in profitability benchmarks where 6% to 7% decline can be seen in 2019 after a steady period. Overall, it would be fair to say that emission allowances are material to the financial statements, for at least half of the sample, throughout the three-year examined period.

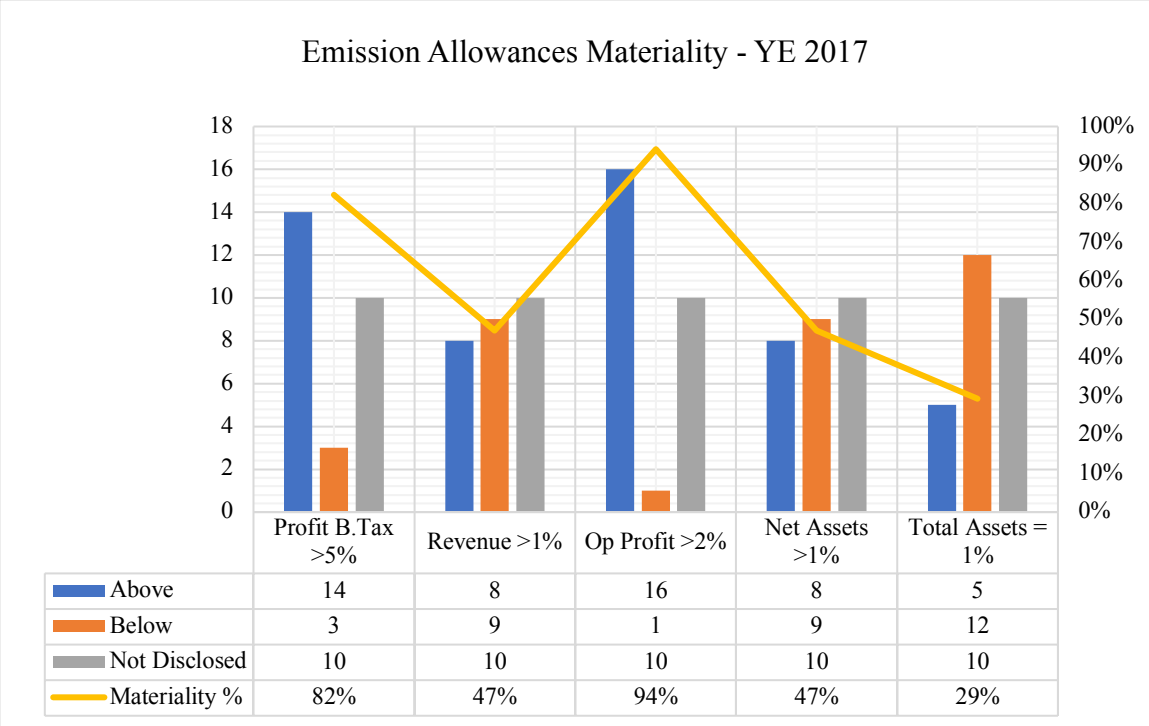


	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
2017	82%	47%	94%	47%	29%
2018	89%	67%	94%	56%	28%
2019	82%	76%	88%	65%	47%

Figure 20: Comparison of Emission Allowances Materiality Level for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Annual materiality levels are also presented separately in Figure 21, 22 and 23 for an in-depth analysis of yearly fluctuations. In 2017, Profit Before Tax >5% and Operating Profit >2% were highly material, as fourteen and sixteen out of twenty-seven companies' emission allowances value was higher than their profits (Figure 21). Revenue >1% and Net Assets >1% both stood at 47% of the sample being material to their financial statements. Whereas,

the lowest materiality was observed under Total Assets =1% scale, with only 29% crossing materiality benchmark.



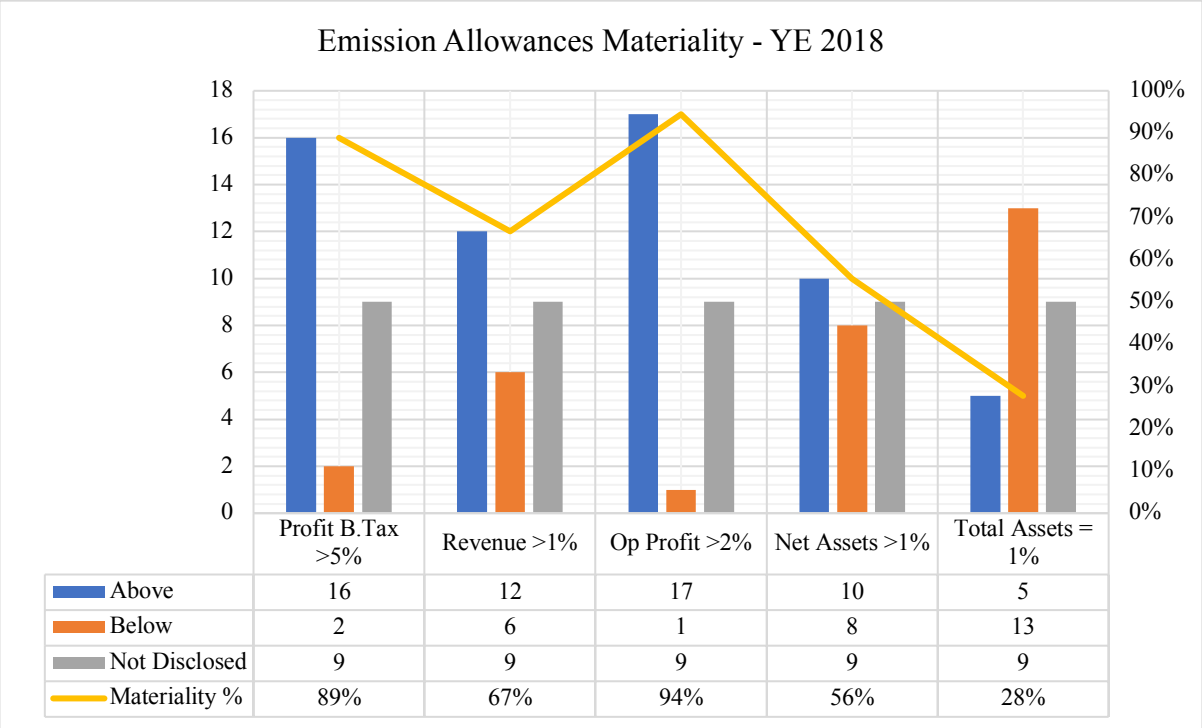
	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
Above	14	8	16	8	5
Below	3	9	1	9	12
Not Disclosed	10	10	10	10	10
Materiality %	82%	47%	94%	47%	29%

Figure 21: Emission Allowances Materiality Level for the Year-End 2017, IFRS Sample, Author, 2021

Usually assets for certain industries are higher in values, as in the case for utilities industry, power plants are worth in billions. Having a slightly lower assets-based materiality doesn't mean allowances are immaterial to the financial statements. In fact, auditors often set performance materiality levels at a lower percentage than the actual benchmark to identify material misstatements. Additionally, it is not only quantitative but also a qualitative assessment; materiality is a subjective phenomenon that requires judgement (FRC, 2017). Surely, the global concern of carbon footprints makes it a concern of global stakeholders that requires relevant disclosures in the financial statements.

Allowances' values became more material in 2018, when all benchmarks climbed up, except for a 1% slope in Total Assets =1% as in Figure 22. The upward trend indicated that more emission allowances were purchased in 2018 than 2017, making the values more material for accounting purposes. Surprisingly, one more company disclosed its accounting treatment in 2018, reducing the overall non-disclosures percentage by 4% from last year. Comparing

the increment in materiality levels with the minor reduction in non-disclosures shed light on the possible parallel connection, i.e. higher materiality levels played a role in improving transparency of accounts. Material misstatements in accounts also leads to a qualified audit opinion, reflecting on the connection between materiality, disclosures and the pressure from accounting bodies and the auditors for a higher disclosure level. Could the increment of 4% in disclosures, as in Figure 22 below, be related to the normative pressures from the professional accounting bodies (that compelled the entity to disclose their accounting practice pertaining to the increase in their materiality level, as stressed upon by the institutional accounting bodies)?

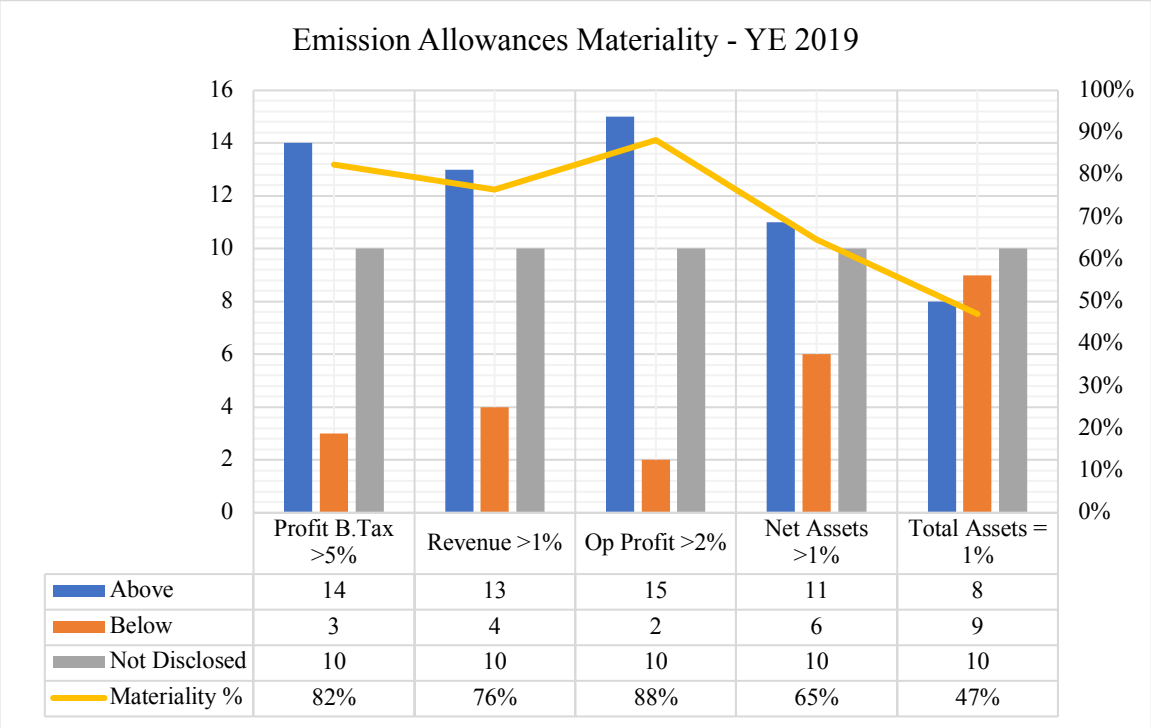


	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
Above	16	12	17	10	5
Below	2	6	1	8	13
Not Disclosed	9	9	9	9	9
Materiality %	89%	67%	94%	56%	28%

Figure 22: Emission Allowances Materiality Level for the Year-End 2018, IFRS Sample, Author, 2021

The slight downfall in Total Assets =1% as observed in 2018 quickly recovered in 2019 as in Figure 23 below, and rose to 47%. The inclining trend in other benchmarks continued, except for a slight dip in profitability-based materiality benchmarks. With the increase in asset and revenue-based materiality scales, relevant disclosures percentage should have increased from 2018, however that didn't happen. Instead, non-disclosures have increased from 2018 levels and maintained 2017 position in 2019.

Based on the prior argument about materiality and disclosures connection (that higher materiality possibly forces the entity to reveal appropriate accounting disclosure), non-disclosures may have risen due to the dip in profitability measures, i.e. lower materiality equals to less relevant disclosures. However, with the hefty increase in other measures (asset and revenue materiality), non-disclosures should have actually declined. The results from 2019 created a conflicting situation, in comparison with prior years.



	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
Above	14	13	15	11	8
Below	3	4	2	6	9
Not Disclosed	10	10	10	10	10
Materiality %	82%	76%	88%	65%	47%

Figure 23: Emission Allowances Materiality Level for the Year-End 2019, IFRS Sample, Author, 2021

In the absence of a suitable accounting standard, uniformity in accounting treatments would be hard to achieve, as seen in the case of carbon emission allowances. Although chosen accounting methods by the surveyed companies were somewhat consistent on an annual basis; several qualitative characteristics of useful financial information failed to exist. Exceptionally higher materiality levels didn't always compel the entities to provide more relevant accounting disclosures. This simply points the finger towards other aspects that may have improved transparency, comparability, relevancy and faithful representation of the accounting information; could that be the institutional pressure (i.e. by accounting bodies)?

5.2.2 Emission Allowances Obligations

Members of the cap-and-trade scheme, such as the EU ETS, must surrender one carbon allowance per tonne of emission production over the period, back to their administrators. As per IAS 37 *Provisions, Contingent Liabilities and Contingent Assets*, operators must record a provision in their financial statements for their obligation to give up allowances equivalent to their original emissions to fulfil the requirements of the scheme (Ayaz, 2017; Lovell, et al., 2010; Warwick and Ng, 2012).

As per Figure 24 below, more than half of the IFRS examined companies (56%) recorded their **obligation** towards the cap-and-trade schemes by recognising 'provision' in their financial statements. Whereas, a 44% (twelve out of twenty-seven companies) sample chose not to disclose their accounting criteria at all. Non-disclosures landed in the range of granted (59%) and purchased emission allowances (33% to 44%), as displayed in Table 11, p.153.

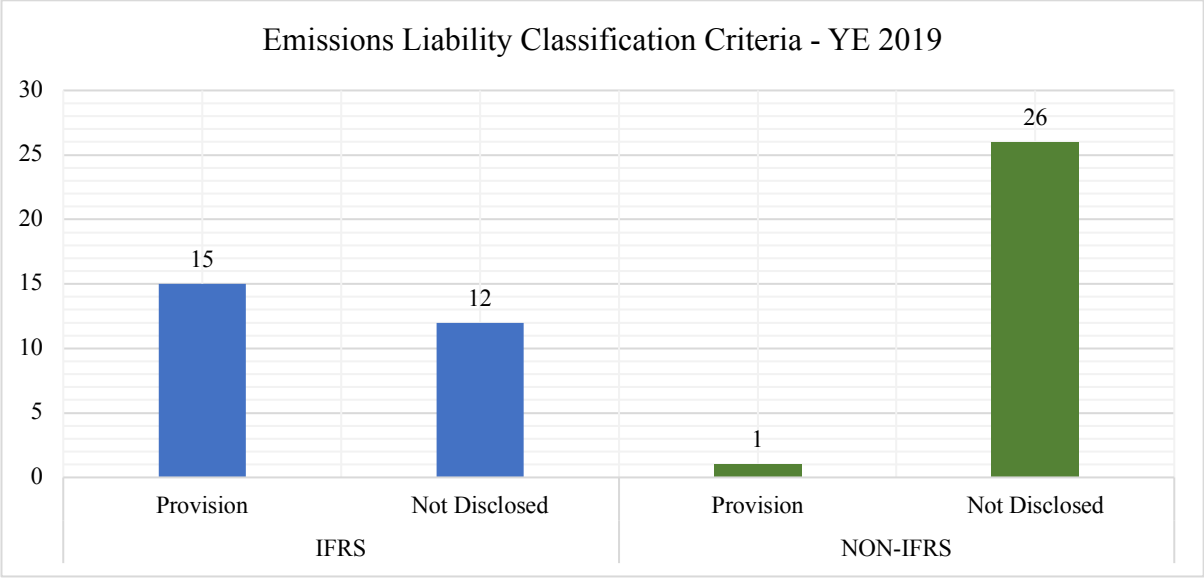


Figure 24: Comparison of IFRS vs NON-IFRS Classification of Emissions Liability in the Financial Statements for the Year-End 2019, Author, 2021

As per the net-liability method, entities only reveal their provisional liabilities if the original emissions level exceeded the granted or purchased allowances. As the non-disclosure percentage for granted allowances (59%) was equivalent to the stated provisional liabilities (56% or fifteen out of twenty-seven IFRS companies) as per Figure 24 above, it possibly

meant that more companies may have adopted 'net-liability method'. However, only two out of twenty-seven companies actually mentioned about its use in their notes to the financial statements[3]. Net-liability method was also the favorite choice among participants as identified by Romic (2010). Conversely, the results revealed a higher percentage of non-disclosures in this study, which stood at 41% as compared with 23% identified by Lovell, at al., (2010).

Comparison of IFRS with the NON-IFRS sample exposed an exceptionally higher non-disclosure level of 96% as per Figure 24 above. Only one out of twenty-seven companies stated its obligation to their respective cap-and-trade scheme by recognising provision at 'Carrying Value' in the financial statement under the NON-IFRS sample (Appendices). In contrast, between 19% to 33% did disclose their accounting practices for granted and purchased emission allowances as shown in Table 11 (p.153). It could mean that those companies stayed within their allowance's quota, thereby, also adopting 'net-liability method' similar to some of the IFRS companies. Alternatively, majority of the NON-IFRS sample simply didn't report their provisional liabilities due to the lack of an accounting standard. Bearing in mind that most of the NON-IFRS jurisdictions adopts a rule-based approach to financial accounting, lack of disclosures in the absence of an accounting standard, is actually in compliance with the local law. Once again, the results reflected on the institutional pressure that could direct the entities one way or the other. Had there been an accounting guidance on carbon-emission allowances, higher level of uniformity and transparency would have resulted in practice.

Within the IFRS sample, **consistency** of accounting applications was tested in Figure 25 below. It was found that financial statements were largely consistent on an annual basis, based on the number of entities that did and did not disclose their accounting treatments. A parallel increment and decrement were observed between the classification of provisional liabilities versus non-disclosures in the financial statements. Provisions are declining by an

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[3] *The Group accounts for the net liability arising from greenhouse gas emissions. This means that the allowances acquired for free are not accounted for and the provision is recognised only in the case and at the moment when actual greenhouse gas emissions exceed the emission allowances acquired for free (Slovenské Elektrárne, A.S., 2019, p.24).*

The allowances for greenhouse gas emissions (tonne of carbon dioxide equivalent) are reported in "net liability method" under which the Group recognizes a liability for carbon dioxide emissions when the emissions are emitted and are in excess of the distributed and additionally purchased allowances (Bulgarian Energy Holding, 2019, p.35).

accumulator of one each year, creating a causational increase in the statistics of non-disclosures by the same value. If the trend followed, within the next few years, provisional liabilities would cease to exist pertaining to the emission allowances in the annual reports, unless the circumstances will change, i.e. professional or regulatory pressures. These results could also mean that more companies are staying within their granted emission allowances quota, and applying net-liability method (where provisions are only stated upon exceeding the granted and purchased allowances). However, lack of disclosures remained the grey-area regardless of any possibilities. The results once again pointed towards 'net-liability method' based on the consistency of accounting applications between 2017 and 2019. Those entities that have not exceeded their actual emission levels probably retained disclosures on that basis.

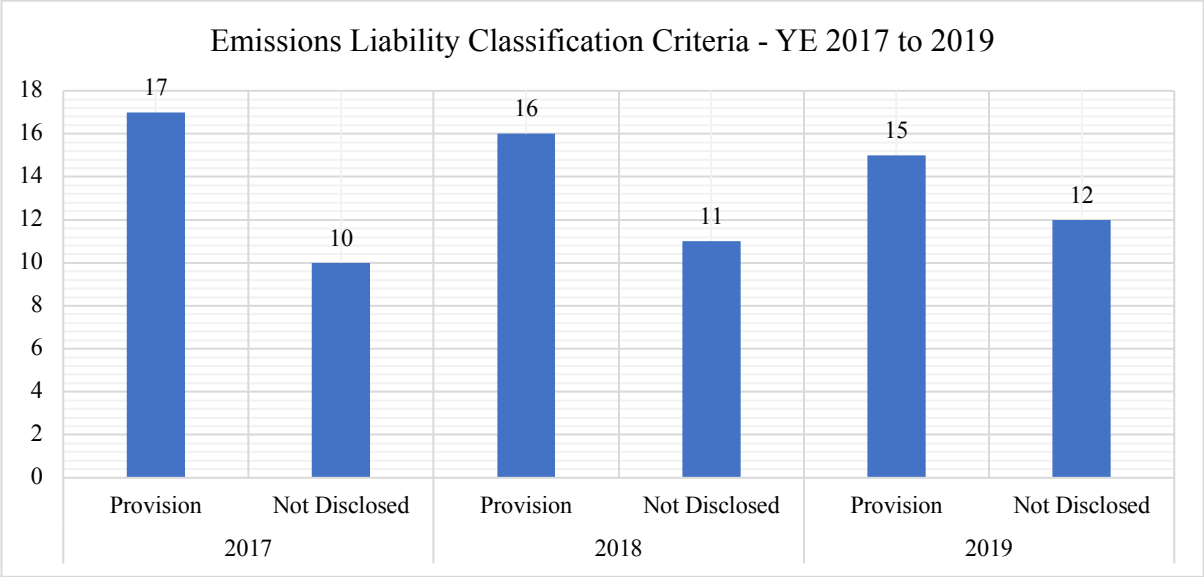


Figure 25: Classification of Emissions Liability in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

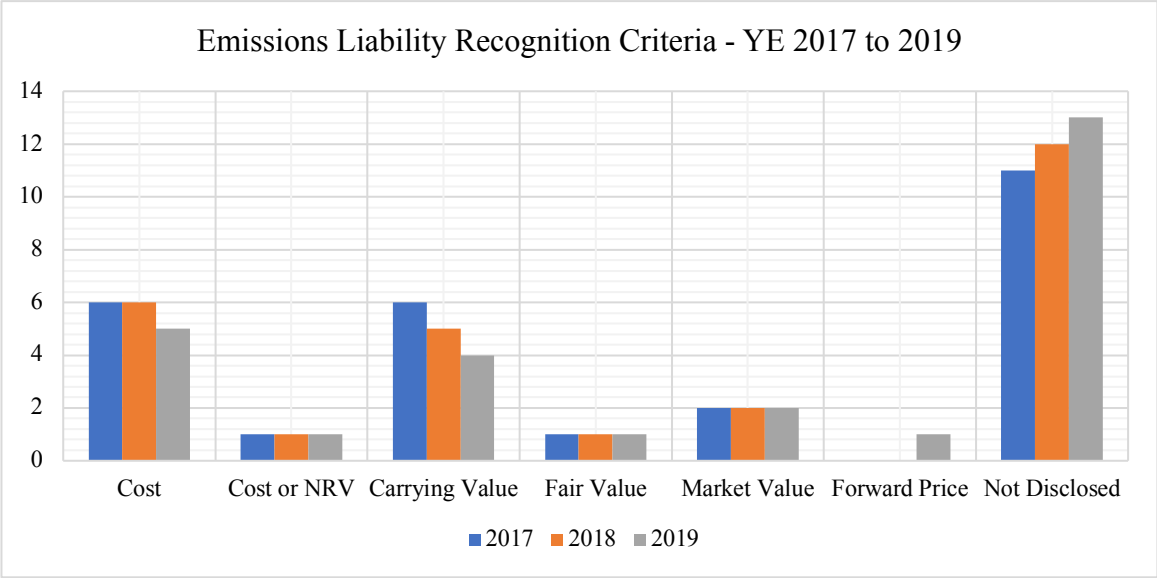


Figure 26: Recognition of Emissions Liability in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Recognition of emissions liability also exercised consistency over the span of three-years as per Figure 26 above. Results reflected a change from one company that has not disclosed its provisional liability from 2018 onwards, leading to a steady decline in 'Carrying Value' and a consequential incline in 'Not Disclosed' category. Another company recognised the obligation at the 'Forward Price' of the allowances that has previously been recording it at carrying value. Unlike the recommendations of the removed IFRIC-3 *Emission Rights* interpretation that supported the use of 'Fair Value', majority preferred 'Cost' and 'Carrying Value', somewhat similar to the results discovered by Lovell, at al., (2010) that has found a heavy reliance on carrying values but not the cost. It is astonishing to notice that non-disclosures for classification and recognition criteria are not the same. An extra company has acknowledged provision for emission allowances on an annual basis as per Figure 25 earlier (in 2019, total non-disclosures stood at 12 for provisions, however 13 for recognition criteria), however, failed to disclose their recognition criteria (Figure 26); once again pointing towards poor quality of financial disclosures.

While the consistency was proved, **materiality** levels were tested to identify whether the provisional liabilities were significant to the financial statements of the IFRS surveyed companies. Based on the entities that revealed their provisional liabilities, all key materiality benchmarks displayed significantly higher materiality levels with an annual inclining trend.

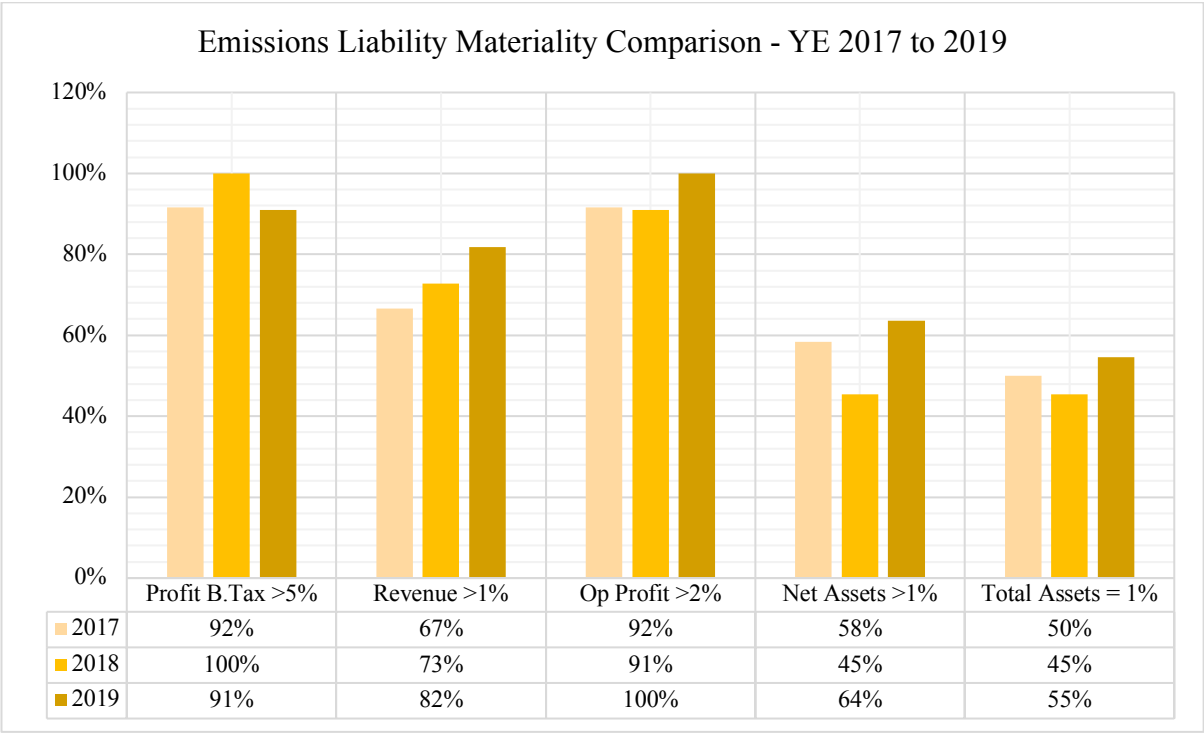
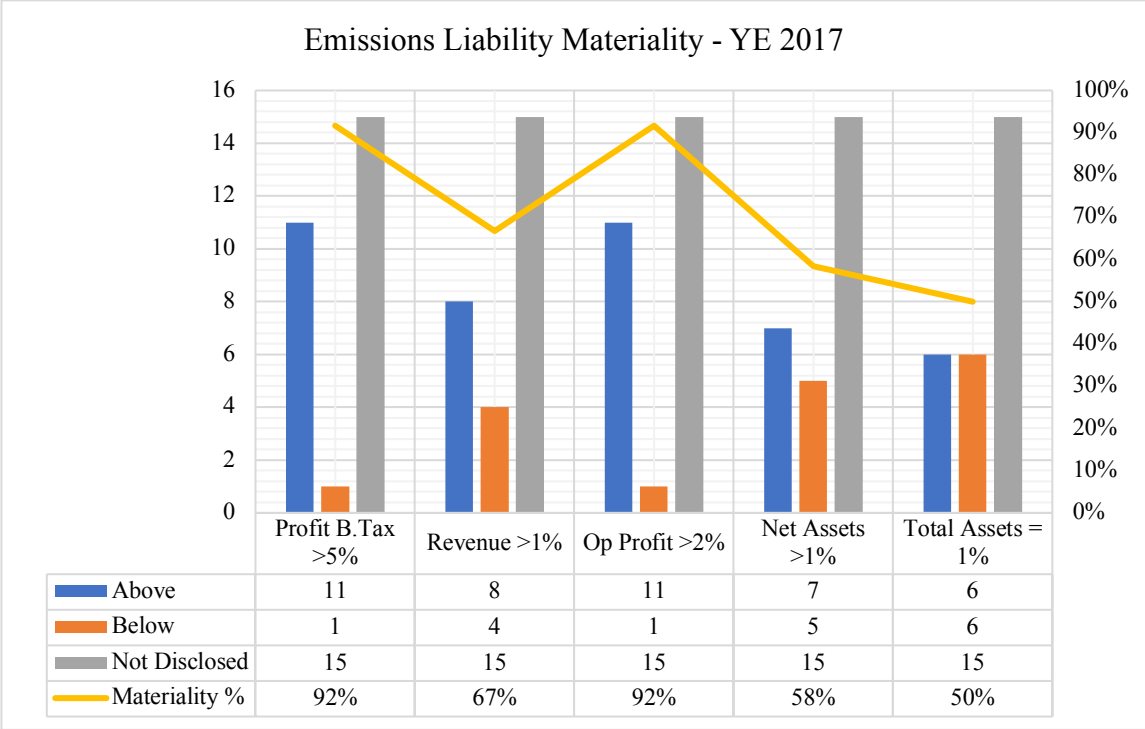


Figure 27: Comparison of Emissions Liability's Materiality Level for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Similar to the case of emission allowances, profit-based materiality scales touched the peak with Profit Before Tax >5% and Operating Profit >2% swinging between 91% to 100% during the year 2017 to 2019 (Figure 27). While the asset-based benchmarks were not so significant comparatively, at least half of the sample's provisional liabilities were material to their financial statements. Revenue >1% continued its climb from 67% in 2017 to 82% in 2019. Regardless of the type of materiality scale, provisions for emission allowances were indeed significant to the financial statements of the sampled entities.

Annual fluctuations in materiality levels were also observed and shown in Figure 28, 29 and 30 below. Surprisingly, while seventeen out of twenty-seven companies revealed their liability recognition criteria in 2017, five did not disclose the respective values in the financial statements. This shed light on zero value provisional liabilities, but even that was the case, disclosures didn't cover that aspect. This illustrated the need for relevant and complete disclosures, especially for material values (whether financially or by nature) for better transparency, verifiability and comparability of financial statements.



	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
Above	11	8	11	7	6
Below	1	4	1	5	6
Not Disclosed	15	15	15	15	15
Materiality %	92%	67%	92%	58%	50%

Figure 28: Emissions Liability's Materiality Level for the Year-End 2017, IFRS Sample, Author, 2021

At least half of the sample's provisions were material to their financial statements based on the abovementioned materiality benchmarks in 2017.

Similar to the situation in 2017, at least six companies refrained from disclosing their provisional liabilities for emission allowances in 2018, even though the recognition criteria were stated in their financial statements (Non-disclosures for 2018 increased to 16 in Figure 29 below, as compared with 15 in Figure 28). Profit Before Tax >5%, Operating Profit >2% and Revenue >1% exposed the dangers of material misstatements in financial reporting based on the exorbitant materiality levels.

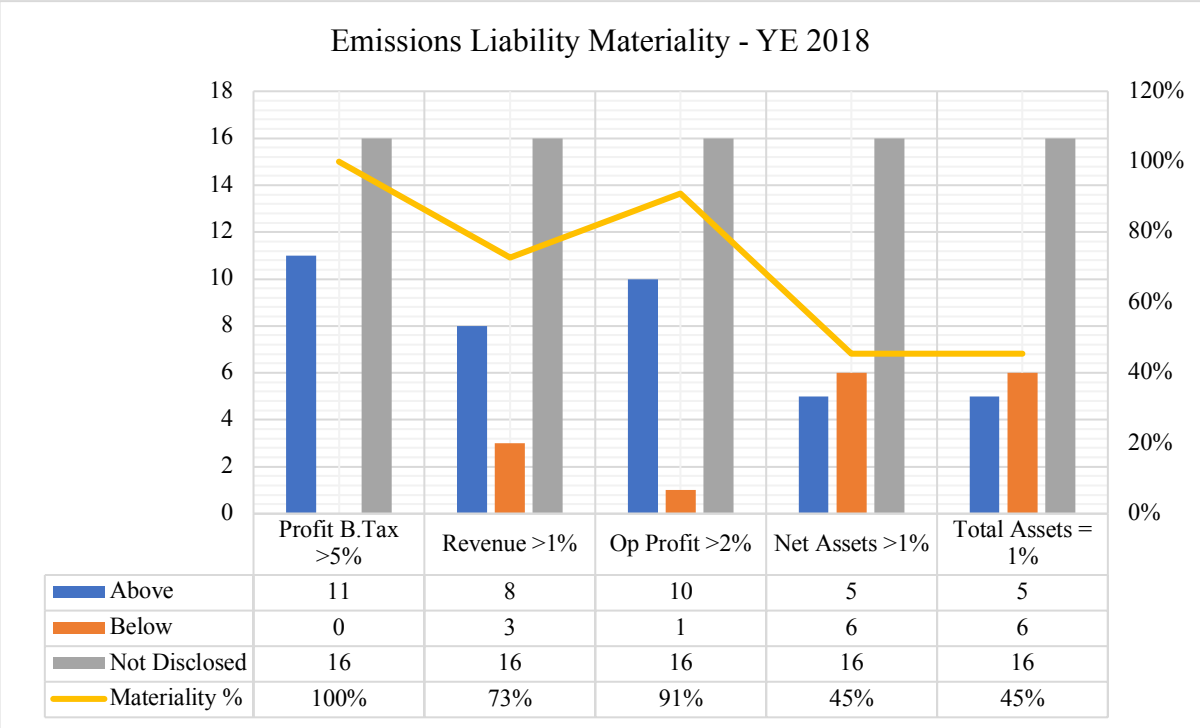


Figure 29: Emissions Liability's Materiality Level for the Year-End 2018, IFRS Sample, Author, 2021

Situation of non-disclosing provisional liabilities didn't change in 2019 either, with the same level of companies not disclosing values for verifiability purposes. On the other hand, except for a small deterioration in Profit Before Tax >5% in 2019, all other benchmarks rose to new high levels, touching 100% considering Operating Profit >2% for example (Figure 30 below). Based on the trends over the span of three-years, the importance of revealing complete disclosures couldn't be stressed enough. While some companies decided to reveal recognition criteria, values were missing. If the adopted accounting treatments were similar to 'net-liability method', narratives didn't go far enough to capture that. In comparison with the higher materiality levels for nuclear fuel, provisional liabilities for emission allowances failed to support the narrative that significant values are always disclosed in the financial statements. Perhaps this argument might be valid if there was an accounting standard for emission allowances, in which case, it would be the institutional pressure to follow the professional standard instead, behind the improved transparency in financial reporting, and not material figures on their own.

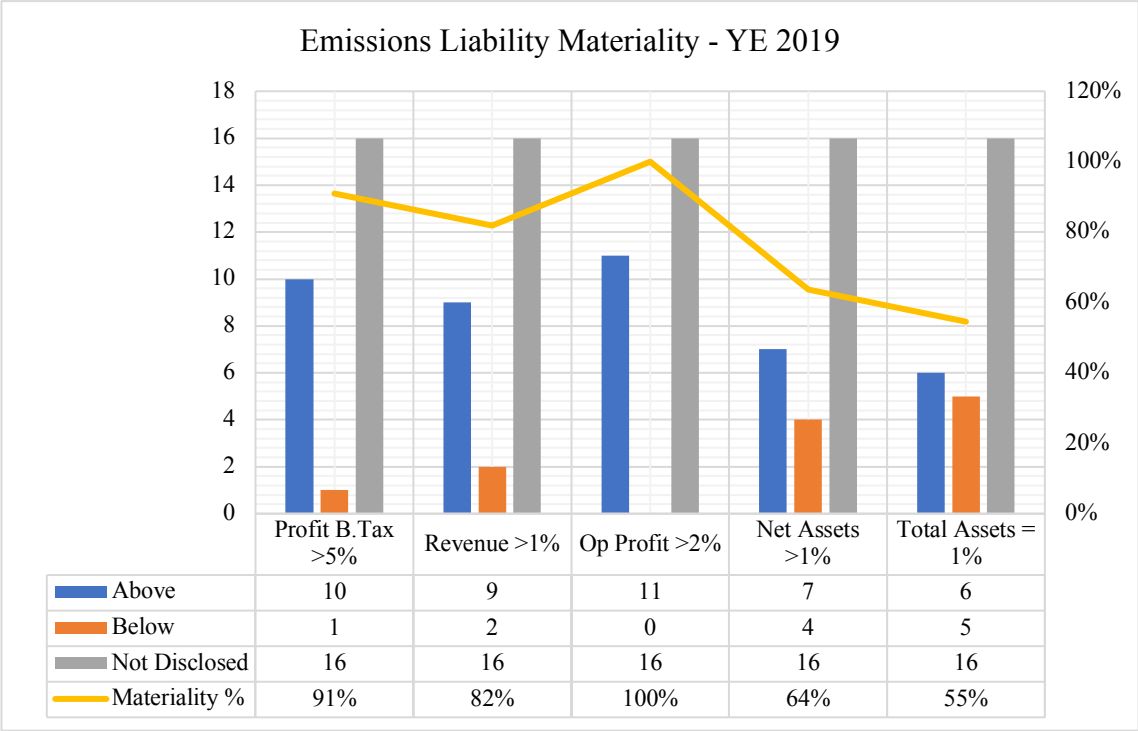


Figure 30: Emissions Liability's Materiality Level for the Year-End 2019, IFRS Sample, Author, 2021

5.2.3. Summary

Based on the results for carbon emission allowances, and its related obligations, derived from the financial statements of the examined companies, the following arguments can easily be drawn: -

- **Lack of relevant disclosures** regarding the recognition criteria for highly material values. Both granted and purchased carbon emission allowances have shown between 33% to 59% non-disclosure by IFRS and 67% to 81% for NON-IFRS surveyed companies in 2019. Considering emission liabilities, at least 44% of IFRS sample withheld disclosure for recognition criteria, whereas the percentage for NON-IFRS stood extraordinarily at 96%. In many cases for emission liabilities, some entities that did disclose their recognition criteria, refrained from disclosing financial values, if zero valued, disclosures didn't clarify such situations.

- Carbon emission allowances were mainly recognised as various types of 'current-assets' by both IFRS and NON-IFRS sample. Where the former largely preferred **inventory** treatment, followed by other-current asset and receivables, whereas the latter only opted for inventory in current assets. The second popular choice after inventory, among both IFRS and NON-IFRS, was **intangible assets** as suggested by the former IFRIC-3 *Emission Rights* interpretation. Results were quite different from prior studies that have shown higher preference towards intangible assets instead of inventory method.

- Purchased allowances for business-use were mainly valued at **cost**, whereas **fair value** was the top preference for trading allowances. Granted allowances on the other hand faced equal preference towards **cost** and **nil value** among both IFRS and NON-IFRS sample. A steady shift towards 'Cost or NRV' from only 'Cost' was also observed for purchased allowances (business-use) in 2019 in the IFRS sample. Overall, 'Cost' option stood out from the crowd, once again, different from the IFRIC-3 *Emission Rights* suggestion to use 'Fair Value' (which was the top preference only for trading allowances in this research).

- Carbon emission obligations were recognised as **provisions** by 56% of IFRS as compared with only 4% of NON-IFRS surveyed companies in 2019 **Carrying Value** was the preferred valuation choice by both samples, similar to the results by Lovell, at al., (2010).

- Both emission allowances and liabilities figures were **significantly material** to the financial statements of the IFRS sample, especially considering profit and revenue-based materiality benchmarks.

- **Consistency** in accounting treatments were mostly maintained by the IFRS entities. However, a minor shift towards new categories, such as 'receivable' was discovered in 2018, which followed on to 2019. Recognition methods were also consistently applied on the most part for both allowances and related liabilities.

- Apart from consistency in accounting practices on an annual basis, several qualitative characteristics of useful financial information failed to exist. For example, **faithful representation**, especially when relevant disclosures and material information were continuously absent from the notes to the financial statements. Information was not complete when provisions were stated, but the recognition criteria was not given, for example; failing the characteristic of **completeness. Relevancy** was compromised when disclosures did not accommodate detailed and relevant information about the company's accounting practices.

5.3 Asset Retirement Obligations

5.3.1 Decommissioning Liabilities

Decommissioning of nuclear power plants involves several stages, that usually includes the demolition of the facility, remediation of the polluted land, and the restoration of the site for its normal use (Lordan-Perret, Sloan and Rosner, 2021). The disposal of radioactive material, except for the spent fuel that is accounted for separately (in normal cases), makes up the notable size of the entire decommissioning cost. This process covers an extensive timeframe, usually between forty to eighty years, after the cessation of a nuclear power plant. Whether practically or economically, speeding up the decommissioning procedure isn't a wise decision (KPMG, 2015). With the assumption of a power plants' operational life of about five to six decades, adding the period after its closure; it would take over a hundred years to safely shut down a nuclear power plant (Thomas, 2014).

As the decommissioning responsibility arises from the establishment of a power plant, asset's retirement obligation starts from the day one of its operations. Figure 31 below illustrates a vast majority of the population, among both IFRS (81%) and NON-IFRS (93%) sample, recorded provisions for their decommissioning obligations.

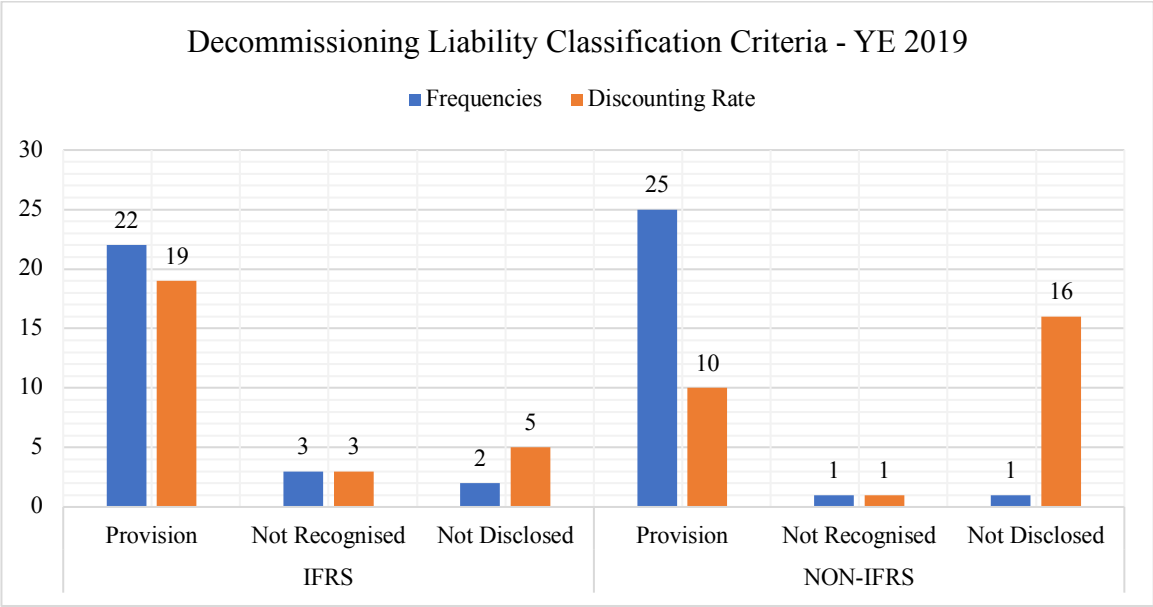


Figure 31: Comparison of IFRS vs NON-IFRS Classification of Decommissioning Liability in the Financial Statements for the Year-End 2019, Author, 2021

Only two out of twenty-seven IFRS entities (7%) chose not to disclose their liabilities in the financial statements. Equally, a smaller sample of 11% stated that the responsibility for decommissioning lied with other institutions (such as the government or specific entities) instead, which is why, they chose not to recognise provisions in their financial statements[4] (Figure 31 above). Similarly, within the NON-IFRS sample, Indian GAAP entity stated that local government held the duty for decommissioning, therefore, no provisions were recorded[5]. Only one entity following Hong-Kong FRS refrained from disclosing their decommissioning liabilities due to unclear reasons. That meant almost everyone disclosed their future obligations towards the deconstruction of nuclear power plants and the site rehabilitation costs, and accounted for it using their nationally approved financial accounting standards.

Because decommissioning procedure involves several decades, discounting of provisional liabilities is required for accounting purposes, i.e. to calculate its present value by considering the time value of money. Figure 31 above also revealed whether the surveyed companies stated the discounting rates in their financial statements or not. Based on the IFRS sample, it can be seen that three out of twenty-two companies that did reveal the respective provisions, ignored the discounting rates in their narratives; questioning the completeness of related disclosures. Having said that, at least 70% companies provided ample information regarding provisions, including the appropriate discounting rates and their types (including risk-free, pre-tax, long-term real rate, etc.). On the other hand, more than half of those that

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[4] *As there is no clear national strategy for the decommissioning of nuclear facilities at the date of approval of the consolidated financial statements and no estimate of the projected cost of the project by the IFRS Fund has been made, the Group cannot reliably estimate the obligation and has not recognized provision for the decommissioning of nuclear installations on 31 December 2019 and 31 December 2018 (Bulgarian Energy Holding, 2019, p.35).*

In accordance with Government Decision no. 1080/2007, and Radioactive Waste Nuclear Agency ("ANDR") is responsible for collecting and managing the contributions made by the SNN for the dismantling of the two units and for disposal of radioactive waste generated in the operation and decommissioning of units (Societatea Nationala Nuclearelectrica S.A., 2019, p.50).

Due to unchanged production capacities of NEK, provisions were not drawn in the period under review…. The company GEN will continue to follow the strategy of making and adjusting provisions in accordance with NEK Economic Plans (Gen Energija D.O.O, 2019, p.79).

[5] *Property, plant and equipment are stated at cost less accumulated depreciation…. The cost does not include site restoration cost or decommissioning liability as decommissioning of nuclear power plant/ facility is the responsibility of DAE, GOI. (NPCIL, 2019, p.21)*

did disclose provisions among the NON-IFRS sample, withheld information related to the discounting rates. Once again, Japan GAAP sample exhibited unanimous practices, i.e. all of the nine entities revealed their respective discounting rates (Appendices). Equally, all US GAAP companies didn't disclose such rates in their financial statements. Were these cases referring to the mimetic pressures of isomorphism by imitating the industry leaders and competitors to follow their accounting practices for the disclosures of discounting rates?

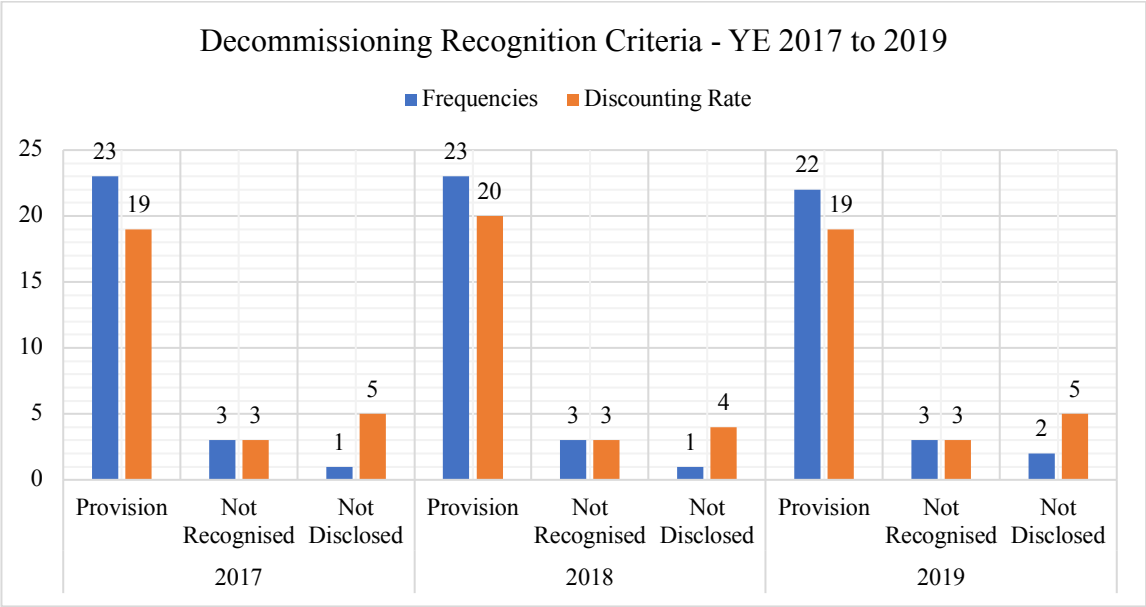


Figure 32: Recognition of Decommissioning Liability in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Consistency of the recognition criteria for asset retirement obligations were scrutinised and presented in Figure 32 above. As explained before, a few companies that did reveal provisions for decommissioning liabilities refrained from quoting the discounting rates in the disclosures. This practice can be seen on a yearly basis starting with 2017, the percentage stood at 17%, later declined to 13% in 2018, moving back to its original position in 2019. Three companies that didn't record provisions remained the same throughout the sample period. However, non-disclosures percentage rose by an extra company in 2019 to 7% from the prior 4%. Besides that, a majority of over 80% between 2017 and 2019 consistently disclosed relevant provisions. By including the figures of those that doesn't have decommissioning duties (i.e. it belongs to the government), the percentage of entities illuminating relevant disclosures would go above 92% for all years. This shed light on the

fact that official accounting guidelines improves transparency and comparability of financial reporting worldwide. Institutional pressures from the authoritative organisations ensures uniformity in practice by the concerned population.

Another important aspect pertaining to decommissioning liabilities are the discounting rates. Figure 33 below revealed the common rates used by both IFRS and NON-IFRS sample to discount their corresponding liabilities for the Year-End 2019. A wide range of discounting rates were used by the IFRS sample, ranging from -1.50% to 6.78%. The general rates stood between 2% to 2.5% among both samples, with 2.3% being the most common among NON-IFRS entities, adopted by all companies in Japan GAAP (Table 12 below).

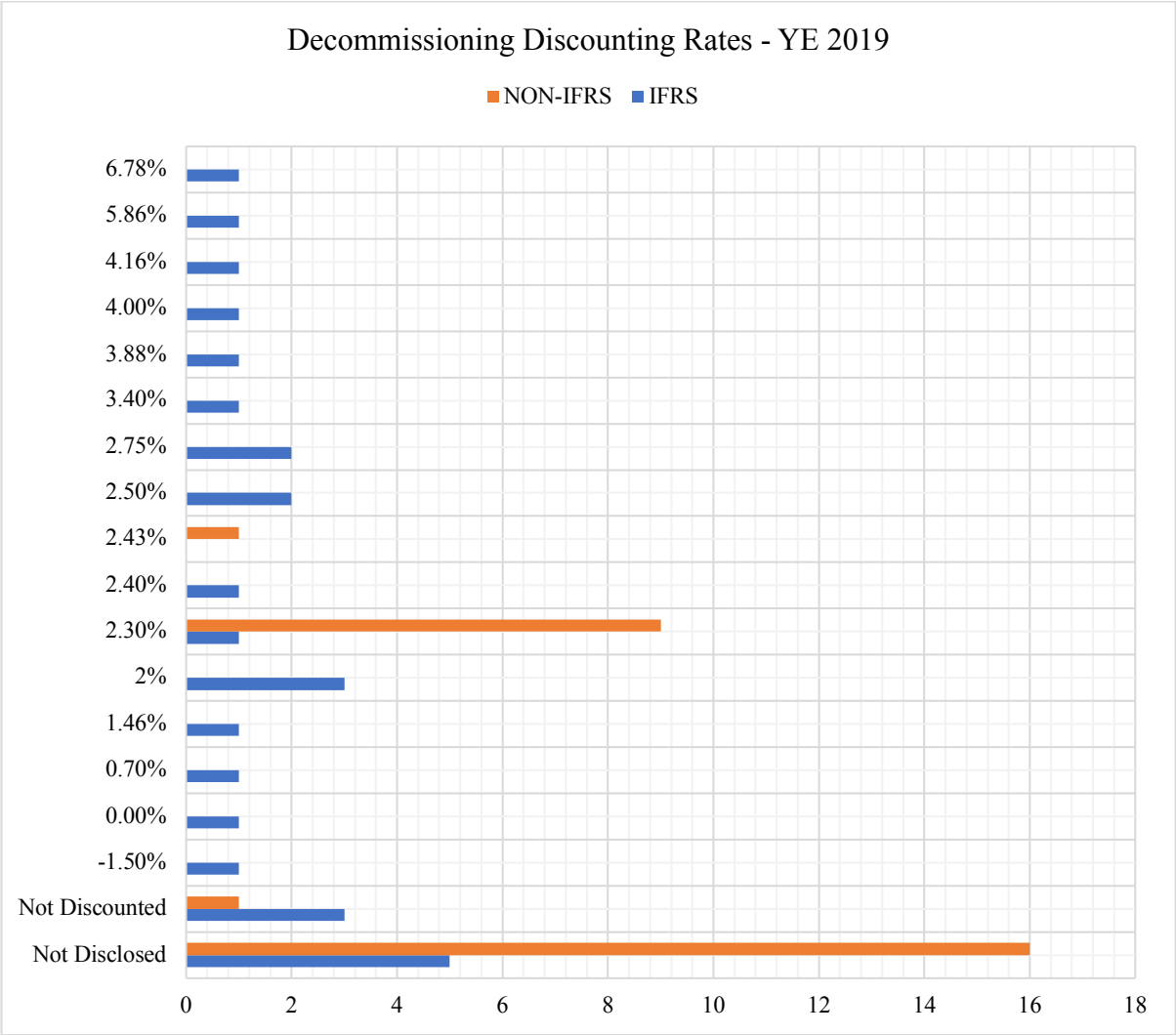


Figure 33: Comparison of IFRS vs NON-IFRS Decommissioning Discount Rates in the Financial Statements for the Year-End 2019, Author, 2021

IFRS					NON-IFRS			
Owner	Country	NPP Count	**Disc. Rate**		Owner	Country	NPP Count	**Disc. Rate**
ANPPC	ARMENIA	1	ND		OPG	CANADA	18	ND
EBL	BELGIUM	7	2.50%		YJNPC	CHINA	24	ND
ELETRON	BRAZIL	2	5.86%		CNNO	CHINA	21	ND
KOZNPP	BULGARIA	2	NDT		NPCIL	INDIA	22	ND
NBEPC	CANADA	1	4.16%		TEPCO	JAPAN	7	2.30%
CEZ	CZECHIA	6	0.70%		KYUSHU	JAPAN	4	2.30%
FORTUM	FINLAND	2	ND		CHUBU	JAPAN	3	2.30%
TVO	FINLAND	2	4%		TOHOKU	JAPAN	3	2.30%
EDF	FRANCE	58	2.30%		SHIKOKU	JAPAN	1	2.30%
EON	GERMANY	3	2.00%		KEPCO	JAPAN	7	2.30%
ENKK	GERMANY	1	2.40%		HOKURIKU	JAPAN	2	2.30%
RWE	GERMANY	2	-1.50%		CHUGOKU	JAPAN	1	2.30%
CFE	MEXICO	2	ND		HEPCO	JAPAN	3	2.30%
EPZ	NETHERL	1	2.50%		KHNP	S KOREA	24	2.43%
SNN	ROMANIA	2	NDT		EXELON	USA	21	ND
REA	RUSSIA	38	6.78%		ENTERGY	USA	9	ND
SE	SLOVAKIA	4	3.88%		TVA	USA	7	ND
KRSKO	SLOVENIA	1	NDT		DUKEENER	USA	9	ND
ESKOM	S AFRICA	2	3.40%		DOMINION	USA	7	ND
ID	SPAIN	4	1.46%		SOUTHERN	USA	6	ND
ANAV	SPAIN	3	0.00%		NEXTERA	USA	8	ND
FKA	SWEDEN	6	2.75%		FENOC	USA	4	ND
OKG	SWEDEN	1	2.00%		NSP	USA	3	ND
AXPO	SWISS	3	2.75%		PSEG	USA	3	ND
KKG	SWISS	1	ND		APS	USA	3	ND
TPC	TAIWAN	4	ND		PG&E	USA	2	ND
EDF UK	UK	15	2.00%		LUMINANT	USA	2	ND

ND = Not Disclosed NDT = Not Discounted

Table 12: Comparison of IFRS vs NON-IFRS Decommissioning Discount Rates in the Financial Statements for the Year-End 2019, Author, 2021

All companies in the US GAAP, highlighted in blue colour (including the one in Canada that also follows US GAAP) remained silent on the discounting rates. Although the time value

of money is dependent upon the lifetime of individual nuclear power plants, plus some local economic aspects to consider, Table-12 revealed companies within the same country chose different discounting rates in 2019, i.e. Finland, Germany, Spain and Switzerland. Why there were such differences among the IFRS entities, but not in the NON-IFRS? Could it be the reason that rules-based jurisdictions (such as US GAAP) didn't have stringent rules on the disclosures of particular discounting rates, lead the sample to hide their rates entirely? In case of Japan GAAP (also seen in the results for nuclear fuel), could it be the mimetic pressure forcing the entities to adopt similar discounting rates as that of their competitors? All of the abovementioned examples refer to the institutional pressures that derived identical results in the NON-IFRS sample. As the companies are free to adopt the discounting rates based on their own independent expert judgement, IFRS has offered a relaxed approach towards the discounting criteria. In normal circumstances for a lifespan of up to 10 years or so (for example) would not create large anomalies, however decommissioning procedure would last for several decades. Should the same principle be acceptable for nuclear power plants as well? In case of the IFRS (principles-based framework) sample, could the lack of authoritative guidelines (i.e. institutional pressure from accounting bodies via standardised regulations) be the reason for multiplicities in discounting rates?

A graphical representation of discounting rates adopted by the IFRS sample for the Year-End 2017, 18 and 19 are presented in Figure 34 below. With the help of Appendices, it can be observed that the discounting rates have been decreasing from 2017 on an annual basis. No obvious patterns can be seen from the examined annual reports. Over 11% of the sample did not discount their decommissioning liabilities, and 19% did not reveal their chosen rates in the financial statements. Discounting rates were tested to identify **consistency** besides the rate-selection pattern. The number of companies that either not discounted or not disclosed their discounting rates remained static over the span of three-years, with marginal variations among a couple of companies. Discounting rates were lower amongst the European entities in comparison with the companies in other parts of the world, with highest rates applied in Russia and Brazil. None of the surveyed companies provided detailed sensitivity analysis of the selected rates, and the calculations or assumptions to justify the percentages.

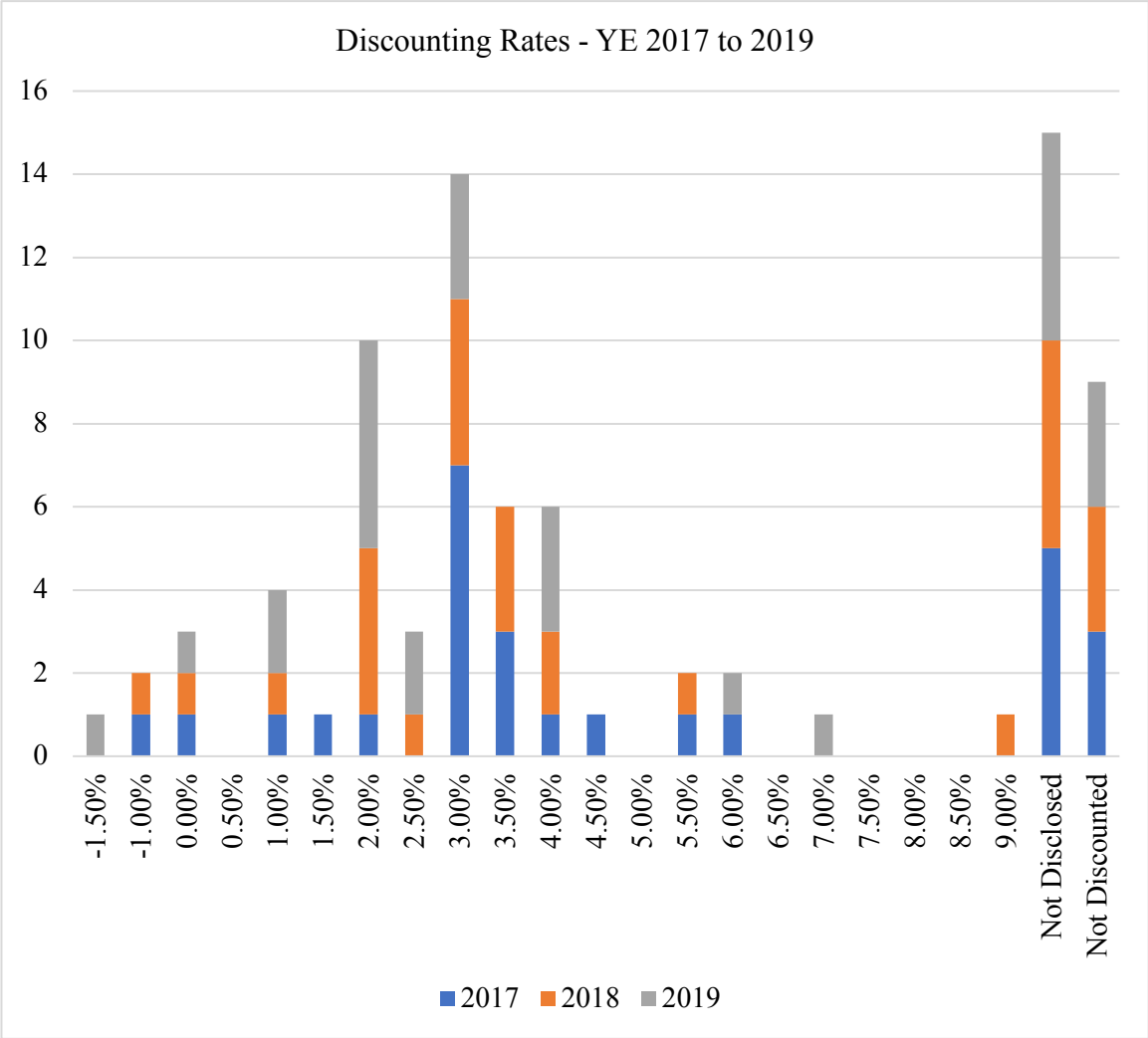


Figure 34: Discounting Rates Used in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

A wide selection of applied discounting rates can be observed in Figure 34 above. Considering the three popular average for the discounting rates used by the IFRS examined companies; mean, median and mode ranged between 2% and 3.5% for 2017, 18 and 19 as stated in Table 13 below.

Averages of mean, median and mode of the three-year period were calculated to find a common value per year, and to identify if there's an obvious trend. As per Table 13 below, overall, 3% is the average of all years. However, per year statistics would reveal that if the declining trend of averages were to continue, after 2019, the 3% average would decline to 2% as a whole. The applied discounting rates were declining from 2017 onwards, if this range were to be considered a norm in this industry, it is questionable why all IFRS

companies didn't adopt the similar rates' range? Could the accounting standards have played a better role in determining a precise framework pertaining to the discounting rates for extensively longer-term liabilities, i.e. pensions or decommissioning? At least a firmer stance on sensitivity analysis for decommissioning rates of discounting, and the requirement to disclose such rates in the financial statement may have resulted in more even results.

Year	Mean	Median	Mode
2017	2.89%	3.00%	3.50%
2018	3.00%	3.00%	3.50%
2019	2.63%	2.50%	2.00%
Average	2.84%	2.83%	3.00%

Table 13: Averages for the Discounting Rates Used in the Financial Statements for the Year-End 2019, Author, 2021

One interviewee who has a broad experience in the utilities industry, working directly with the companies under the EU-ETS scheme, discussed the issues of clarity in determining discounting rates for decommissioning liabilities, and said:

"I think a good accounting practice would be, to clearly state the main assumptions and regulatory requirements that were used to derive the aggregate nuclear provision, for example. This should include a clear process over what discount rate is used and how it is derived? It could also include a sensitivity, which I have seen for nuclear plant operators in their annual report what a x bps change in the nuclear provisions discount means for the nuclear provision" (Participant 8).

Decommissioning liabilities were also tested for **materiality** to determine the consistent movements on an annual basis for the Year-End 2017, 18 and 19. As per Figure 35 below, all five key benchmarks revealed a common range between 80% to 90% of IFRS companies' decommissioning liabilities being material to their financial statements. Lowest percentages landed for Total Assets =1% scale, stood at 81% in 2017 and 2018, were still exceptionally higher to the sample. As the results suggested, future liabilities for the demolition of nuclear power plants were highly material to the financial statements. This meant that minor changes (as explained in Table 1, p.71) in the discounting rates or other relevant factors would result in material misstatements in financial reporting, that could result in a qualified audit opinion.

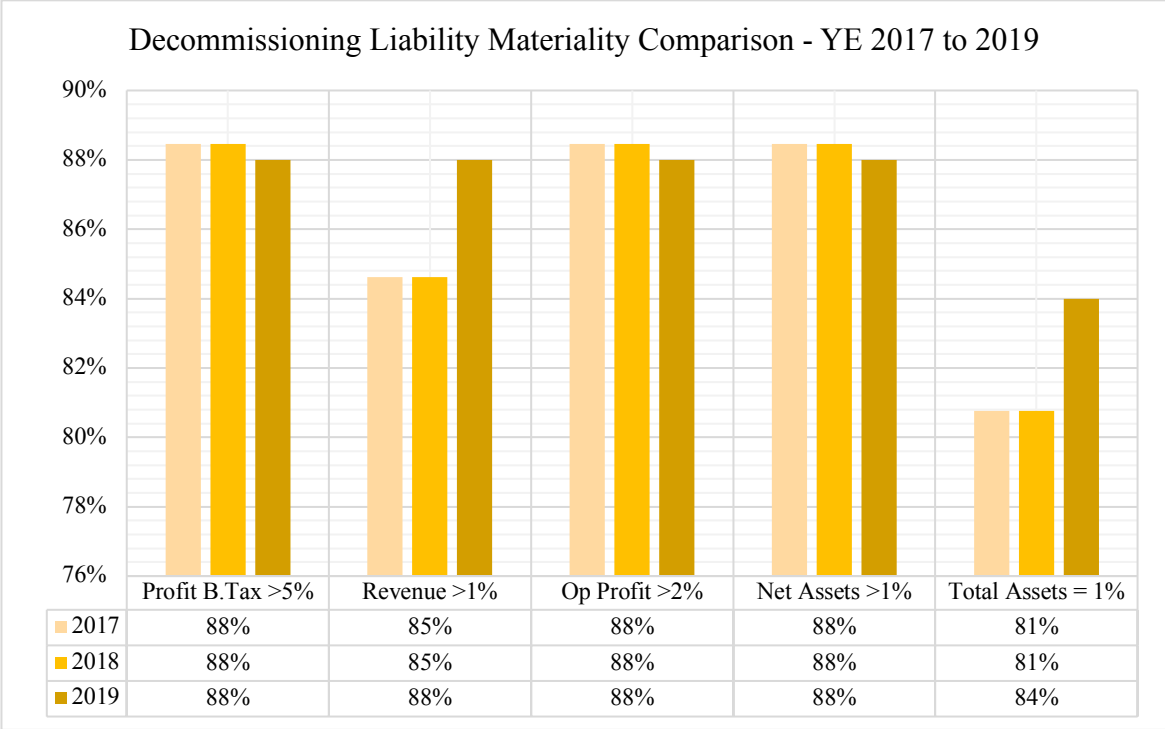
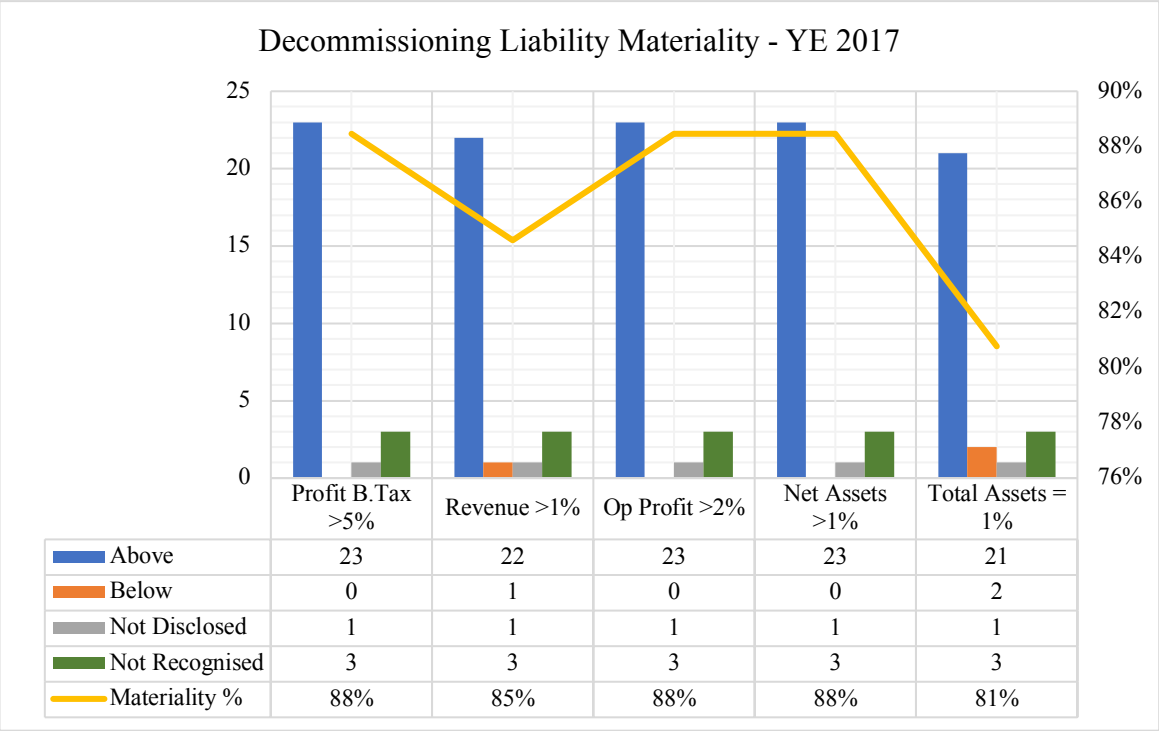


Figure 35: Comparison of Decommissioning Liability's Materiality Level for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

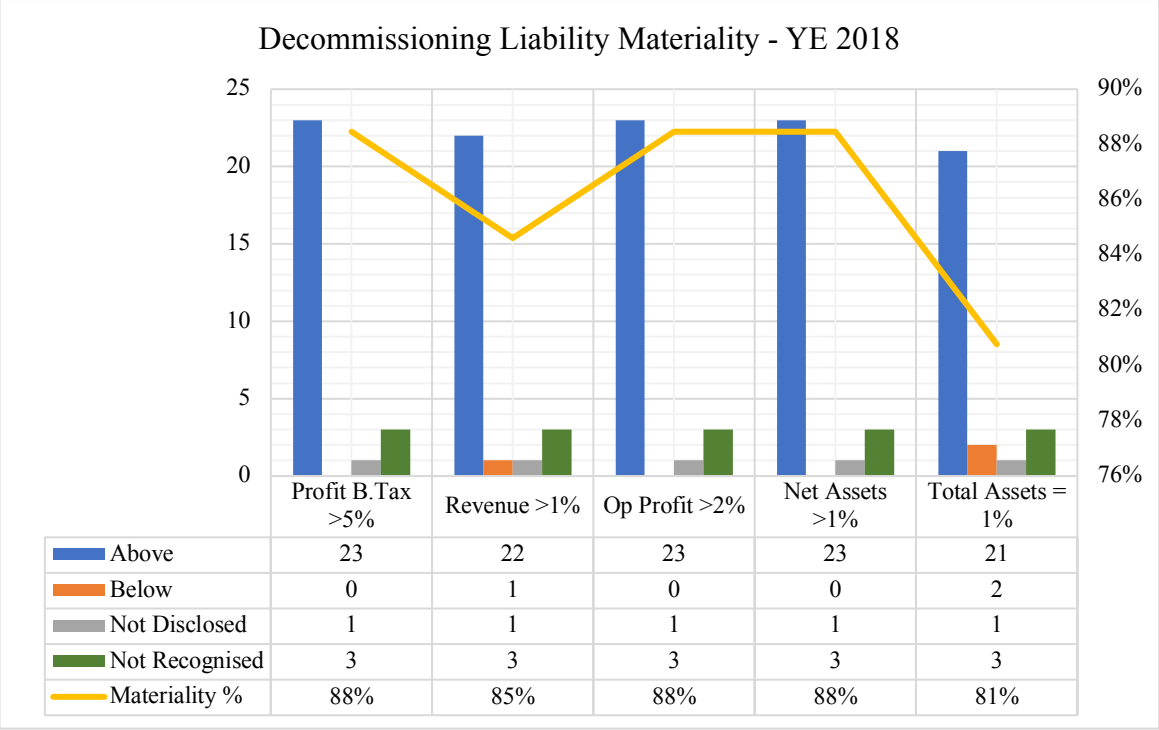
For highly significant liabilities, a pre-defined criterion for discounting rates were missing. Comparing this case with emission allowances (when both areas are not strictly touched by prevalent accounting standards), whether for the classification or recognition criteria, lack of relevant and complete disclosures in the financial statements were alarming. Does it mean the oversight of accounting bodies for these areas were the reason for discrepancies in accounts? Could the weaker scrutiny by institutional organisations be the reason for poor quality of useful financial information on emission allowances and discounting rates?

Annual materiality movements of decommissioning liabilities are given in Figure 36, 37 and 38 below, where almost all values remained unchanged over the span of three-years.



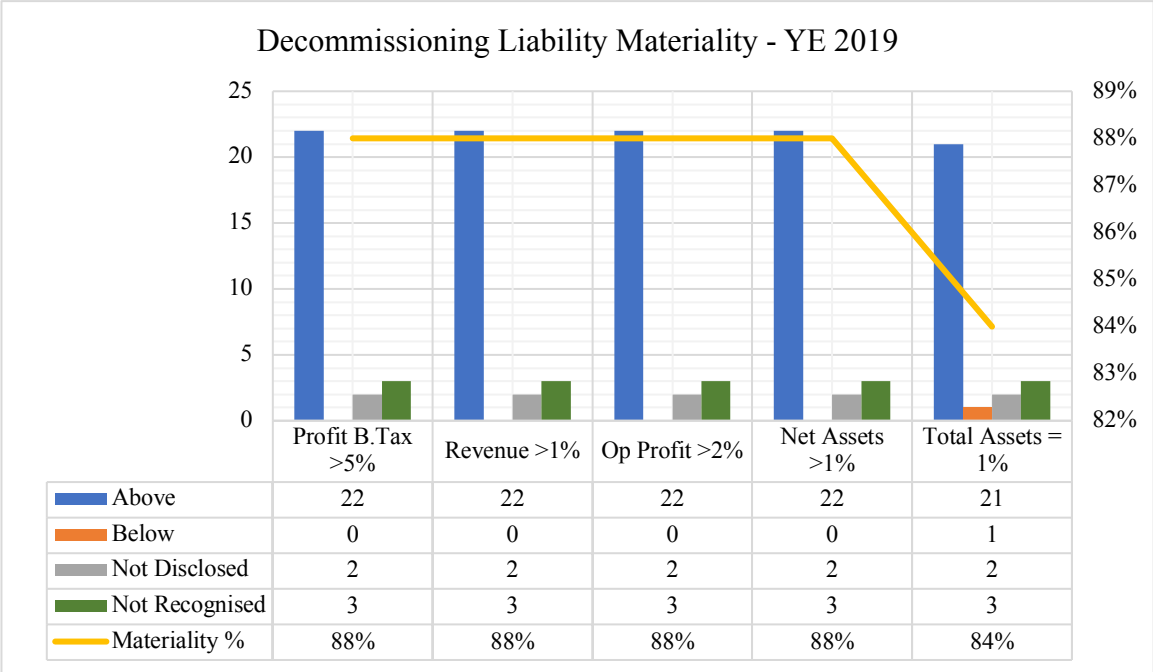
	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
Above	23	22	23	23	21
Below	0	1	0	0	2
Not Disclosed	1	1	1	1	1
Not Recognised	3	3	3	3	3
Materiality %	88%	85%	88%	88%	81%

Figure 36: Decommissioning Liability's Materiality Level for the Year-End 2017, IFRS Sample, Author, 2021



	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
Above	23	22	23	23	21
Below	0	1	0	0	2
Not Disclosed	1	1	1	1	1
Not Recognised	3	3	3	3	3
Materiality %	88%	85%	88%	88%	81%

Figure 37: Decommissioning Liability's Materiality Level for the Year-End 2018, IFRS Sample, Author, 2021



	Profit B.Tax >5%	Revenue >1%	Op Profit >2%	Net Assets >1%	Total Assets = 1%
Above	22	22	22	22	21
Below	0	0	0	0	1
Not Disclosed	2	2	2	2	2
Not Recognised	3	3	3	3	3
Materiality %	88%	88%	88%	88%	84%

Figure 38: Decommissioning Liability's Materiality Level for the Year-End 2019, IFRS Sample, Author, 2021

Only a minor decrease was observed in Figure 38 above when one out of twenty-seven IFRS surveyed companies chose to withheld information regarding decommissioning obligations, thereby increasing the non-disclosure figure from 4% in 2017 and 2018 to 7.4% in 2019.

5.3.2 Asset Retirement Funds

In order to complete the decommissioning process, a large pool of funds is collected throughout the operational life of a nuclear power plant, which can then be used for this purpose in the future. Accounting provisions, unsegregated and segregated funds are the key examples of how the asset retirement funds are invested to accumulate enough capital for the deconstruction procedure.

Figure 39 below proves that a majority of both IFRS (85%) and NON-IFRS (93%) surveyed companies acknowledged their contribution in the asset retirement funds. About 15% (four out of twenty-seven IFRS companies) chose not to disclose enough details regarding the funds required for decommissioning. On the contrary, disclosures among

NON-IFRS sample were a little higher, with only two out of twenty-seven withheld details about such funds. Once again, Hong-Kong FRS entity kept the disclosures to the minimum and refrained from revealing ample information regarding these funds. As their accounting standards are virtually identical to IFRS, it is unclear why the disclosures were minimal? Additionally, Korean FRS (again, similar to IFRS) also did not provide relevant details on the decommissioning funds. The observation reveals that companies that follows accounting frameworks that virtually similar to the IFRS regulations are the ones failing to maintain the highest disclosure standards. As observed in the chart below, NON-IFRS jurisdictions complied with the rules-based requirements at its entirety. Conversely, IFRS surveyed companies also performed well in this area, apart from few missing disclosures.

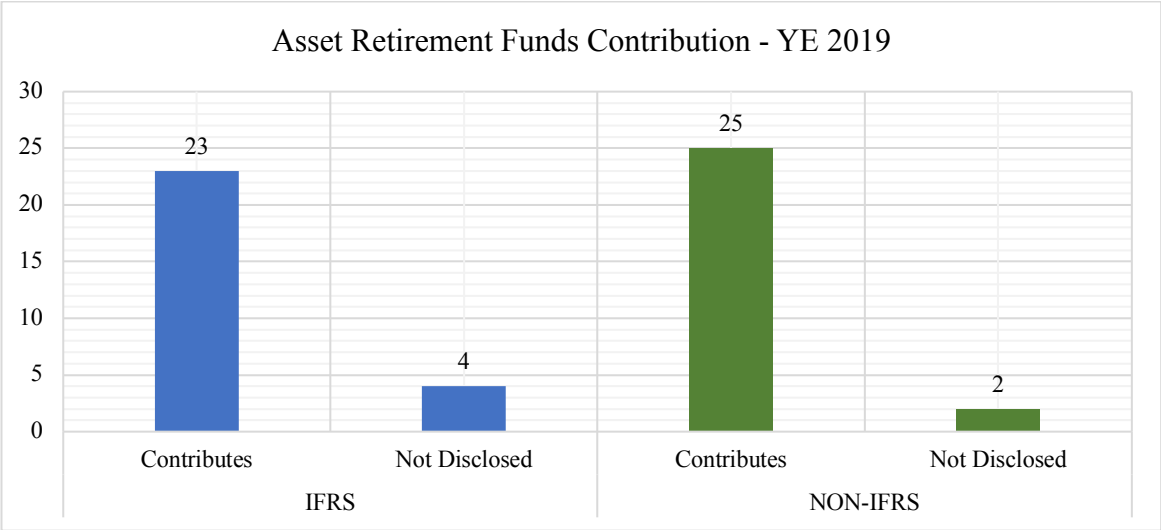


Figure 39: Comparison of IFRS vs NON-IFRS Recognition in Asset Retirement Funds in the Financial Statements for the Year-End 2019, Author, 2021

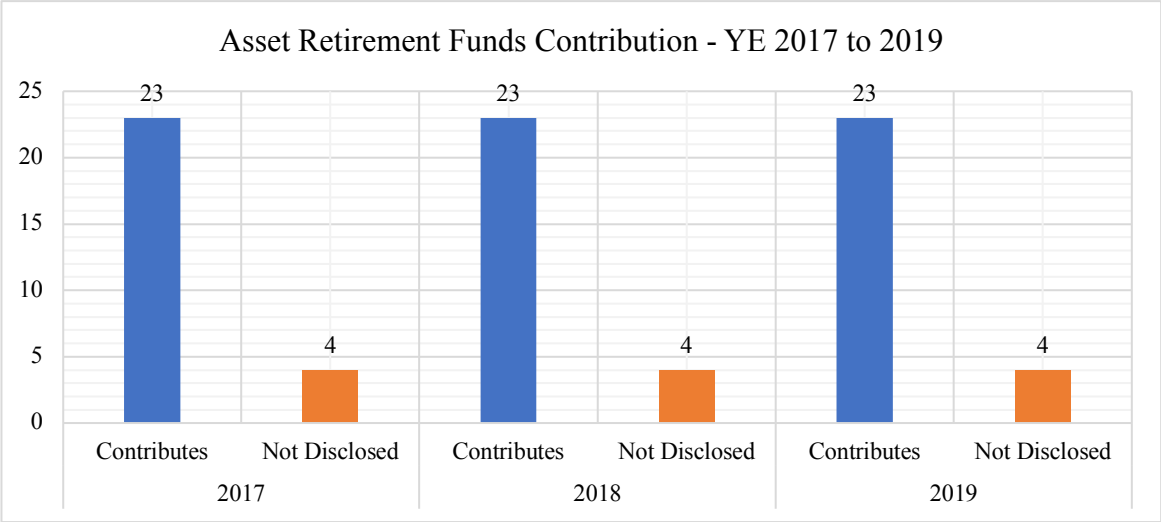


Figure 40: Recognition of Asset Retirement Funds in the Financial Statements for the Year-End 2017 to 2019, IFRS Sample, Author, 2021

Those IFRS companies that publicized relevant details about asset retirement funds applied **consistency** in their application for the period between 2017 and 2019. As there are clear guidelines about such funds in IFRIC-5 *Rights to Interests Arising from Decommissioning, Restoration and Environmental Rehabilitation Funds,* expectation of complete disclosures was a 100%, which didn't happen, but the results were still outstanding as per the empirical results. This was, yet another proof that precise accounting guidelines ensures uniformity and improves comparability and verifiability of the financial statements.

Considering the types of funds, multiple choices were opted by both samples, however the most secure option, i.e. segregated funds, were leading the charts as per Figure 41 below. IFRS (67%) and NON-IFRS (83%) examined companies invested finances to fulfil asset retirement obligations in restricted funds to ensure the decommissioning procedure won't face major disruptions in the future. Segregated funds provide extra layer of security, so the funds are largely protected and secured for the designated purposes only. The second favorite choice among the samples were unsegregated funds (that are slightly less secure than the segregated funds) pursued by 11% of the IFRS sample. It followed by provisions that works on the probability of future expenses, and the least secure among the other types of future funds planning. Provisions were recorded by 7% of the IFRS and 4% of NON-IFRS sample as per Figure 41 below.

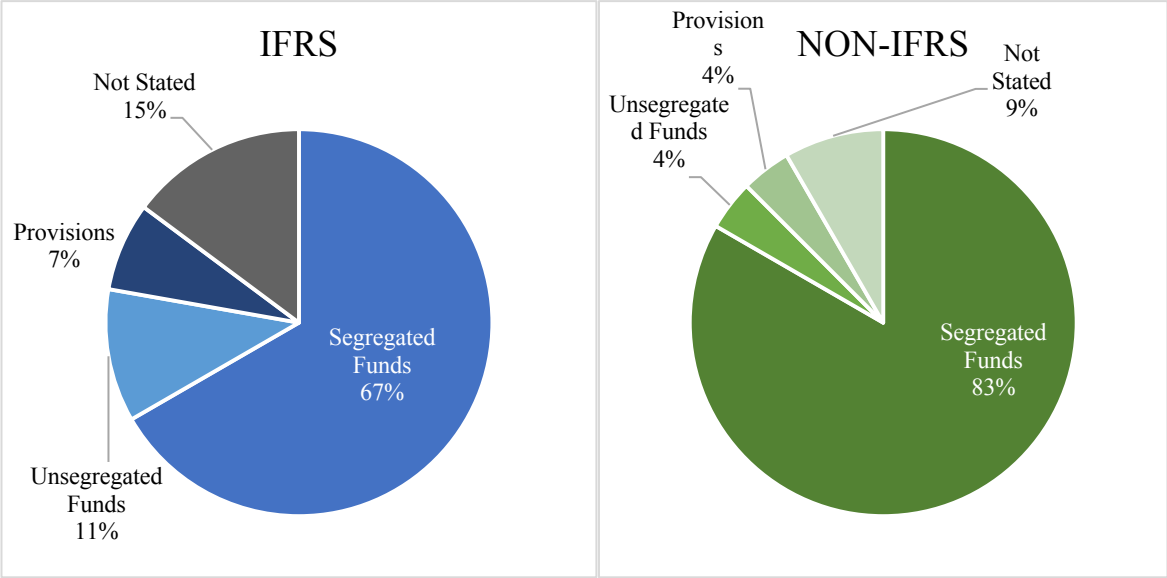


Figure 41: Comparison of IFRS vs NON-IFRS Recognition of the Types of Asset Retirement Funds for the Year-End 2017 to 2019, Author, 2021

Although IFRIC-5 makes it clear that the funds must be kept secured, managed by independent administrators, it is unclear whether the abovementioned provisions ticked the requirements. If it did, more clear disclosures in the financial statements would have clarified the grey areas. Based on the given statistics, the observation reveals more compliance from NON-IFRS entities, where ample details were provided in the disclosures regarding the chosen fund types. Could it be the rules-based accounting frameworks that has created an environment of strict scrutiny from the stakeholders, prompting the entities to be more vigilant in providing disclosures where necessary? Nevertheless, as IFRS does provide suggestions on decommissioning funds, only 15% of the sample withheld relevant details on this area, improving the percentage of compliance with IFRS requirements. Does the obedience of IFRS sample pertaining to the asset retirement funds and disclosures in the annual reports are related to the normative pressures laid down by the professional accounting standard, i.e. IFRIC-5?

5.3.3. Summary

The following points were noted based on the review of decommissioning liabilities and its related discounting rates, followed by the contribution towards asset retirement obligations, from the financial statements of the examined companies: -

- **Provisions** for decommissioning liabilities were recorded by a vast majority of both IFRS (81%) and NON-IFRS (93%) sample in the year end 2019.

- **Disclosure requirements** were commonly practiced by the entire sample, i.e. a few companies also revealed if the decommissioning duties belonged to other organisations, which is why, no provisions were recorded in such scenarios. Including them, a wide majority of both IFRS and NON-IFRS surveyed companies have disclosed their decommissioning obligations.

- **Discounting rates** were mostly given, however a few entities that did reveal the necessary provisions withheld information regarding the applied rates, raising questions about the completeness of disclosures.

- **Multiplicities in discounting rates** were observed among the IFRS sample, with the average mean, median and mode swinging between 2% to 3.5% for the Year-End 2017, 18 and 19, however, applied rates by multiple companies in the same country largely varied. On the contrary, NON-IFRS sample displayed uniformity where Japan GAAP companies recognised identical rate of 2.3%, and US GAAP entities didn't disclose their rates at all.

- Decommissioning liabilities were **highly material** to the financial statements, ranging over 80% for all tested materiality benchmarks.

- Almost all companies in both samples acknowledged their contribution towards asset retirement funds, with the most favored option being **'segregated funds'** as suggested by IFRS in IFRIC-5.

- A higher level of **consistency** in accounting information was observed pertaining to accounting practices for asset retirement obligations by the IFRS surveyed companies.

5.4 Experts Interview Analysis

Following the discovery of how the owners of nuclear power plants have recognised carbon emission allowances, in comparison with nuclear fuel and asset retirement obligations; twenty experts in financial accounting were interviewed to answer Research Questions 2 to 4 (pp.26-27).

Experts were initially asked to share their opinion on the initial accounting treatment for carbon emission allowances. This was to compare the expert's opinion with the industry's practice. The main aim of interviewing experts was to investigate the core intentions behind company's selection of accounting practices. Experts were asked to share their opinions on the following areas: -

1. Accounting recommendations for carbon emission allowances.
2. Key sources of accounting information in the absence of particular accounting standard, and possible implications of incorrect accounting treatments.
3. Disclosure criteria for companies in the absence of a relevant accounting standard.
4. Qualitative characteristics of useful accounting information in light of the constituents of good accounting practice.

Responses received from the experts were analysed using NVivo software to prepare useful and easy to understand charts for detailed illustrations.

Familiarity with the issues in accounting for nuclear power plants under IFRS, focusing on carbon emission allowances, was tested by asking the participants to rank their familiarity levels. Figure 42 below illustrates the profiles of interviewed participants along with their familiarity with this niche issue. Among all twenty experts in accounting who have extensive years of experience in environmental accounting, only 15% were fully familiar with the accounting issues pertaining to the carbon emission allowances, and 30% were partially familiar. More than half (55%) of the cohort were not aware of the financial accounting complexities on this area, citing that they have not read any news via administrative platforms in accounting such as IFRS, IASB or their relevant accounting bodies, i.e. ACCA, ICAEW, etc. Those that were slightly familiar gained awareness through a couple of studies

in the past, IFRS agenda timelines for future projects or through a word of mouth in their business network. Because participants were given ample notice to prepare for the interview, it is understood that the experts may have done their research on the given topic beforehand.

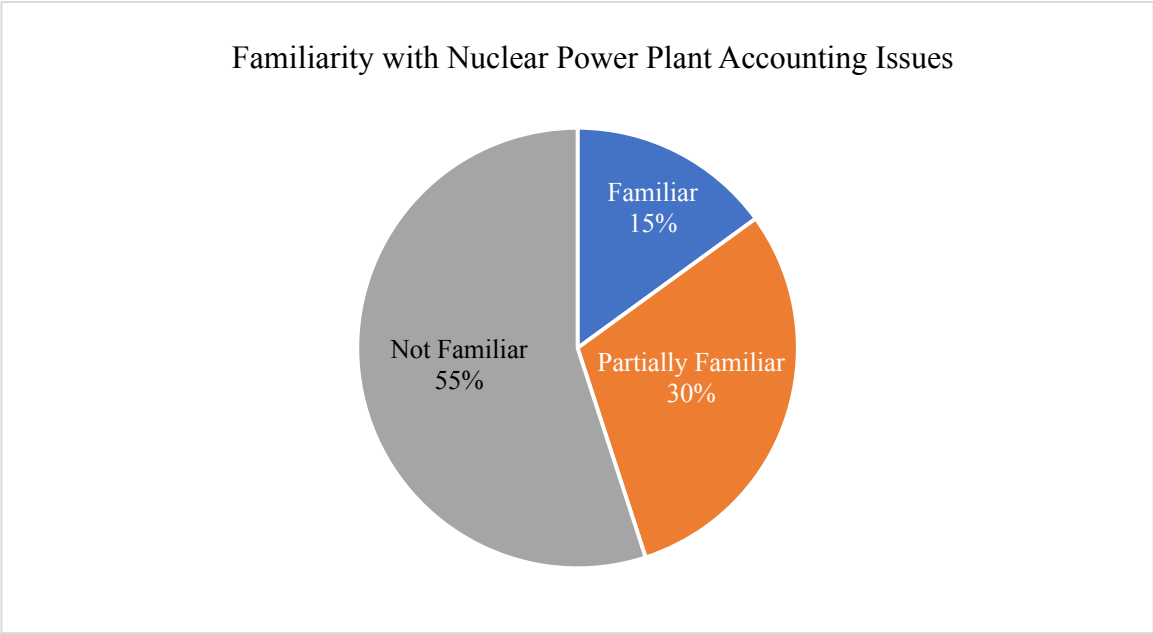


Figure 42: Interviewees Familiarity with the Accounting Issues for Nuclear Power Plants, Author 2021

5.4.1 Accounting Practices (Carbon Emission Allowances)

As the recognition of carbon emission allowances is a particularly niche issue in financial accounting, majority of the experts in accounting are generally not sure about its recognition criteria, and that includes the standard setters themselves. Also, in order to avoid bias opinion from experts, instead of familiarity with the issue, years of experience in environmental accounting was the essential shortlisting criteria.

To answer Research Question 2, when asked to share their judgement on the initial recognition criteria for carbon emission allowances, mixed views were observed from the cohort. As in Figure 43 below, at least half of the participants supported the withdrawn IFRIC-3 *Emission Rights* recommendation of 'intangible asset' method for both granted (50%) and purchased emission allowances (70%). The second popular choice among the participants was 'inventory' method for purchases (30%), whereas 'government grant' for

allocated emission allowances (30%).

Figure 43: Experts Opinion on the Initial Recognition Criteria for Carbon Emission Allowances, Author 2021

Interviewers made no difference between the purchased emission allowances for both business-use and trading purposes. All participants believed that there shouldn't be any distinction between the practice, and the criteria should remain the same for both. This is to bridge the gap between various accounting practices that currently exists in this industry, and to improve consistency in application. Mismatching in accounting practices was the main reason why practitioners were against the former IFRIC-3 Emission Rights interpretation, which led to its withdrawal soon after its arrival (IFRIC 3 Emission Rights Withdrawn, 2017). As the 'inventory' method was the most commonly practiced accounting criteria among both IFRS and NON-IFRS examined companies, experts who also supported this idea for the granted version of allowances said the following: -

A professor in accounting from a leading UK university said:

"These rights are assessed each year by the governing bodies, and are given for daily emission of toxic materials into the environment. Because of its daily use, it is an **Inventory**" (Participant 1).

Another professor in accounting said:

"It is a tricky question. As far as I remember, carbon emission rights are granted for a year, after that, you lose them. If they don't use or sell in a year, govt will reset the cap next year. I know some companies are recording it as an Intangible Asset, but it shouldn't be a long-term asset. It is, as recognising an item that is harmful to the environment, an asset in our accounts. Therefore, for environmental reasons, as well as one-year cap, it is an **inventory**. Even if the companies didn't use up the rights within a year, and can hold on to them for long-term, these shouldn't be treated as long-term assets, because these rights were given to the operators for their operational use". (Participant 2).

The support for inventory method also extended for the purchased emission allowances. It was said by another expert in accounting:

"There shouldn't be any accounting difference for granted and purchased rights. Both should be recorded in an identical manner, i.e. as **inventories**. For the entity that will purchase these rights from the selling entity would do so to fulfil their emission requirements, i.e. to use right away or within a year. For that reason, it is still an inventory. Because there aren't many rights available in the market due to the curtailment by the cap-and-trade scheme organisers, nuclear operators cannot be thinking of investments in rights for trading purposes" (Participant 3).

Although the abovementioned arguments were valid and reasonable, most of the participants supported intangible assets criteria, inspired by the former IFRIC-3 *Emission Rights* for both granted and purchased allowances. A professional chartered accountant from a private accounting practice said:

"Again, depending on the perceived use – investments, intangibles or some form of short-term asset if planning to sell immediately. Overall, recognition criteria should be similar to the granted rights, because both are identical in nature. My inclination would be **intangible assets**, assuming that the operators will buy the rights to fulfil their own emission requirements" (Participant 6).

One of the interviewees who was a senior auditor in a Big4 firm, said:

"Rights are intangible assets and grants are covered in IAS-20 (particularly these grants are only issued and controlled by the governmental organisations), therefore, recognition should be the same as if **intangible** is received as a **grant** from government" (Participant 12).

A professor in accounting said:

"As these rights are purchased, control is assumed, plus there is a measurable economic resource, an **intangible asset** must be recorded" (Participant 19).

Because the support for both inventory and intangible asset criteria were reasoned with logical arguments, experts were also asked to reflect upon the obligation to surrender the allowances equivalent to their real emissions level, back to the scheme. Most experts seemed to agree that there was an obligation pertaining to the respective scheme, i.e. EU ETS for European entities, (as suggested by IFRIC-3 *Emission Rights* as well). However not all supported 'provisions' criteria as observed among the 59% of surveyed IFRS entities. Most of the participants leaned towards a contingent liability over provision, although some believed there was no obligation at all. An experience professor in accounting stated:

"I would say **contingent liability** as it is dependent on the future uncertainties and the emissions. If we didn't emit carbon or sold the rights to another operator, we passed over the liability to them. If we keep them, then we would have an obligation to give-up rights equivalent to the emissions, so it is contingent upon the intention" (Participant 4).

Support for contingencies extended by other professors as well. As mentioned by another interviewee:

"It is a **contingent liability** as the obligation is applicable only upon the emission of rights. If the company didn't emit anything for various reasons, and chose to sell the rights, it will pass on the liability to the buyer. So, the liability is contingent upon its use" (Participant 5).

While the majority supported the idea of contingent liability, 20% of the respondents believed there wasn't an actual obligation towards the regulators. They argued that the surrender of allowances was merely a box-ticking exercise as no monetary values are involved in the surrendering process to the State. A professor argued that:

"As the rights are to be treated as inventories, there is **no obligation**. A disclosure might be appropriate to justify the obligation to the government" (Participant 7).

Having said that, 30% of the participants threw their support behind provisions for emission obligations. This practice was inspired by the withdrawn IFRIC-3, and resulted in the second most popular choice of accounting treatment by the interviewed cohort. A professor in accounting claimed that:

"Companies can record a **provisional** liability in the given period for the estimated number of rights that will be surrendered" (Participant 14).

Experts suggestions were largely derived from the former IFRIC-3 *Emission Rights* interpretation as they favored 'intangible assets' criteria to recognise both granted and purchased carbon emission allowances. These recommendations were different than the current accounting practices by the sampled entities that largely pursued 'inventory' methods among both IFRS and NON-IFRS sample. Accounting experts slightly deviated away from the provisional liabilities as suggested in the former standard, and advised contingencies for the obligations to surrender emission allowances back to the scheme. Once again, this suggestion was different from the prevalent accounting practices where the majority of the IFRS sample recognised provisions.

A cross-sectional analysis of expert suggestions for emission allowances is compared with the industrial statistics in the table below:

Year-End 2019				
		Interviews	Annual Reports	
Items	**Categories**	**Experts Opinion**	**IFRS Surveyed Companies**	**NON-IFRS Surveyed Companies**
Granted Emission Allowances	Intangible Assets	50%	15%	7%
	Government Grants	30%	0%	0%
	Inventories	20%	7%	11%
	Other Current Assets	0%	11%	0%
	Not Recognised	0%	7%	0%
	Not Disclosed	0%	59%	81%
Purchased Emission Allowances (Business Use)	Intangible Assets	70%	22%	11%
	Inventories	30%	26%	19%
	Other Current Assets	0%	11%	0%
	Not Recognised	0%	0%	0%
	Not Disclosed	0%	33%	67%
	Derivatives	0%	0%	0%
Purchased Emission Allowances (Trading)	Intangible Assets	70%	15%	4%
	Inventories	30%	26%	15%
	Other Current Assets	0%	11%	0%
	Not Recognised	0%	0%	0%
	Not Disclosed	0%	5%	81%
	Derivatives	0%	4%	0%
Emissions Allowances Obligation	Contingent Liability	40%	0%	0%
	Provision	30%	56%	4%
	No Obligation	20%	0%	0%
	Impairment of Assets	10%	0%	0%
	Not Disclosed	0%	44%	96%

Table 14: Cross-Sectional Analysis of Expert Opinion vs Current Practices of the Accounting Treatments for Carbon Emission Allowances by IFRS and NON-IFRS Entities, Author, 2021.

As per Table 14 above, green-coloured boxes represents the most preferred accounting treatment, followed by yellow-coloured boxes that signifies the second preference by each cohort. Experts have thrown their support for 'Intangible Assets' criteria to classify and recognise **granted emission allowances** in the financial statements, by adopting the IAS-38

Intangible Assets approach. This suggestion was recommended by half of the respondents (50%), and was also endorsed by the former IFRIC-3 *Emission Rights.* IAS-38 offers both cost and revaluation model models, which could bring back the mismatching issues as previously voiced by the practitioners that lead to the withdrawal of IFRIC-3. Based on the IFRS surveyed companies (apart from the percentage that did not reveal their practices), intangible asset criteria were still largely prevalent within the industry. However, it was not the first accounting choice across the NON-IFRS sample, as they chose it as the second option. Being the first preference of accounting treatment in the IFRS sample and supported by the experts, could it mean that the recommended procedure was inspired by the authoritative guidelines (i.e. IFRIC-3) even though they are no longer in practice? If so, there's a possible connection with the institutional isomorphism as the participants have continued to support the controversial accounting practice, despite the industrial criticisms.

When it comes to the accounting for **purchased emission allowances**, experts made no distinction between the intention to keep the allowances for business-use or trading purposes. Experts argued that, unlike physical non-current assets held for sale, it would be too difficult to separate the two, as allowances don't physically exist. Additionally, emission allowances can be purchased and granted both at the same time; it would be easier to classify them as one for accounting purposes. For that reason, results for both kinds of purchased emissions revealed identical opinions from the interviewed participant. As per Table 14 above, experts continued to back 'Intangible Asset' criteria, while the industry practiced inventory method among both datasets, i.e. IFRS and NON-IFRS companies. This indicated that the entities are considering purchased allowances as any other item of raw-material or work-in-progress item that is required for production purposes. When asked by the interview participants, where should the companies seek guidance in the absence of an official accounting standard, they pointed towards accounting bodies as the first option. That might indicate that the experts' support for intangible asset criteria may have been driven from the former IFRIC-3 guidelines. However, intangibles were the second choice by the existing companies in the utilities and energy sector.

While there isn't an accounting standard suggesting allowances are intangibles, however, considering the experts opinion and the former IFRIC-3 guidelines, there would be implications of recording an intangible as an inventory (or vice-versa) since emission allowances are materially significant based on the results (Figure 20, p.159). Over or

understated inventories would impact profitability, assets and equity ratios. Overstated inventory values would severely affect the true-and-fair of annual accounts, especially when the amounts are materially significant (as observed in Figure 20). Such overstatement would also affect the share price as evidenced by the recent example of Ted Baker. The company had artificially overstated their inventory value by £25m of phantom inventories as initially reported. The news of this blunder brought their share price to its lowest in the last decade (BBC, 2019). Later, the overstatement turned out to be £58m (SkyNews, 2020). It had falsely overstated the profitability and assets of the company (Robertson, 2020). Conversely, understated closing inventories would lower the gross and net profits, that would affect the taxes as well as the share price as well. On the other hand, over or understating intangible assets would increase or decrease total assets and liquidity ratios, further impacting the company's position and its reputation among the stakeholders.

With regards to the accounting treatment for **emission allowances obligations**, experts favoured contingent liability as their first priority, slightly ahead of provisions as per Table 14. Many interviewed participants believed that the obligation to surrender equivalent allowances back to the regulatory is only on paper, as no payments are involved in that process. Additionally, surrendering of allowances is dependent upon the actual emissions in the environment, and not just holding the rights. So, it is contingent upon the harmful carbon footprints of the entities, therefore, disclosures would suffice in the notes to the financial statements. In contrast, contingencies were not practiced by either of the two datasets in this study, i.e. IFRS and NON-IFRS sample (Table 14, p.194). The industry players recorded their obligations as provisional liabilities as the only accounting options in practice. Although 30% experts supported provisions, it was their second and not the first choice. While it can be argued that the entities may have been influenced by the former IFRIC-3 guidelines to recognise provisions for emission allowances obligations (i.e. the effects of isomorphism), experts' opinion was not drawn from the withdrawn interpretation, but the current IAS-37 guidelines. Nevertheless, experts have based their suggestions on the accounting guidelines by IASB. One of the interviewed professors in accounting said:

"My arguments are based on the current accounting standards, and using the IASB framework" (Participant 12).

Both accounting treatments are covered under IAS-37 by IFRS, however the implications of

over or understating provisional liabilities would be greater than contingencies. Overstated liabilities would affect financial ratios, particularly, the balance sheet ratios. Experts highlighted the potential impact of incorrect accounting treatments would include window-dressing issues, inconsistency in financial reporting, fraudulent practices and more (later explained in Section 5.4.2).

The cross-sectional analysis of experts' recommendations vs the industrial practice (among the IFRS surveyed companies) revealed a unanimous agreement in accounting for granted allowances as intangible assets. While both IFRS and NON-IFRS datasets exposed a common preference towards the classification and recognition of purchased emission allowances as inventories (whether for trading or business-use motives), experts stood by the former IFRIC-3 proposals. Once again, the global entities (both IFRS and NON-IFRS) seemed to adopt a mutual accounting practice to record emission allowances obligations as provisions, experts believed that contingent liabilities might be a slightly better alternative. Nevertheless, a vast majority among both data samples did not reveal their practices, which could highly change the results, that may align more with the experts' opinions.

5.4.2 Good Accounting Practices

Not only the recommendations for suitable accounting treatments pertaining to carbon emission allowances, participants were mainly interviewed to gain an understanding of the inspiration behind the chosen accounting practices by the sampled entities. This investigation was useful to map the structure that companies follow in the absence of suitable authoritative accounting guidelines.

Research Question-3: What are the key sources of accounting information, and the basis of disclosures in the absence of a particular accounting standard for the owners of nuclear power plants?

Due to the lack of an official accounting standard for carbon emission allowances, companies are currently allowed to adopt accounting methods, that in their best judgement, are fit for the purpose (also suggested in IAS-8 *Accounting Policies, Changes in Accounting Estimates and Errors).* But where does the inspiration for such judgement comes from? All interviewed accounting experts were asked to identify the key sources for businesses to gain knowledge

about various accounting treatments. Without giving a pre-determined list to choose from, all participants identified key sources to the best of their knowledge, which were then compiled into a list, and presented in Figure 44 below. Expert's responses were arranged in a descending order, from highest to lowest number of similar responses. Colour schemes were adopted to represent the ranking where the darker the colour, the higher the number of responses were received from the participants. Figure 44 exemplifies that relevant accounting bodies, i.e. IASB, IFRIC, GRI, etc., were the obvious choice to gain accounting knowledge from. Experts indicated that if there aren't suitable guidelines for carbon emission allowances, other accounting standards within the same framework must be researched thoroughly. As mentioned by a professor in accounting from a renowned UK university:

"This is a complex question cause the professional bodies and legislations are always there to provide relevant guidance for the end-users. In the given scenario of nuclear power plants, where there isn't any concrete guidance given under any accounting standard that addresses emission rights, companies must look thoroughly for similar guidelines given by their professional accounting bodies. The companies must find the most appropriate accounting treatments given by their accounting bodies in the first instance. They can also seek help from their auditors who can bring their wider accounting and business experience to practice and recommend the optimum accounting solution. Lastly, the companies could adopt universal accounting guidelines on that area, such as GRI guidelines or similar" (Participant 17).

A director of an NGO, working in the area of environmental accounting and its impact on business stated:

"In this scenario, GHG protocols are important as they are set up by experts in this industry. Additionally, other accounting standards bodies could also give useful tips on various accounting criteria" (Participant 15).

The second popular suggestion was to seek guidance from the industry experts, where auditors and practitioners would be the optimal choice based on their industry experience. Additionally, analysts and academics would be helpful in sharing their in-depth knowledge. An academic from a leading UK university said:

"In absence of an accounting standard, companies should look for guidance towards researchers, analyst and experienced practitioners, agencies dealing with accounting information" (Participant 12).

When the same question was asked from a senior auditor at one of the Big4 firms, the respondent stated:

"Big4 firms have FAQs on this topic. IASB/IFRIC has also discussed this topic at few occasions. It would be appropriate for issuers to refer to those discussions and guidance" (Participant 11).

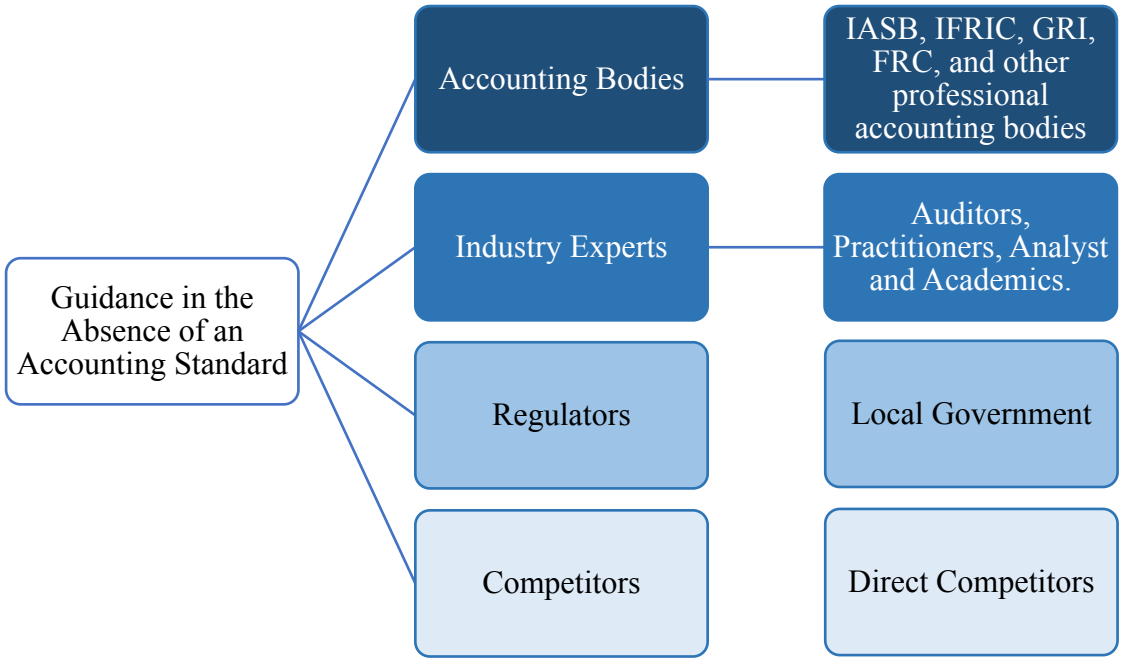


Figure 44: Experts Opinion on the Key Sources of Guidance in the Absence of an Accounting Standard, Author 2021

Regulators or the local regulations were the next option as per the interviewed participants. Guidance from local regulations are mostly available as said by an equity analyst below: -

"Usually it isn't an issue, as the companies would look towards their local governmental regulations in the first instance. Otherwise, they would follow either the global practice or

their competitors. So, the guidance is out there, but it's a question whether they'll look for it" (Participant 8).

Lastly, the least preferred recommendation was to look for the practices by key competitors in the same industry. It was observed in the case of Japan GAAP, most of the policies in the industry were unanimous, i.e. the discounting rate for decommissioning liabilities (Table 12, p.177). Experts endorsements mainly reflected upon the institutional guidelines, i.e. from the current accounting standards and least suggested mimetic pressures of isomorphism, i.e. to look towards competitors.

Based on the empirical results, it was observed that the values related to carbon emission allowances were material to the financial statements. Material misstatements won't only lead to a qualified opinion, but also misguide the key stakeholders, and misrepresent the true-and-fair view of financial reports. Due to the prevalent varied views in accounting for emission allowances, experts were asked about the implications of pursuing incorrect accounting treatments. Although there isn't yet an official standard on this area, so independent judgement is all that the entities can rely upon, effects of material misstatements would still be present in the financial statements. Once again, coloured scheme was used to highlight the most to least similar expert ideas, from darker to lighter colour tone. As per Figure 45 below, under and overstatement of assets and liabilities were the key highlighted concerns by most of the interviewees. Mismatching issues were also raised by practitioners when IFRIC-3 *Emission Rights* was launched in 2005, where assets (intangibles) and corresponding liabilities (provisions) were valued differently. It was observed in the empirical analysis; multiple valuation methods were used to record emission allowances by the IFRS surveyed companies which would lead to material differences in the financial statements.

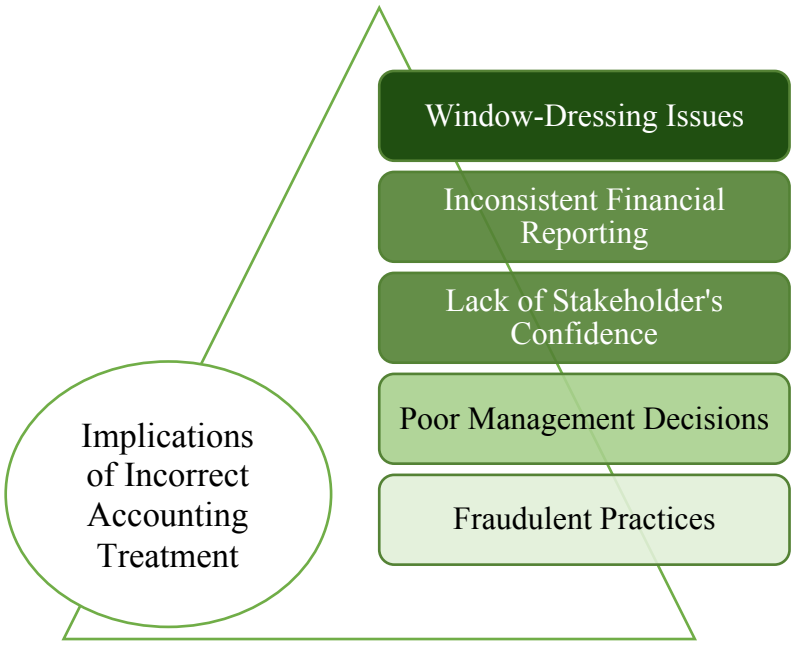


Figure 45: Experts Opinion on the Implications of Incorrect Accounting Treatment in the Financial Statements, Author 2021

Inconsistent financial reporting was the second concern raised by the experts, and rightly so, as window-dressing issues would result in material errors in the reports. Due to the lack of awareness regarding the accounting issues pertaining to emission allowances (as also observed in Figure 42 that many experts who have been working directly in the environmental accounting area weren't fully familiar with such issues, in fact, 55% experts didn't hear much about it before), and the silence of accounting bodies on this area, shareholders and investors are possibly unaware of the true situation. Lack of stakeholders' confidence was the next area identified by the experts, which would have more significance with the increasing awareness on this area. As per the participants, the least possibilities of incorrect accounting treatments would lead to poor management decisions and fraudulent practices. Although the presence of material misstatements supresses the true-and-fair view of accounting information, there are possibilities that the lack of accounting standards is being used for unfair advantages, i.e. fraudulent practices (Figure 45 above).

Disclosures are a useful way to improve communications between the principal and its agents, i.e. shareholders and the management. A meaningful communication of information in the financial statements about the resources and obligations of the entity, makes the information more relevant and faithful (IFRS, 2018). So, what makes up the useful

disclosures? How do the companies decide what and whatnot to disclose in the financial statements?

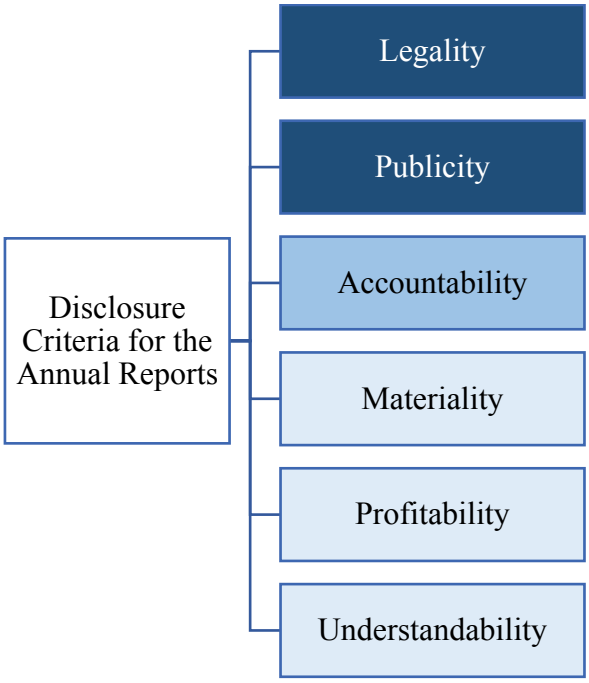


Figure 46: Experts Opinion on the Disclosure Criteria for the Annual Reports, Author 2021

Experts were asked to identify the reasonings behind the disclosures criteria to explore why the reviewed entities decided not to make voluntary disclosures on carbon emission allowances. A few interviewees stressed upon the legalities, that the company would ensure all relevant disclosures were given if they're legally obliged to do so. A director of a UK professional accounting body argued that accounting disclosures are:

"To comply with financial, legal and regulatory standards / requirements. After that, it is to follow the industry norm / good practice, and to comply with rules set by government for specific sectors. Relevant, appealing and useful information for current and future investors" (Participant 19).

However, many experts also believed that voluntary disclosures were a publicity stunt, if it helps improve healthy profits and positive gains to the company, it will surely be stated in the annual reports. An equity analyst from a famous UK high-street banks said:

"When it comes to disclosures, companies will try to avert negative publicity, therefore, any

questionable items in practice would not be disclosed unless required by legislation per se. Disclosures that do bring positive influences to the companies, whether financial or non-financial, are usually disclosed in the annual reports" (Participant 8).

After legal and publicity, experts identified accountability to be the reason that companies use to decide their disclosures criteria. It followed by materiality, that companies will have to report material information (disclosures) in their annual reports to maintain the professional standards and official requirements. This benchmark contradicted with the empirical analysis, as observed for carbon emission allowances (Section 5.2), higher material figures were left undisclosed due to the lack of a relevant accounting standard. Unless there were important guidelines in the standards, such as in case of nuclear fuel (when disclosures were exceptionally higher, Figure 8 and 9), materiality wasn't the main reason for disclosure basis. A senior auditor shared their experience and mentioned that:

"In my experience, emissions are generally immaterial for the financial statements as a whole, and therefore companies do not report the accounting policies adopted or the impact of emissions. However, with the overall shift in reducing the carbon footprint, it is likely that investors would be interested in understanding the P&L and balance sheet impact of emissions, and the related policies. Therefore, it is possible that in the near future it might become qualitatively material (unless it is already material for some entities, then it should be disclosed). I think more work is needed, from an accounting perspective, in understanding different environmental products, emission certificates and other similar instruments and the related laws in different jurisdictions. This would enable the technical accountants to agree a more uniformed basis of accounting" (Participant 11).

Profitability and understandability received lowest points by the experts, as they didn't believe management's intention for disclosures are generally to report profits and improvement of accounting awareness of the stakeholders. It is a general understanding that companies are using accounting information to improve the share value by highlighting positive aspects about the company during the respective timeframe. No wonder why the experts believed it was mostly for either positive gains or accountability purposes, however the most common reason was the legal requirements (Figure 46). This response pointed towards the institutional pressures, as previously explained with the help of empirical analysis. Where there were precise or authoritative accounting guidelines by IFRS, i.e. for

nuclear fuel (Figure 8 and 14) and decommissioning liabilities (Figure 31), overall disclosures level was a lot higher than for carbon emission allowances (Figure 17 and 24), that doesn't have an approved accounting standard comparatively.

Research Question-4: What are the qualitative characteristics of useful accounting information for carbon emission allowances, in light of the constituents of good accounting practice?

The revised *Conceptual Framework*, 2018 have highlighted fundamental and enhancing qualitative characteristics of useful accounting information that are of utmost importance for key stakeholders, especially investors and shareholders. The essential qualities include relevance and faithful representation, whereas comparability, verifiability, timeliness and understandability were identified as enhancing characteristics. The concept of materiality was also addressed in the revisions, and highlighted that it could be material both by nature and the magnitude depending on a case-by-case basis. Entities must not use their own pre-determined materiality benchmarks to decide the level of information that may or may not be needed to appear in the financial statements (IFRS, 2018). Based on that argument, disclosures about carbon emission allowances would be material in its nature, regardless of numbers, as it is of concern for wider-stakeholders across the globe.

Experts were asked to identify which qualitative characteristics, in their own best judgement, would be highly significant for the usefulness of financial reporting. Highlighted in blue as in Figure 47 below, accounting specialists seemed to prefer enhancing characteristics of verifiability and comparability over the fundamental ones as suggested by IFRS.

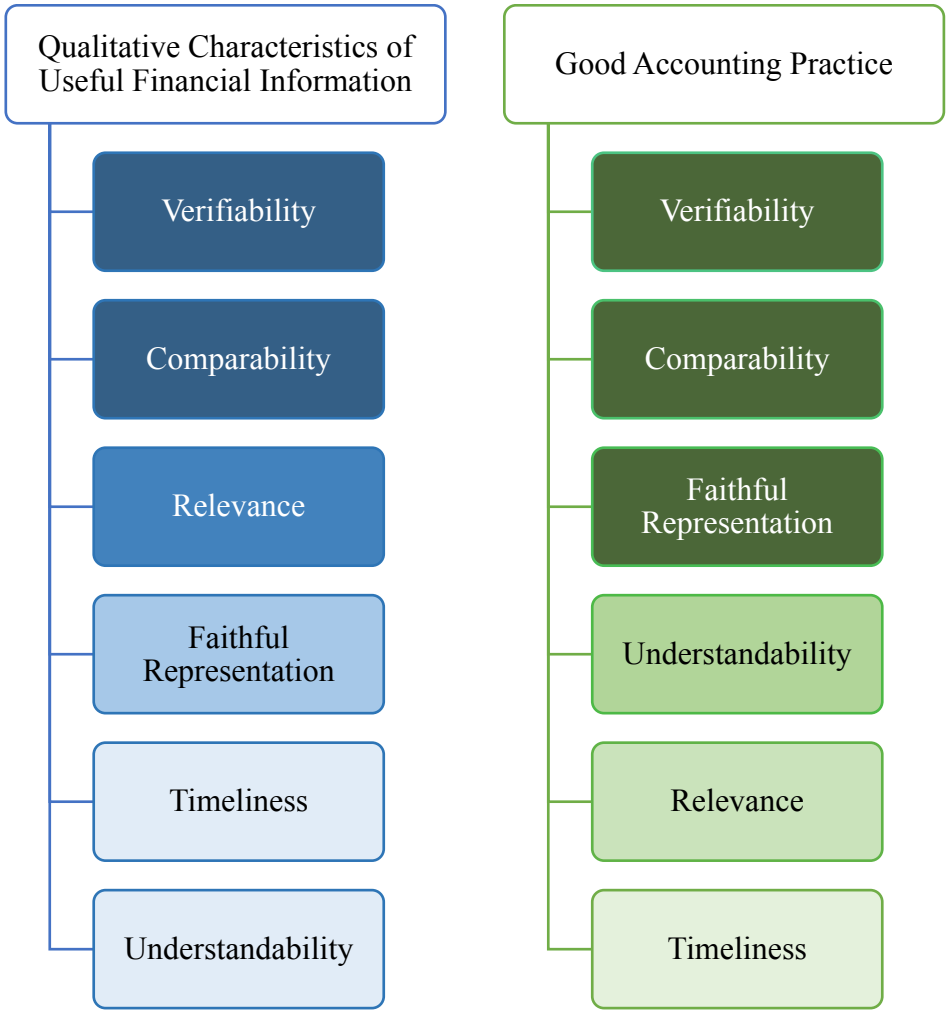


Figure 47: Comparison of Experts Opinion on the Qualitative Characteristics of Useful Financial Information vs Good Accounting Practice, Author 2021

Interview participants placed fundamental characteristics, i.e. relevance and faithful representations on the third and fourth place respectively. The results were different from Mookdee (2013) when most experts opted for relevance and reliability as the key qualities. Experts believed that timeliness and understandability were least important in terms of the priority for quality financial reporting. Empirical analysis also revealed that key disclosures related to carbon-emission allowances were largely either missing or incomplete, which made it harder to verify the assumptions and valuation methods taken by the sampled entities. Also, the reasons for the variations in discounting rates for asset retirement obligations were not supported by sensitivity analysis, for example, represented poor verifiability of financial information. Consistency assists in achieving the goal of comparability (Conceptual Framework, 2020). As noticed in the results, most of the accounting treatments were largely consistent, however some variations in accounting

treatments were observed in emission allowances. Mainly the higher degree of non-disclosures for emissions allowances and related obligations (Figure 17 and 24) made it difficult to assess the comparability of accounting information.

When asked by the experts to illustrate the elements of good accounting practices, surprisingly, as identified for the key qualitative characteristics of accounting information, most of the preferences remained the same. The combination of verifiability and comparability, along with faithful representation were the key favourites of accounting specialists (Figure 47 above). An academic in accounting said:

"As per my understanding, I strongly count accounting practice as good when they are consistent and verifiable in approach, and disclose the information in clear manner, accurate and responsibly towards to larger cause" (Participant 1).

Also stated by a director of an NGO:

"It is an exercise of truthful representation that connects every taxpayer and all the stakeholders. Accounting bodies stresses on the true-and-fair point of view for that reason. Disclosures of every important details are important and must be given where necessary" (Participant 15).

Stressing on the key qualities of useful financial information, another academic from a leading UK university argued that:

"Harmonization, verifiability and comparability of accounting regulations, key disclosures of material and non-material information that would be of interest to wider stakeholders, and true-and-fair view of the company's accounting practices. Personally, I believe every penny must be recorded in the books, thus there must be enough information in the annual reports to justify the actions. This would improve stakeholder's trust in the mechanism as well as the company" (Participant 2).

It followed by understandability of accounting information, which is said to improve the knowledge about accounting treatments and for raising awareness about emerging issues (i.e., carbon emission allowances). Relevance, referred to as the fundamental characteristic

by IASB, was positioned second-last in experts ranking, followed by timeliness once again. Although information must be relevant to be useful for important business decisions; true-and-fair view, together with verifiable and comparable information were more significant as per the experts. Nevertheless, among all experts, one interviewee who is also a senior auditor claimed that:

"A good accounting practice is the one, which is relevant and reliable. I think in the context of emissions it is important to measure the asset and liability at fair values but not through OCI. However, the existing guidance on intangibles provides no such room. This is the same challenge with cryptocurrency and gold, for example. As such, in the existing accounting world it comes down to disclosure. The prepares should report the fair value of rights held and obligations to be settled in the future" (Participant 11).

5.4.3 Summary

Based on the interviewees of accounting specialists, who had extensive experience in environmental accounting, in various industries, following points can be noted down: -

- Experts supported the initial classification and recognition of carbon emission allowances as **intangible assets**, based on the former IFRIC-3 *Emission Rights* idea. While the current industrial practice by IFRS entities also applied the experts' suggestions for granted emission allowances; both IFRS and NON-IFRS companies mostly opted for inventory method for purchased allowances.

- With regards to the carbon emissions obligations towards the trading schemes, experts preferred **contingent liabilities** slightly over provisions; this time slightly deviating away from the former IFRIC. This recommendation was not observed by either of the two samples; IFRS and NON-IFRS respectively.

- **Accounting bodies** (i.e. guidelines from existing standards and interpretations) were the main preference of interviewed experts to seek guidance from, in case a particular accounting standard was missing. It followed by industry and field specialists, regulators and lastly competitors.

- **Window-dressing** issues and **inconsistent financial reporting** were the top implications of applying incorrect accounting treatments as pointed out by the experts.

- Experts believed that **legalities** and **publicity** were the key reasons that companies would use to decide whether to provide relevant disclosures on areas not covered by existing accounting standards.

- Among others, **verifiability** and **comparability** were the key qualities of useful accounting information, as identified by experts.

- Together with verifiability and comparability, **faithful representation** were the most significant elements of good accounting practices.

5.5 Critical Discussion of Research Findings

Following the descriptive analysis of the research findings, it is important to understand if there are factors that influence management's choice of accounting policies in the absence of an official accounting standard (i.e. for carbon emission allowances). As found in the prior studies (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Balatbat and Wang, 2010; Elfrink and Ellison, 2009; Lovell, et al., 2010; Steenkamp, Rahman and Kashyap, 2011; Mookdee, 2013; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020; PWC/IETA, 2007; Warwick and Ng, 2012), there wasn't an obvious pattern of accounting practices for emission allowances. Companies have either disregarded disclosures on this area or voluntary disclosed minimal information. Additionally, no obvious uniformity has been found in the application of accounting treatments for emission allowances by the few companies who have decided to keep their stakeholders informed. Numerous reasons, including societal concerns, economic constraints, industrial practices, professional standards, and many more forms basis of management's reliance on accounting treatments for carbon emission allowances. The aim of this study was not only to establish the current accounting practice for emission allowances, but also to figure out the possible reasons behind the applied policies. Findings of this study are useful to understand the disclosure patterns and accounting practices by companies in the absence of an official accounting standard. Results are helpful in understanding good accounting practices in alignment with the qualitative characteristics of useful financial information.

The selected dataset for this research is divided into two groups, covering IFRS and NON-IFRS companies; within numerous geographical locations. As per Table 9 (p.131), IFRS sample covered twenty-one nations (mostly European countries), whereas six formed part of the NON-IFRS group (that included India, Japan and USA, amongst others). It is evident that management's approach in handling disclosures and selecting accounting policies in the absence of official interpretations would be different in various jurisdictions. It is because institutional pressures in each society is formed by unique societal, economic, ecological and stakeholders' expectations (Gallego-Alvarez, et al., 2017, p.820). Empirically, it might be challenging to pinpoint exactly which of the three institutional pressures (as per the institutional theory, i.e. coercive, mimetic and normative pressures) might be affecting a company at a time, as more than one pressures could be prevalent at a variable percentage of them all (Carpenter and Feroz, 2001, p.593). As per Mizuchi and Fein (1999),

identification of one form of isomorphic pressures affecting a company does not mean that other pressures are not prevalent and potent. Having said that, using institutional theory framework, the author has tried to identify if there were major trends behind the selection and application of accounting policies for emission allowances. Using the cross-sectional analysis of archival data from the selected companies' annual reports and the interview responses from experienced professionals in environmental accounting (Table 14, p.194), the author has compiled the evidence to critically analyse the research findings. Discussion is separated into IFRS and NON-IFRS sections to analyse the types of institutional pressures affecting companies around the globe.

5.5.1. NON-IFRS Companies

A total of six geographical locations formed part of the NON-IFRS companies' dataset for this study, covering a total of six accounting standards (Figure 5, p.129). As most of the NON-IFRS standards (US GAAP, Indian GAAP, etc.) follows a rules-based approach, compliance with the given accounting guidelines are mandatory. This meant that non-disclosures in the absence of official guidelines (i.e. for carbon emission allowances) would be considered compliance with the accounting standards, as there were no rules to begin with. Among all companies within the NON-IFRS group, Indian and Japanese corporations revealed noteworthy results.

Indian GAAP: As the Indian legislation prohibit companies from disclosing detailed information on nuclear fuel for security reasons, the sample company withheld information on this area. The company did not maintain inventory record for nuclear fuel and the charges were recorded on a provisional basis after receiving authorisation from the Department of Atomic Energy (NPCIL 2019, p.71). Similarly, the obligation for decommissioning lies with the national government, so the company did not record provisional liabilities towards the retirement of nuclear stations. However, the company disclosed these statements very clearly, on several occasions within the annual report as nuclear fuel and decommissioning liabilities, both, are material items in the financial statements. On the other hand, carbon emission allowances were nowhere to be seen in the annual report due to the lack of mandatory requirements for its accounting and disclosures in the Indian GAAP. Because companies are required to reveal all material transactions (whether by value or nature) in the annual reports, this company fulfilled its duties for disclosures, but only for the mandatory aspects. This pattern indicates that where there were clear accounting guidelines (i.e. for

nuclear fuel and decommissioning liabilities), the company followed them entirely, however the accounting practice was superseded by the institutional pressure from the national government (as the company could only reveal minimal disclosures due to the legal restrictions).

There's a clear sign that coercive pressures (from the national and local authorities) were dominant over normative pressures (from the Indian GAAP, societal expectations of carbon disclosures, industrial norms, etc), with the absence of any mimetic pressures due to the monopolistic status of the company in India. Additionally, if the Indian GAAP necessitated the company to account for and disclose carbon emission allowances, the sample company would have possibly adhered to that requirement as well (unless prohibited by the legislation). Using the company's dominant position, management could have also voluntarily shared their practices towards climate-change and GHGs, however, that stems from the national awareness, which varies across the globe (Lorenzoni and Pidgeon, 2006). India's reporting standards on carbon emissions are still at its emerging phase (Japee, 2018; Kumar and Firoz, 2019), which explains the low priority towards emissions' reporting. Also, in the rules-based accounting jurisdictions, management is more focused on compliance with the mandatory regulations and have minimal motivation towards voluntary measures. Interviewed experts also prioritised authoritative and publicity concerns as the top two reasons for the company's disclosure criteria. This suggests that the local GAAP plays a key role in promoting onerous accounting measures, i.e. actions for climate-change, as it is the most popular topic in the current decade (Kumar and Firoz, 2019). There's an argument that minimal social awareness and poor leadership by Indian GAAP (i.e. the accounting body) are a few reasons for the absence of emission allowances in the financial statements (Lovell and Mackenzie, 2011).

Japan GAAP: Entire sample of Japanese companies revealed unanimously identical results. Both, nuclear fuel and decommissioning liabilities were appropriately classified and recognised in the financial statements as per Japan GAAP. Results revealed that all companies disclosed relevant accounting practices in their annual reports, with reportedly similar narrative statements. Additionally, discounting rates used for decommissioning liabilities were identical among all competitors, and stood at 2.30% (Table 12, p.177). This was a noticeable observation as compared with its European counterparts (for example, Finland, Germany, Spain and Switzerland) where discounting rates varied significantly.

Because there aren't stringent accounting regulations on the determination of a suitable discounting rate for extended lifetime obligations (i.e. for decommissioning liabilities); selection of an appropriate rate is questioned by practitioners. An interviewed expert for this study also argued that the criteria for the discounting rate is dubious and it should be clearly stated in the notes to the financial statements (p.180). Not only this, all companies contributed in the asset retirement funds by making contributions to the Nuclear Reprocessing Organisation of Japan (Appendices, pp.392-93). On the other hand, the entire sample remained silent on their accounting policies for carbon emission allowances, thereby, observing similar practices by not providing such disclosures.

There are convincing indications of mimetic pressures (from direct competitors) in the Japanese society, possibly to gain legitimacy and a positive public opinion. While Japan has made it binding for companies to report on their carbon footprints (Wensen, et al., 2011; Comyns, 2018, p.68), making it a common practice to reflect on their emissions level, no accounting practices were found in the financial statements. None of the nine companies revealed financial information on carbon emission allowances. This suggests that normative pressures were relatively weaker than mimetic pressures in this context. Japanese companies are generally highly compliant with national laws and regulations, i.e. conforming to coercive pressures. While Japan being one of the top carbon emitters (Datt, et al., 2021), past study discovered that only 60% of the Japanese companies' sample revealed some environmental disclosures, however not so meaningful or quantifiable (Bahari, Alrazi and Husin, 2016; p. 79). Due to the lack of official accounting regulations for the recognition of emission allowances, none of the sample companies volunteered to share their individual practices. Rather, the entire sample conformed to the mimetic behaviour by not sharing anything on this area. *Albeit* the presence of carbon trading schemes and adherence to disciplined societal norms, the silence on emission allowances in the annual reports revealed a weaker performance of Japan GAAP in ensuring transparency of financial reporting. Because the sample companies were compliant with other accounting measures (as tested for this study), promotion of emission allowances disclosures by Japan GAAP could have resulted in mimetic behaviour among competitors on this area as well.

US GAAP: Other than the IFRS regulations, a larger proportion of global companies follows US GAAP, making it the second most popular accounting standards worldwide. The final sample for this study covered 52% of the NON-IFRS companies that follows US GAAP

(Figure 5 and 6, p.129). Being a rule-based accounting framework, compliance with regulated guidelines are rigid and straightforward (Schantl and Wagenhofer, 2021, p.4). The findings revealed that sample companies predominantly followed the US GAAP recommendations for nuclear fuel and decommissioning liabilities; adhering to consistency, conformity and transparency guidelines. However, the results for carbon emission allowances revealed intriguing facts. Most of the companies remained silent on their accounting practices for emission allowances. However, a few decoupled from the societal norms (i.e. non-disclosures on emission allowances) by voluntarily sharing their chosen policies on carbon emissions. Surprisingly, majority preferred to recognise purchased emission allowances as *inventories* and the obligations to surrender emissions as *provisional liabilities*, similar to the practice found in the IFRS companies' sample. However, the percentage of disclosures for the allowances and its related liabilities were a major mismatch (as many companies that did record allowances as inventory for example, failed to disclose its obligation towards the scheme/regulators). Minor accounting differences were observed for the granted emission allowances among the IFRS and NON-IFRS sample (Table 14, p.194). The key takeaway from this observation was that majority of the US GAAP sample were compliant with the mandatory accounting practices. Whereas, a few decoupled, and cherry-picked their practices that were similar to the international competitors (i.e. the IFRS companies). Also, the variety of accounting practices were limited to the temporary accounting recommendations given by both, the IFRS and FASB (i.e. to account for allowances as either intangible assets or inventories as a general category). Companies would refer to accounting bodies as their first source of information than other mediums, such as industrial practice, regulators and competitors, as per the interviewed participants of this study (Figure 44, p.199).

Findings pointed towards <u>decoupling from societal expectations</u> for carbon emission allowances. Compliance with the US GAAP guidelines were widely observed in all mandatory aspects, conforming to the <u>coercive and normative pressures</u>. Voluntary measures for carbon emissions disclosures were also taken by a few companies, however, at a minuscule scale. One possible reason for the lack of voluntary disclosures on a wider scale could be the lack of awareness. Pew Research Centre (2013) found that Americans were generally less aware of climate-change and greenhouse gases as compared with the Europeans. As accounting bodies play a major role in promoting emerging issues, it is fair to say that US GAAP's performance on carbon emission allowances were highly passive.

Other Accounting Standards: Other than Indian, Japan and the US GAAP, a few other accounting standards (i.e. Korean FRS, Hong-Kong FRS and Chinese GAAP) were also present within the NON-IFRS group of companies (Figure 5 and 6, p.129). The Korean FRS is the only standard that has provided almost all disclosures in the annual report, including carbon emission allowances and discounting rates for asset retirement obligations. Although, Korean FRS and Hong-Kong FRS both, are virtually similar to the IFRS standards, only the former has outperformed in mandatory and voluntary accounting measures (both) in comparison with the latter (that has remained silent on all major aspects). Chinese GAAP also provided some mandatory disclosures on nuclear fuel and decommissioning liabilities, however, refrained from participating in voluntary disclosures on emission allowances. The close business relationship between China and Hong-Kong could be a factor for companies observing similar accounting practices, where statutory compliance is highly observed; however, voluntary practices remains a second priority.

Findings from the Korean FRS demonstrates mimetic (competing with international competitors, following IFRS standards) and normative pressures (societal and professional expectations) more than coercive pressures. Because of the monopolistic situation in Korean case, it is difficult to justify whether the governmental and authoritative guidelines coerced the company in practicing high standards of accounting disclosures. However, the societal and professional expectations would more likely to be the reasons for its transparent approach towards the stakeholders. To appear more legitimate, the company may have adopted the industrial practice for carbon disclosures by mimicking their competitors for public acceptability. Interviewed participants for this study also suggested that legal and publicity reasons are the key factors that companies use to disclose relevant information in their annual reports (Figure 46, p.201).

5.5.2. IFRS Companies

A combination of European and Non-European companies made up the total of 21 geographical locations that formed part of the IFRS companies' dataset (Figure 5, p.129). IFRS standards are principles-based, i.e. a flexible approach in accounting measures are acceptable (Schantl and Wagenhofer, 2021, p.4). Additionally, companies are encouraged to voluntarily disclose their key accounting policies and practices. Because of the popularity of IFRS standards around the globe, stakeholders have higher expectations from the entities in taking a more transparent, comparable, reliable and verifiable approach. Harmonisation of

IFRS accounting standards has been a long-term project by its regulators (Adeem, 2020), and so far over 144 countries have already accepted IFRS's guidelines for all listed entities in their capital markets (IFRS – Why global accounting standards? 2022). With such an extensive network and the mission of a single set of global accounting standards, entities are expected to demonstrate a higher level of uniformity, professionalism and transparency in their financial reporting. At the same time, the race to compete with other companies in gaining public approval and legitimacy is highly competitive.

Since the withdrawal of IFRIC-3 *Emission Rights* in 2005, companies have been practicing numerous accounting treatments for carbon emission allowances, that in their professional judgement, were a better alternative. This practice is approved by accounting standards as per IAS-8 *Accounting Policies, Changes in Accounting Estimates and Errors* that permit changes in accounting policies and estimates to suit the business's needs (IAS 8, 2020). However, the revised Conceptual Framework necessitates that all material transactions (whether significant by value or nature) must be disclosed in the financial statements (Conceptual Framework, 2020). This suggests that recording carbon emission allowances as inventory instead of intangible assets might be acceptable, as long as the company has clearly disclosed their practice in the financial statements, especially if emission allowances are material by value or nature.

Findings of this study has revealed questionable results from the IFRS companies in the area of **voluntary disclosures**. Firstly, a wide-range of accounting treatments for carbon emission allowances were observed in the entire IFRS dataset. A handful companies maintained their position on this area by ensuring consistency of accounting practices. However, majority refrained from providing useful disclosures, even though emission allowances proved to be material to the financial statements (Figure 20, p.159 and Figure 27, p.167). Not reflecting on material transactions is against the principles of the Conceptual Framework 2018 and does not meet the quality criteria of useful financial information. A minor trend is observed among the sample that are gradually moving towards the recognition of emission allowances as inventory, as opposed to intangible assets (opposing the withdrawn IFRIC-3 guidelines). While some companies recognised provisions towards their obligation to surrender emission allowances to the regulators, a gradual decline in disclosures was also visible in the results (Figure 25, p.165). Findings revealed that the inspiration for disclosures and accounting treatments for carbon emission allowances in the absence of an accounting standard would

come from the accounting bodies (i.e. IFRS), followed by industrial experts (i.e. practitioners, auditors, academics) and competitors. Results implied that coercive and normative pressures would shape the companies' disclosure patterns. More active awareness of voluntary disclosures on emerging issues would improve transparency and comparability issues among competitors.

The dispersion in accounting practices for carbon emission allowances was benchmarked with accounting treatments for nuclear fuel and assets retirement obligations. Because the criteria of discounting factors for decommissioning liabilities is not very clear, a similar observation is found in this area as well. A wide-range of discounting rates were adopted by the IFRS sample, where companies in the same jurisdiction applied completely different rates, for example, companies in Finland, Germany, Sweden, Spain and Switzerland (Table 12, p.177). The implications of using an incorrect discounting rate for extended liabilities, i.e. decommissioning of nuclear power plants, would be astronomical (as explained in Table 1, p.76). Results of this study suggests the need for more clarity on voluntary disclosures by the accounting standard setters, i.e. the IFRS. No uniformity in practice was found, whether for carbon emission allowances or discounting rates. Findings highlight a presence of weaker normative pressures from the professional accounting bodies in the area of voluntary disclosures.

On the other hand, accounting practices for nuclear fuel and decommissioning liabilities exposed a higher level of standardisation in practice. Entire IFRS dataset pursued fundamental and enhancing qualitative characteristics of useful financial information given in the revised Conceptual Framework (2020). As nuclear fuel and decommissioning liabilities, both, are highly material to the financial statements (Figure 10, p.144 and Figure 35, p.181), non-disclosures in these areas were either non-existent or negligible. However, materiality was not the main factor in ensuring higher compliance with IFRS standards, but normative and coercive pressures by the accounting bodies, regulators and societal norms. As pointed out by the interviewed experts for this study, official requirements and positive publicity are the two main reasons that companies use to decide whether or not to create a disclosure in the financial statements. Whereas, material significance of the concerned items would be the third preference in the line of useful disclosures. Additionally, experts pointed towards accounting bodies as the main source of guidance for companies in need of assistance regarding accounting treatments. In the absence of an official accounting standard for carbon emission allowances, relevant guidelines by IFRS would provide a useful

perspective to the practitioners. Since 2005, carbon emission allowances (renamed as *Pollutant Pricing Mechanisms* in 2015) have been removed from the active panel agendas, subtly promoting its non-importance by the accounting bodies. Up until recently, KPMG Ltd. wrote a letter to the IASB's board asking them to place Pollutant Pricing Mechanisms on their priority list (KPMG IFRG, 2021, p.3). This sends a signal to IFRS companies that carbon emission allowances are not important for financial accounting purposes, as sustainability reporting and reduction in carbon footprints would simply please the stakeholders for public approval. It has become a societal norm in Western societies, particularly in Europe (that actively promotes climate-change issues), to report on sustainability measures due to a higher public concern (Pew Research Centre, 2013; Rowlands, 2000). Mandatory reporting on GHGs and sustainability measures have generally improved sustainability reporting by corporations (Gallego-Alvarez, et al., 2017; Wensen, et al., 2011). This indicates that coercive and normative pressures play a higher role in shaping corporate practices and could be the main key towards harmonisation of accounting standards worldwide.

Concerning the implications of incorrect accounting treatments, it was found that window-dressing of the financial statements, inconsistent financial reporting and lack of stakeholders' confidence would be the key resultants (Figure 45, p.200). Focusing on the fundamental and enhancing characteristics of useful accounting information (IFRS, 2018), financial statements would not provide a faithful representation of accounts in the absence of material misstatements. As per the results of this study, carbon emission allowances were material, both by nature and value. Until an official accounting standard is underway, mandatory disclosures is one of the methods in promoting transparency and comparability of financial statements worldwide. As per the findings, companies are more likely to report their accounting practices if officially required or expected to bring positive publicity to the company. Thereby, implying that coercive and normative pressures are the way to enhance the qualitative characteristics in financial reporting, resulting in a good accounting practice.

5.6. Literary and Theoretical Contribution

This study fills a huge gap in the literature by accumulating the accounting practices of a global sample of all owners of nuclear power plants. Accounting treatments for carbon emission allowances are benchmarked with nuclear fuel and assets retirement obligations to identify global trends. All prior studies have either focused on fewer case-studies or European companies, and no other research (as per the knowledge and research done by the author) have covered data of nuclear power plants at this scale. Findings of this study conforms towards the institutional pressures that shapes the companies reporting behaviour. It was observed that only material significance would not ensure greater transparency in financial reporting. In fact, legitimacy and public acceptability are the upmost criteria in ensuring the qualitative characteristics of useful financial information. Accounting bodies are the main source of guidance in the absence of an accounting standard, followed by industrial and competitors' practices. This signifies a general reliance on authoritative guidelines in ensuring comparability and transparency of financial reporting. Additionally, financial statements of the owners of nuclear power plants are not fully compliant with the qualitative characteristics of useful financial information as mentioned in the revised Conceptual Framework (2020). While the chosen accounting practices of the utility and energy companies were consistently applied; they were not comparable and transparent in reporting carbon emission allowances.

This study also offered the experts' viewpoint on the classification and recognition of carbon emission allowances in the financial statements. Astonishingly, experts' recommendations were mainly driven from the foundations of IFRS accounting guidelines. Having an extensive experience in environmental accounting, interviewed participants' familiarity with this concept were vain. Only a small percentage of the experts were fully familiar with the financial accounting issues of carbon emission allowances (Figure 42, p.189). Upon the acknowledgement of the classification and recognition issues for emission allowances, experts used IFRS standards and ground knowledge to support their reasonings. It was suggested to recognise emission allowances as intangible assets, similar to the advice given in the withdrawn IFRIC-3 *Emission Rights*. However, the obligation to surrender the emissions back to the regulators must be treated as a contingent liability, instead of provisions (as per IFRIC-3). However, the empirical data observed a different approach in

practice. This signifies the presence of professional standards and norms as the major inspiration behind the expert opinion (i.e. normative pressures), but the reality depicted a slow-moving trend towards 'what fits better' approach, unless made mandatory.

Coercive and normative pressures by the legislative and accounting bodies and societal norms would improve disclosures in the financial statements. While institutional pressures could vary based on the geographical location of a company, this study has revealed that more than one pressures are behind the organisational reporting pattern. Whether a higher presence of mimetic pressures in Japan or coercive pressures in India, more than one types of pressures were the reasons behind the organisational disclosures. Some prior studies have found more evidence of coercive and normative pressures (Carpenter and Feroz, 2001. p.593; Pedersen, et al., 2013. p.357; Mookdee, 2013. p.163; Situ, Tilt and Seet, 2020. p.1618). Whereas, many recent studies have found indication of normative and mimetic pressures (Amoako, et al., 2021. p.1; Dagiliene, et. al, 2020. p.10). Results for this study indicates that national legislation, accounting standards and societal norms plays a key role in shaping organisational reporting pattern, similar to the findings by Gallego-Alvarez, et al., (2017) and Grosbois and Fennell (2022).

Institutional theory is primarily focused on the external influences (DiMaggio and Powell, 1983) by neglecting the internal factors, such as parent-subsidiary relationships, management incentives attached to the financial metrics, etc. Additionally, the theory broadly states that all three institutional pressures could come from any external factors. However, the theory failed to rank the pressures in terms of severity of rising institutional pressures. In monopolistic situations, as observed in the case of India and South Korea (where all nuclear power plants are owned by a single company), leading companies would not mimic smaller competitors, as the dominant position of the company can shape its own legacy. Also, coercive pressures could always overrule other pressures, as regulators would make it harder for companies to operate in non-compliance with the legislation. Perhaps, coercive pressures would always affect corporations in most circumstances, and therefore, should be considered as the most severe among the three pressures. On a theoretical level, results for this study contributes towards questioning the institutional pressures based on its severity. Because legislation can easily override the reporting standard, coercive pressures, should be considered as the dominant among all by default. Additionally, normative pressures would be mostly affected by the geographical locations and the societal beliefs.

Certain organisations, such as accounting bodies, plays a vital role in ensuring normality. For example, if IFRS kept the accounting issues for carbon emission allowances on their active agendas, practitioners would have been more familiar with the practical issues; resulting in better disclosures in the financial statements. This meant that normative pressures created by communal organisations have a non-legitimate power towards legitimacy. This study argues that the potency of institutional pressures is not discussed in the institutional theory. Findings can be used to rank the pressures in order from high to low severity levels, where coercive pressures would always be present (whether actively or passively) by default, followed by normative and occasional presence of mimetic pressures.

Normative pressures open a discussion on whether accounting bodies are doing enough in protecting wider-stakeholder's interests? Differences in financial reporting are mainly caused by economic and social settings, cultural differences, local legislations and the requirements of regulatory information from local businesses (Barth, Landsman and Lang, 2008). Harmonisation of accounting standards worldwide is a major project currently undertaken by IFRS. Some of the key benefits of adopting IFRS accounting standards includes transparency, accountability and efficiency. The focus is on the financial statements as they are used to make informed business decisions (Daske, et al., 2008). The idea behind harmonisation is to create a uniform set of globally approved accounting regulations for all businesses that would improve understandability and enforceability of global standards (Kozuharov, Ristovska and Blazeska, 2015). However, comparability and verifiability are the pressing concerns of the stakeholders that represents a good accounting practice, as identified in this research. Additionally, results have proven that transparency has not been the biggest achievement among the IFRS sample due to the lack of an accounting standard for carbon emission allowances. IFRS's harmonisation goals have a lot more to achieve towards the reduction of comparability issues across borders (Carmona and Trombetta, 2008). The adoption of IFRS standards have been quite popular for the last two decades due to their focus on harmonisation goals (Barth, Landsman and Lang, 2008). While many studies have reported the positives of adopting IFRS standards in many countries (Ahmed, Neel and Wang, 2013; Capkun, Collins and Jeanjean, 2016); no improvement in accounting quality has been reported in recent studies as well (Christensen, et al., 2015; Doukakis, 2014; Lin, Riccardi and Wang, 2012). It can be argued that normative pressures from the accounting bodies have the power to standardise stakeholders' expectations of the financial statements. In other words, if IFRS has continued promoting voluntary reporting of carbon

emission allowances (even if the accounting standard wasn't ready to be applied in practice), a higher disclosures level would have been found in the energy and utilities industry.

Evidence of more than one type of institutional pressures were found in both datasets (i.e. IFRS and NON-IFRS). Among all, **coercive and normative** were the dominant pressures. It was argued that geographical locations, societal norms and local legislations plays a vital role in determining organizational disclosure patterns.

Findings of this study can be used in the research domain to study the effects of normative pressures by accounting bodies and societal norms in enhancing the quality of financial reporting in other industries.

VI: CONCLUSION

At the present day, with regards to the global green and sustainable reporting, accountability by the owners of nuclear power plant is inadequate. Sustainable measures by businesses have become a progressively vigorous requirement nowadays. Entities must exercise useful control of resources in the present, and for a sustainable future. Thus, the enthusiasm for eco-friendly or green reporting has mounted immensely across all industries, especially in the Energy sector, mainly with regards to their accountability as a business (Gallego-Alvarez, et al., 2016).

One of the massive difficulties threatening our lives and the planet is climate change caused by the greenhouse gases. Several attempts have been made to curb emission levels by nuclear power plant operators, including the launch of Kyoto Protocol to restrict the emissions level. In order to curb the rising carbon emissions level, and in accordance with the renowned Kyoto Protocol, emission-trading schemes had been launched. Among all schemes, the European Union Emissions Trading Scheme (EU ETS), started in 2005, caught the most attention and became the most popular scheme in Europe. Curbing carbon emissions on a global scale has gained momentum since the launch of EU-ETS scheme. Concerns regarding the application of the scheme in the annual reports of the members companies have unsealed ongoing dialogues with the involvement of all kinds of stakeholders (Haupt and Ismer, 2011).

IFRIC had launched IFRIC-3 *Emission Rights* in 2004 to address questions relating to the accounting for carbon emissions in financial statements produced by the emitters. However, the interpretation did not survive long, and was withdrawn within a few months due to the negative response received by its users (Bebbington and Larrinaga, 2008). The analysts labeled this method as 'Mixed Presentation Standard', as it might result in credible instability in the stated income (ACCA, 2010). Since its withdrawal, accounting standard setters have so far issued no guidelines, due to which, discrepancies in the accounting policies for carbon emissions accounting have continued to emerge (Haupt and Ismer, 2011). The project of finding the most appropriate accounting solution for nuclear power plants and their activities have been one of the lowest priorities of accounting standards setters. Lack of any firm guidelines has created a situation of 'accounting mayhem' (Romic, 2010). Because carbon emission allowances are still facing classification and recognition issues in the financial

statements; comparability and transparency issues, along with the multiplicities in practice, continue to ascend (Montero, Calderon and Dias, 2020). To address this complex issue that has been on hold for several years now, an official accounting interpretation by IFRS is urgently required.

This chapter starts with the summary of research questions, and outlines individual chapters of this study. It followed by a review of the implications and limitations of this research. Future research areas and the use of results are presented later in this chapter, followed by a conclusive summary.

6.1. Review of Research Questions and a Summary of the Thesis

To investigate the accounting treatments adopted by carbon emitters in the Energy sector, a global perspective of carbon emissions market would offer a valuable viewpoint. As the issue of accounting for carbon emissions in the financial statements is still gaining public awareness, not many prior studies have been conducted on this niche topic. Because of the widespread reach of the EU ETS scheme, most researchers have covered the European practices on this area. One key element elaborated in the prior studies were poor quality and minimal disclosures in the financial statements (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Lovell, et al., 2010; PWC/IETA, 2007, Warwick and Ng, 2012). Disclosure requirements for financial accounting purposes are currently on voluntary basis, leaving the emitters to decide whether they want to reveal or hide relevant information regarding carbon emission allowances in their annual reports. Additionally, due to the absence of any authoritative accounting guidelines on the classification and recognition of emission allowances, emitters can exercise their own independent judgement to take such steps, or simply ignore them. In order to find a possible solution to this problem, the author has selected a global sample of the owners of nuclear power plants, under various accounting frameworks, to outline common practices on a global scale. The researcher has also interviewed experienced professionals to discuss their perspective on the prevalent practices, and accounting solutions based on their judgement would provide an optimum solution.

The **aims and objectives** of this study are fourfold, they are as under:

1. To outline the prevalent accounting treatments used for carbon emission allowances, benchmarked against nuclear fuel and asset retirement obligations, by the companies following IFRS framework.

2. To understand the expert proposal on accounting for carbon emission allowances in the financial statements.
3. To pinpoint the main inspiration behind the chosen accounting treatments and disclosures for emission allowances by their emitters.

4. To discover the elements of good accounting practice for carbon emission allowances as per the accounting professionals.

To answer the research objectives with the help of empirical analysis, the following **research questions** were designed.

1. How do the owners of nuclear power plants classify and recognise carbon emission allowances, in comparison with nuclear fuel and asset retirement obligations, in their financial statements based on IFRS framework?

2. What are the possible accounting solutions for carbon emission allowances based on the experts' opinion?

3. What are the key sources of accounting information, and the basis of disclosures in the absence of a particular accounting standard for the owners of nuclear power plants?

4. What are the qualitative characteristics of useful accounting information for carbon emission allowances, in light of the constituents of good accounting practice?

To meet the objectives of this study and to answer the research questions, prior studies along with the IFRS standards, were reviewed in the second chapter to discover the likely classification and recognition of carbon emission allowances. Based on the IFRS framework, emission allowances have characteristics to be classified as inventory, financial instruments and intangible assets. The former accounting guidelines given under IFRIC-3 *Emission Rights* identified emission allowances as intangibles, however the aspects of trading that later came into the picture has made the classification somewhat questionable based on the

emitters wide-ranging motives.

Not all entities now receive allowances as gratis from their governments, and the ultimate goal is to remove the free allowances entirely, by making all emitters to pay for their carbon footprints – to make them purchase the allowances (Europa, 2021a). The distinction between the allowances acquired for business-use and trading purposes have created difficulties for the emitters as they would need to separate the two in the financial statements. Because of the absence of an official accounting standard by IFRS, entities can voluntarily disclose their chosen accounting treatments in the financial reports. With the general assumption from the principles-based framework, i.e. IFRS, it is expected that the entities would maintain a high standard of accounting practices, and would reveal all necessary disclosures that are material, both in nature and value, to the wider-stakeholders (Conceptual Framework, 2020).

A handful of past studies have been done on carbon emission allowances, that have discovered the presence of multiplicities in practice (Allini, Giner and Caldarelli, 2018; Ayaz, 2017; Balatbat and Wang, 2010; Elfrink and Ellison, 2009; Lovell, et al., 2010; Steenkamp, Rahman and Kashyap, 2011; Mookdee, 2013; Mookdee and Bellamy, 2017; Montero, Calderon and Dias, 2020; PWC/IETA, 2007; Warwick and Ng, 2012). Companies have been classifying and recognising these allowances from a wide-ranging option including inventory, intangibles, other current assets and expenses, amongst other categories. In terms of their recognition criteria, entities have been valuing emission allowances at cost, fair value, market value, nil value, zero value and carrying value. Such an extensive selection of classification and recognition methods would result in material misstatements, and would not represent a true-and-fair view of the annual accounts. Transparency, comparability and faithful representation are the top qualities that have been affected by the application of numerous accounting practices by carbon emitters (Montero, Calderon and Dias, 2020).

To understand the primary intentions behind the use of varied accounting treatments by the owners of nuclear power plants for carbon emission allowances, institutional theory has been used as a **theoretical lens** for this research. Because of the influence of institutional organisations, such as, governments, accounting bodies and other regulators, participating entities have to comply with institutional pressures to ensure smooth operation of daily business activities. Isomorphism and decoupling are the two aspects of institutional theory

that are discussed in this study. Because carbon emitters are bound by the rules of carbon trading schemes, such as EU ETS in Europe, certain rules must be followed, i.e. surrendering of carbon allowances to the regulators, equivalent to the actual emissions level in April each year, where late submission will entail penalties (EU ETS, 2015, p.101). Similarly, emitters who are entitled to free allowances or seeking support from the government would comply with the coercive pressures from the administration. Conversely, accounting guidelines are endorsed by professional accounting bodies, that the participating entities must adhere to for annual accounts. Among other requirements, the revised Conceptual Framework (2020) serves as a foundation of all accounting guidelines, and the followers of IFRS framework are required to implement qualitative characteristics of useful accounting information in all accounting treatments. Additionally, the norms of the society, for example, the concerns of climate-change have created more public awareness than there was a few years ago. Stakeholders expect the businesses to be more responsible in their carbon footprints, therefore, sustainability reporting has become a norm for most corporations as part of their annual reports. Such demands from the professional organisations and society are normative pressures affecting the owners of nuclear power plants. In the absence of a suitable accounting lens, and to gain public acceptability, companies might imitate the actions of the market leaders or other competitors by adopting their accounting treatments for carbon emission allowances. Such imitation would be mimetic pressures under the institutional theory. Any breaks between the official narrative and market practice could be the result of decoupling. Due to the relevancy of various institutional pressures surrounding the owners of nuclear power plants, institutional theory served as the most suitable theoretical lens for this study.

Following the theoretical framework, this research is conducted by employing **mixed-methods research** approach. The data for this study is collected by using both qualitative and quantitative techniques, i.e. by the use of publicly available Annual Reports and a set of interviews. With the use of convergent parallel design and content analysis technique, data is analysed to answer the research questions. To address the limitation of prior studies that has largely focused on European entities, this study has collected global data with the use of official IAEA database. As the author's expertise are mainly based on the IFRS framework, all owners of nuclear power plants that follows IFRS guidelines were used to include total population in this research. To gain meaningful insights, NON-IFRS companies were also selected using subjective sampling method to perform competitive benchmarking. As per

the authors understanding and research, no other studies have been done using the entire sample of the owners of nuclear power plants. Additionally, prior studies have not established a link between the accounting practices for carbon emission allowances, nuclear fuel and asset retirement obligations to identify the motivation for voluntary disclosures. This study **fills a gap in the literature** by offering a global sample research analysis.

A total of 443 operational nuclear power plants are currently owned by approximately seventy-one companies. Because of the limitations of publicly available data for a few companies within the IFRS sample, a total of twenty-seven companies out of seventy-seven were used for the **final sample**. For a like-to-like comparison, twenty-seven NON-IFRS companies were also selected, covering over 76% of the total population. Within the comparative sample, various accounting frameworks such as, US GAAP, Japan GAAP, Indian GAAP, and others were included. Not only the comparison of global practices for carbon emission allowances, other complex areas during the lifecycle of nuclear power plants were also benchmarked, that includes nuclear fuel and asset retirement obligation. **Annual reports** of the Year-End 2019 were used for benchmarking, however to test consistency and materiality issues, three years of financial statements, for the Year-End 2017, 18 and 19 were used for the IFRS sample. **Semi-structured interviews** of twenty participants who have long-term experience in the area of environmental accounting, in different industries were selected to share their expert opinion on this complex issue of accounting for emission allowances. Confidentiality, privacy and other ethical issues related to human participants in a research were addressed as per the ethical guidelines of Anglia Ruskin University. Other ethical concerns for using secondary data were also dealt with as per the ethical codes laid out by the professional accounting body, ACCA. This study has received ethical approval from Anglia Ruskin University, and written consent from the interviewed participants.

After analyzing the data, **results** have revealed that IFRS examined companies mainly recognised granted **emission allowances** as intangible asset with equal preference towards nil value and cost. On the contrary, purchased emission allowances for business-use were recorded as inventories at cost, however inventories for trading allowances were recognised at fair value. The practices of NON-IFRS companies have revealed some common practices to that of IFRS entities, i.e. they have also recorded both types of purchased allowances as inventories, but mainly at cost. With regards to the granted emission allowances, NON-IFRS

entities have recognised them as inventories at nil value and cost or net realisable value, instead of intangible assets as in the IFRS sample. This showed the global Energy sector prefers inventory method for purchased allowances as a whole, instead of intangible asset recommendation given by the former IFRIC-3 *Emission Rights* interpretation. The results of this study are more compatible with Allini, Giner and Caldarelli (2018, p.2203) who found the sample to be more lenient towards inventory than intangible method. The results were in contrast with Ayaz (2017, p.478), Black, (2013, p.237), Lovell, et al., (2010, p.28), Steenkamp, Rahman and Kashyap (2011, p.21), PWC/IETA (2007, p.11) and Warwick and Ng (2012, p.64), with regards to the recognition of purchased allowances that were recognised as intangibles in the prior studies. However, the intangible asset criteria for granted allowances remained identical across all of the abovementioned past studies, including the findings of this research.

When asked from the experts about their suggestions on the classification of emission allowances, their viewpoints were driven from the IFRS guidelines, as they have also backed the intangible asset criteria for both, granted and purchased allowances. Experts suggested that there should be no difference in the classification of allowances, whether received as gratis from the State, or purchased from the marketplace either for business-use or trading purposes. The suggestions made sense as it would be difficult to distinguish allowances held for various purposes, mainly as they don't physically exist unlike non-current assets held for sale. While the NON-IFRS entities have displayed uniformity as all types of allowances were predominantly classified as inventories, IFRS companies were still practicing two different methods (inventories and intangibles) at the same time.

Notwithstanding the fact that a majority of NON-IFRS companies (between 67% to 81% of the sample) did not disclose their accounting policies for both types of allowances. Similarly, a noticeable percentage (33% to 59%) of IFRS entities also withheld ample disclosures on their financial accounting practices for carbon emission allowances. Based on the materiality testing of IFRS sample, it was observed that at least 47% of the sample had material values (of carbon emission allowances) based on the benchmark of Total Assets = 1%. Considering the profitability benchmark of Profit Before Tax > 5%, about 82% of the sample's emission allowances figures were material to their financial statements for the Year-End 2019. As the auditors calculate performance materiality values slightly lower than the set scales (depending upon a case-by-case basis), this would mean that carbon emission allowances

are highly material to the financial statements of the owners of nuclear power plants. Not disclosing relevant details about material values in the annual reports would result in a qualified audit opinion. Since there isn't an enforceable accounting standard by IFRS, auditors cannot impose such guidelines, as the management can exercise their independent judgement for disclosing or not-disclosing the accounting criteria. The results of high level of non-disclosures among the global sample were similar to the findings by Batker and Harrington (2018), Montero, Calderon and Dias (2020) and Romic (2010).

With regards to the results for **emission allowances obligations,** it was observed that more than half (56%) of the IFRS sample recognised their duties to surrender allowances to the regulators at the year-end. Whereas, only a minor percentage of 4% of the NON-IFRS sample revealed their accounting practices in the similar manner, both datasets, by recognising provisions for the obligations to the State. Provisions were recognised mainly at cost by IFRS and carrying-value by NON-IFRS surveyed companies. The results to recognise the provisional liabilities were similar to Ayaz (2017), Black (2013), Lovell, et al., (2010) and Steenkamp, Rahman and Kashyap (2011). However, expert opinion slightly differed from the global practice, as the professionals believed contingent liability is likely to be a better contender than provisions. It is because no monetary values are involved in the surrendering process. Plus, if the company has sold excess allowances to other companies, they are not required to surrender to the regulators. For that reason, the obligation to match the actual emissions level are contingent upon the actual emissions level. Having said that, 30% of the interviewed participants also supported the current practice, and backed the idea of provisions.

When tested for materiality, it was observed that the obligations for emission allowances were material to the financial statements. Based on the IFRS sample, profitability benchmarks of Profit Before Tax > 5% and Operating Profit > 2% revealed materiality between 91% to 100% of the sample. Using the asset-based benchmarks, at least 55% of the examined companies values for provisional liabilities were material on the basis of Total Assets = 1% scale. Once again, a hefty percentage of 96% of NON-IFRS and 44% of IFRS companies did not provide relevant details about their obligations to the State. For such material values, understatement of liabilities would result in overstated assets and profitability levels, that would provide an unfaithful representation of the financial statements.

To cross-examine the results of carbon emission allowances; other complex areas in the lifecycle of nuclear power plants, i.e. nuclear fuel and decommissioning liabilities were also studied in this research. It was to examine if there's a correlation between materiality and authoritative guidelines vs the disclosure criteria and uniformity in accounting practice. Based on the results of initial **nuclear fuel**, the total population of IFRS sample disclosed their recognition criteria, with the major preference towards inventory method. Whereas, 93% of the NON-IFRS sample recognised fuel, mainly as property plant and equipment followed by inventory method. Nuclear fuel was highly material, ranging between 63% to 93% in the Year-End 2019 within the IFRS companies. Although there isn't a concrete statement from IFRS pertaining to the classification of fuel as either inventory or property, plant and equipment, guidelines are very clear on the distinction between a current and a non-current asset. Given, both the higher materiality and ample authoritative advice, it was obvious that companies would comply with the IFRS guidelines, so other areas were examined for further elucidation.

Because spent-fuel must be kept secured for a longer duration due to the presence of radioactivity, owners of the nuclear power plants are obliged to record their obligations towards the asset retirement obligations (unless it belongs to a different organisation). Spent fuel provision was recognised by 93% and 89% of both IFRS and NON-IFRS sample, respectively. Even in cases where the liability does not belong to the owners, i.e., the company adopting Indian GAAP, ample disclosures were given in the annual reports clarifying the situation. In fact, for the initial fuel, the same company stated that disclosures were not given due to the confidentiality agreement with the Indian government. This revealed strong evidence of coercive pressure behind the disclosure practices.

Another aspect of the **asset retirement obligations** are the decommissioning liabilities. Almost all of the companies in both datasets recognised provisions for their future commitments. Materiality levels stood on average at 88% for IFRS companies for the three-years period between 2017 and 2019. However, discounting rates for such extended liabilities that covers the period of several decades; lack of reasonable guidelines by the IFRS has resulted in companies applying variable rates to value asset retirement obligations. Once again, although material values and authoritative guidelines have resulted in major compliance by the participating entities, voluntary measures (i.e. the selection of discounting rates) have resulted in greater diversity. Data has revealed that IFRS companies in the same

jurisdictions, i.e. Finland, Spain and Sweden, have applied different discounting rates, whereas all companies in Japan (under the NON-IFRS sample) applied the common rate of 2.3%. Japanese companies have also demonstrated uniformity in practices for asset retirement funds by allocating secure segregated funds for decommissioning obligations. However, for emission allowances and related obligations, none of the companies in Japan revealed any information in their annual reports. There's a strong evidence of mimetic pressures in the Japanese scenario for companies imitating the practices of their competitors. Similarly, the presence of other institutional pressures was found for not revealing disclosures that were not expected of them as per the Japan GAAP. That meant, non-disclosure for emission allowances was actually in acquiescence with the administrative guidelines.

To examine the **sources of accounting information** in the absence of regulative guidelines, and the main reasons for not disclosing material values in the financial statements, twenty experts with long-term experience in environmental accounting were interviewed. They were asked to elaborate on the key places to seek guidance for complexities in accounting. Experts pointed towards the accounting bodies as their first preference, followed by the experienced professionals for relevant advice. As accounting guidelines for independent situations are driven from the general definitions of assets and liabilities within the Conceptual Framework (2020), experts' suggestion to comply with the founding principles perfectly made sense. Following the practices of competitors was the least preferred choice of interviewed participants. The implications of incorrect accounting treatments would result in window-dressing issues and inconsistent financial reporting, that would not offer faithful representation of the annual accounts. Given the high percentage of non-disclosures pertaining to carbon emission allowances, it is fair to say that the IFRS entities did not fully adhere to the qualitative characteristics of useful financial information given in the revised Conceptual Framework (2020).

When asked about the **disclosure criteria** in the absence of an official accounting standard, such as the case for carbon emission allowances; experts were of the opinion that entities mainly provide disclosures if they are legally required or would have a positive impact on the company. That meant, any information that could attract negative publicity would be entirely avoided by the management. As per the accounting professionals, materiality was not the chief reason that would ensure relevant disclosures. Incidentally, the results of carbon

emission allowances revealed that despite the material significance to the financial statements of IFRS entities, disclosures on the accounting treatments were noticeably missing from the annual reports.

Given the **qualitative characteristics of useful accounting information** within the Conceptual Framework (2018), experts were asked to outline the key qualities in the case of accounting for carbon emission allowances. Participants believed that verifiability and comparability of accounting information must be the top priority (similar to the results found by Mookdee, 2013, p.185), followed by relevance and faithful representation. Coincidentally, experts placed all elements at the same position, but relevancy on the fifth place as the elements of good accounting practice. As per the interviewed participants, if the information can be verified and easily compared with the prior years and industry participants, then the authenticity of the information can easily be proven. Faithful representation by accurate accounting values, free from bias, without any omissions and errors, would reflect the true-and-fair view of the annual accounts. Based on the results of this study for carbon emission allowances, consistency was highly present in the applied accounting treatments by the IFRS sample (also found by Romic, 2010, p.70). However, the information was not comparable with other entities given the varied accounting principles applied in practice. Transparency was also compromised, as materially significant values were not present in the financial statements of the surveyed entities that followed the IFRS framework. This was also proven in a recent study by Montero, Calderon and Dias (2020, p.15) that stressed on the transparency and comparability issues in the reporting practices by carbon emitting entities (Allini, Giner and Caldarelli, 2018, p.2204).

Based on the findings of this study, materially significant carbon emission allowances were largely absent from the financial statements of the IFRS entities. It can be argued that materiality is not the decisive, but it could be one of the factors to ensure completeness of accounting disclosures. In fact, institutional pressures are more likely to result in uniform voluntary disclosure practices (Shi, Magnan and Kim, 2011) as studied in the case of Japan GAAP. Amongst all three types of institutional pressures, normative and coercive pressures by the accounting bodies, regulators and societal expectations would ensure a higher compliance with IFRS standards. The option given by the IFRS to the carbon emitting entities to voluntarily select the accounting procedures, and disclosures for carbon emission allowances, is the cause of multiplicities in the industrial practice (Montero, Calderon and

Dias, 2020). Variable accounting applications are the resultant of the lack of authoritative accounting interpretation by the IFRS (Haupt and Ismer, 2013). Under the principles-based approach, participating entities are more likely to practice uniform accounting methods in the presence of an accounting interpretation for carbon emission allowances, i.e. under the lens of institutional isomorphism.

6.2. Implications of the Study

As the issue of accounting for carbon emission allowances is still gaining momentum, very few studies have been conducted on this area. Most of the prior studies have either only examined the European context, or conducted case-studies on a smaller sample. As per the author's research, no study has been done on a global sample that has benchmarked IFRS vs NON-IFRS practices for carbon emission allowances on the majority population of the owners of nuclear power plants. This study **fills a big gap in the literature** by offering a comprehensive analysis of worldwide accounting practices, not only for carbon emission allowances, but also a comparison with other complex areas in the lifecycle of nuclear power plants (i.e. nuclear fuel and asset retirement obligations). The knowledge gained from this research contributes on both theoretical and empirical level. Several stakeholders including the law makers, governments, practitioners, auditors, academics and others can benefit from the findings of this study to ascertain the current market practice for carbon emission allowances, as well as the expert's opinion that could be used for further analysis. Currently, an accounting interpretation to tackle the classification and recognition issues of emission allowances in not even on active agendas of IFRS organisation. This study aims to create further awareness, and highlight the necessity of authoritative guidelines to ensure transparency and comparability of accounting information. As the values have proven to be materially significant to the financial statements, the results of this research will stress the importance of further action by the accounting bodies to protect the interests of wider-stakeholders.

6.3. Research Limitations

This study has relied upon the entire sample of the owners of nuclear power plants that follows IFRS framework. Three years of annual reports for the Year-End 2017, 18 and 19 were used to draw deeper insights, however, for benchmarking against NON-IFRS entities, only 2019 annual reports were used. The author believed that consistency in accounting

applications were not required for benchmarking exercise, but only for the comparison of applied accounting treatments. It is because the aim of this study was to outline the accounting practices by IFRS entities only. For further elucidation, three years of NON-IFRS entities reports may have been used to test consistency in the second sample as well, to ascertain whether accounting policies were consistently applied in the other sample. That might have offered further insights into the NON-IFRS accounting practices, but it wasn't the objective for this study.

Secondly, the number of interviewed accounting professionals could have increased. Due to the complex nature of accounting for carbon emission allowances, surveys might have not been a good idea as the participants might not fully brainstorm their ideas before selection. Interviews offer the participants a chance to do some research beforehand, gather their thoughts and have a productive discussion during the interview. Because of the COVID-19 pandemic, it was difficult to reach out to the participants as their priorities had changed, either due to the health, economical or financial issues. Although conducting online interviews is a lot easier than otherwise, getting the participants to spare some time during the global calamity was quite challenging. Nevertheless, twenty participants with extensive years of experience in the area of environmental accounting were interviewed who had contributed a pool of knowledge in this study. More candidates may have provided additional insights that could have offered more interesting results.

Lastly, interviewing representatives of the surveyed companies may have gained direct responses and underlying reasonings for their selective accounting policies. It wasn't possible to arrange interviews with the sampled companies as the majority have simply ignored the interview requests, and some never agreed to the interviews. The author reached out to the companies directly, and also the key employees indirectly via LinkedIn for anonymous interviews, but none of them agreed, probably due to work protocols. However, annual reports are externally audited, and represents the key verdict of the company's management to its wider-stakeholders. The author believed that annual reports provide authentic and reliable information that was sufficient to answer the research questions for this research.

By the time this study was completed, IAEA database had released an updated global record of nuclear power plants (IAEA, 2021). The total of 443 operational nuclear power plants

were reduced by one, which doesn't have a major impact on the collected data sample. However, a newer version is expected to be released in July 2022. It is advised that new studies are to be done using the most recent version of IAEA database.

6.4. Author's Recommendation

To reduce comparability and transparency issues in financial reporting, the standardisation of accounting transactions and disclosures is tremendously vital. It is recommended for international accounting bodies to issue a precise standard for the Energy sector, with special clauses for the operators of nuclear power plant to put a stop to the mismatching issues. Stakeholders including accountants, auditors, employees, analysts, academics and others, would advantage greatly from this, as they have to deal with such complicated accounting issues by exercising their independent judgements. A uniform accounting standard is more likely to present a true-and-fair view of the annual accounts.

Because the next crucial stage (Phase 4) of the EU-ETS scheme has just began in 2021 (Europa, 2021a), the significance for nuclear power plants accounting will continue to materialise. Especially with regards to carbon emission allowances, since most of them would be sold out very soon. Compulsory disclosure requirements, and higher scrutiny of accounting practices is an utmost necessity to improve consistency in financial accounting in the Energy sector.

Based on the findings of this study, and the discussions with the interviewed accounting professionals, the author has drafted the following points pertaining to the accounting for carbon emission allowances, as well as for nuclear fuel and decommissioning obligations. The key points are as below:

1. **Carbon emission allowances** are assets without physical substances and therefore, meets the definition of **Intangible Assets**. However, the allowances can be used both for production and trading purposes. If the purchases were made purely to benefit from the fluctuations in the market price of the allowances, the criteria of financial instruments would come to light. Because emissions can be created without physically holding the equivalent allowances (as they are surrendered annually in April), production can continue without the presence of allowances. For that reason, it cannot

be treated as an inventory item. As the cap-and-trade schemes, i.e. EU ETS, will gradually phase out the free allocation of allowances, the trading market will become more competitive as the fall in free supply will increase the price per allowance. However, trading won't stop unless the demand has completely phased out. Having said that, if the regulators stop giving out allowances as gratis, there will only be purchase option left for business-use and trading, both. Based on the characteristics, and not the intentions for holding emission allowances, the author believes that IAS-38 *Intangible Assets* criteria must be adopted.

By adopting the cost method, the allowances received by the State must be recorded at Cost (i.e. Nil Value). Any purchased allowances will also be recorded at Cost (i.e. the purchase price) for matching purposes. In case of the revaluation method, any variations in the market price could be adjusted on an annual basis. This would align both purchased and granted allowances at the same channel in the financial statements. **Provisions** must be recognised using the Carrying Value of the allowances held (under assets), so the liabilities are not over or understated. If the entity has sold the excess allowances, any gains or losses over the recorded carrying value of the allowances (against the selling price) must be recorded in the Income Statement.

2. Because of the complexities in accounting for nuclear power plants, and the material values involved in its overall operations, there must be **compulsory disclosure** requirements to improve the transparency and comparability of annual reports across the Energy sector.

6.5. Potential Research Area

Accounting for nuclear power plants is an emerging issue that is now gaining more awareness. Based on the research findings, most of the owners and operators of nuclear facilities are choosing not to reveal their accounting practices concerning carbon emission allowances. Non-disclosures were at the highest level in this industry, causing an unfaithful representation of annual accounts for not disclosing values that are material both in nature and value. Potential research could be done using surveys, questionnaires and interviews of

more financial accountants and auditors to gain further ideas on their suggestions for accounting treatments of allowances. Ideally, interviewing accountants of the sample companies to enquire why they do not clearly disclose such material values would be highly beneficial. This would also be useful to understand how deep the institutional pressures affect the operations and accounting practices of the participating entities.

As this research is conducted on the owners of nuclear power plants, similar study could be done on the largest airlines around the globe, as the materiality of emission values could largely differ due to their excessive carbon emissions. Airlines consume a larger portion of allowances; however, the recent COVID-19 pandemic has put a pause to the travel industry. It would be useful to make a correlation of the emissions' accounting and disclosures given by the airlines pre, during and post pandemic to outline whether the accounting practice is affected by reducing values of emission allowances. This would help in further elaborating on the aspect that materiality levels, are likely not to be the decisive factor in ensuring high quality accounting disclosures.

6.6. Summary

Following points can be summarized from the verdict of this conclusion:

- Experienced accounting professionals recommended carbon emission allowances to be recognised as intangible assets in the financial statements. However, the industrial practice seemed to favour inventory method slightly more than the experts' advice.
- Experts believed that verifiability, comparability and faithful representation are the key qualitative characteristics of useful financial information, however the datasets of both IFRS and NON-IFRS sample failed to maintain these qualities at the highest level; mainly cause the material values were largely hidden from the notes to the financial statements.
- Institutional pressures, particularly normative and coercive pressures, more than the materiality levels seem to be driving a stringent disclosure practice in the Energy sector.
- On a theoretical level, this study contributes towards the institutional theory for raising the issue of severity level among all institutional pressures. This research also fills a gap in the literature by offering accounting insights of carbon emission allowances on a global sample.
- The author believed that this study will further expand the awareness of this issue among the academics and accounting standard setters, given that many highly experienced professionals weren't fully aware that this area was still left deeply unexplored.

VII: REFERENCES

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VIII: APPENDICES-1

8.1. Ethics Approval Document – Anglia Ruskin University, Ethics Committee

Dear Haseeb,

I am pleased to inform you that your ethics application has been ***approved with amendments*** by the School Research Ethics Panel (SREP) under the terms of Anglia Ruskin University's Research Ethics Policy (Dated 8 September 2016, Version 1.7). Approval was ratified by FREP.

Please action the points below and submit to your academic supervisor for them to review:

Participant Information Sheet is missing; please submit it to your supervisor

Ethical approval is given for a period of 1 year for undergraduate/masters students or 3 years for doctorate students and staff from the date of this letter.

It is your responsibility to ensure that you comply with Anglia Ruskin University's Research Ethics Policy and the Code of Practice for Applying for Ethical Approval at Anglia Ruskin University available at www.anglia.ac.uk/researchethics including the following.

- The procedure for submitting substantial amendments to the committee, should there be any changes to your research. You cannot implement these amendments until you have received approval from SREP for them.
- The procedure for reporting accidents, adverse events and incidents.
- The General Data Protection Requirement and Data Protection Act (2018).
- Any other legislation relevant to your research. You must also ensure that you are aware of any emerging legislation relating to your research and make any changes to your study (which you will need to obtain ethical approval for) to comply with this.
- Obtaining any further ethical approval required from the organisation or country (if not carrying out research in the UK) where you will be carrying the research out. This includes other Higher Education Institutions if you intend to carry out any research involving their students, staff or premises. Please ensure that you send the SREP copies of this documentation if required, prior to starting your research.
- Any laws of the country where you are carrying the research and obtaining any other approvals or permissions that are required.
- Any professional codes of conduct relating to research or requirements from your funding body (please note that for externally funded research, where the funding has been obtained via Anglia Ruskin University, a Project Risk Assessment must have been carried out prior to starting the research).
- Completing a Risk Assessment (Health and Safety) if required and updating this annually or if any aspects of your study change which affect this.
- Notifying the SREP Secretary when your study has ended.

8.2. Anglia Ruskin University Research Ethics Online Training Course

Assessment Feedback

question mark

Congratulations, **Haseeb**

You have passed the **Research Ethics Quiz** at **17:29** on **Friday, 21 August, 2020** scoring **9** out of **10** **(90 %)**

Please capture a full screenshot to include in your submission to the relevant Research Ethics Panel. (If needed, **instructions on how to take a screenshot** are provided in the Research Ethics course VLE site).

Once you have captured the screen you can just close your browser.

If you want to view the feedback for the individual questions, please browse through them using the "Next Question" button below.

8.3. Coded Extracts from Surveyed Companies Annual Reports (Micro Version).

Code- NF1							
Research Question: 1							
Classification of Initial Nuclear Fuel (IFRS)							
		YE 2019		YE 2018		YE 2017	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Nuclear fuel is recognized in the statement of financial position under inventories.	Inventory	Nuclear fuel is recognized in the statement of financial position under inventories.	Inventory	Nuclear fuel is recognized in the statement of financial position under inventories.	Inventory
2	EBL	The consumption of this nuclear fuel inventory is recorded	Inventory	The consumption of this nuclear fuel inventory is recorded	Inventory	The consumption of this nuclear fuel inventory is recorded	Inventory
3	ELETRONU	Nuclear fuel …… are classified in non-current assets.	Non-Current Asset (PPE)	Nuclear fuel …… are classified in non-current assets.	Non-Current Asset (PPE)	Uranium ore …. are acquired and classified as non-current assets	Non-Current Asset (PPE)

4	BEH	The fuel loaded in the reactors is…..in the reactors as of the reporting date.	Inventory	Inventory - Fuel includes mainly uncharged fresh nuclear fuel	Inventory	Inventory - Fuel includes mainly uncharged fresh nuclear fuel	Inventory
5	NBEPC	Inventories of materials, supplies, and fuel other	Inventory	Inventories of materials, supplies, and fuel other	Inventory	Inventories of materials, supplies, and fuel other	Inventory
6	CEZ	The Group presents nuclear fuel as part of property, plant and equipment, because its useful life exceeds 1 year.	PPE	The Group presents nuclear fuel as part of property, plant and equipment, because its useful life exceeds 1 year.	PPE	The Group presents nuclear fuel as part of property, plant and equipment, because its useful life exceeds 1 year.	PPE
7	FORTUMPH	Inventories mainly consist of fuels consumed in the production process or in the rendering of services.	Inventory	Inventories mainly consist of fuels consumed in the production process or in the rendering of services.	Inventory	Inventories mainly consist of fuels consumed in the production process or in the rendering of services.	Inventory
8	TVO	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory

9	EDF	Inventory accounts include…. fuel production cycle and fuel components.	Inventory	Inventory accounts include…. fuel production cycle and fuel components.	Inventory	Inventory accounts include…. fuel production cycle and fuel components.	Inventory
10	EON	The principal components of …. raw materials…..Fuel supply is also included in this line item.	Inventory	The principal components of …. raw materials…..Fuel supply is also included in this line item.	Inventory	The principal components of …. raw materials…..Fuel supply is also included in this line item.	Inventory
11	ENBW	Inventories includes nuclear fuel rods	Inventory	Inventories includes nuclear fuel rods	Inventory	Inventories includes nuclear fuel rods	Inventory
12	RWE	Inventories …… raw materials including nuclear fuel	Inventory	Inventories …… raw materials including nuclear fuel	Inventory	Inventories …… raw materials including nuclear fuel	Inventory
13	CFE	Raw materials include fuel	Inventory	Raw materials include fuel	Inventory	Raw materials include fuel	Inventory

14	EPZ	Inventories include nuclear fuel elements	Inventory	Inventories include nuclear fuel elements	Inventory	Inventories include nuclear fuel elements	Inventory
15	SNN	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory
16	REA	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory
17	SE	Nuclear fuel which is consumed over a period of more than one year…. is recognised in inventories.	Inventory	Nuclear fuel which is consumed over a period of more than one year…. is recognised in inventories.	Inventory	Nuclear fuel which is consumed over a period of more than one year…. is recognised in inventories.	Inventory
18	GEN ENERGIJA	All inventories are …… nuclear fuel have a long useful life of 801 days.	Inventory	Under inventories, the Group presents fuel and material	Inventory	Under inventories, the Group presents fuel and material	Inventory

19	ESKOM	Inventory - Nuclear fuel consists of enriched and fabricated fuel assemblies and fuel in reactors.	Inventory	Inventory - Nuclear fuel consists of enriched and fabricated fuel assemblies and fuel in reactors.	Inventory	Inventory - Nuclear fuel consists of enriched and fabricated fuel assemblies and fuel in reactors.	Inventory
20	ID	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory
21	ENDSEA	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory
22	VATTENFAL	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory	Inventories include nuclear fuel	Inventory
23	UNIPER	Raw materials and supplies include, in particular, coal, uranium and nuclear fuel rods	Inventory	Raw materials and supplies include, in particular, coal, uranium and nuclear fuel rods	Inventory	Raw materials and supplies include, in particular, coal, uranium and nuclear fuel rods	Inventory
24	AXPO	Inventories held for own use mainly comprise nuclear fuel	Inventory	Inventories held for own use mainly comprise nuclear fuel	Inventory	Inventories held for own use mainly comprise nuclear fuel	Inventory

25	ALPIQ	“Other energy purchases” primarily contains the cost of acquiring fuels …	Inventory	“Other energy purchases” primarily contains the cost of acquiring fuels …	Inventory	“Other energy purchases” primarily contains the cost of acquiring fuels …	Inventory
26	TPC	Inventories consists of fuel	Inventory	Inventories consists of fuel	Inventory	Inventories consists of fuel	Inventory
27	EDF UK	Inventories - front-end fuel costs consists of the cost of uranium….	Inventory	Inventories - front-end fuel costs consists of the cost of uranium….	Inventory	Inventories - front-end fuel costs consists of the cost of uranium….	Inventory

Code- NF2							
Research Question: 1							
Recognition of Initial Nuclear Fuel (IFRS)							
		YE 2019		YE 2018		YE 2017	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV
2	EBL	Inventories are measured at the lower of cost and net realizable value	Cost or NRV	Inventories are measured at the lower of cost and net realizable value	Cost or NRV	Inventories are measured at the lower of cost and net realizable value	Cost or NRV
3	ELETRONU	Composed of the uranium concentrate…...are recorded at acquisition cost.	Cost	Inventories are recorded at average acquisition cost	Cost	Comprised of uranium concentrate…... are recorded at acquisition cost	Cost
4	BEH	inventories are measured at the lower of their cost and their net realizable value	Cost or NRV	inventories are measured at the lower of their cost and their net realizable value	Cost or NRV	inventories are measured at the lower of their cost and their net realizable value	Cost or NRV

5	NBEPC	Nuclear fuel is valued at cost using the first-in, first-out method	Cost	Nuclear fuel is valued at cost using the first-in, first-out method	Cost	Nuclear fuel is valued at cost using the first-in, first-out method	Cost
6	CEZ	Nuclear fuel is recorded at cost, net of accumulated amortization and possible impairment in value	Cost	Nuclear fuel is recorded at cost, net of accumulated amortization and possible impairment in value	Cost	Nuclear fuel is recorded at cost, net of accumulated amortization and possible impairment in value	Cost
7	FORTUMPH	Inventories are stated at the lower of cost and net realisable value	Cost or NRV	Inventories are stated at the lower of cost and net realisable value	Cost or NRV	Inventories are stated at the lower of cost and net realisable value	Cost or NRV
8	TVO	Inventories are measured at acquisition cost	Cost	Inventories are measured at acquisition cost	Cost	Inventories are measured at acquisition cost	Cost
9	EDF	Inventories are recognised at the lower of acquisition cost or net realisable value,	Cost or NRV	Inventories are recognised at the lower of acquisition cost or net realisable value,	Cost or NRV	Inventories are recognised at the lower of acquisition cost or net realisable value,	Cost or NRV

10	EON	Inventories are measured at the lower of acquisition or production cost and net realizable value.	Cost or NRV	Inventories are measured at the lower of acquisition or production cost and net realizable value.	Cost or NRV	Inventories are measured at the lower of acquisition or production cost and net realizable value.	Cost or NRV
11	ENBW	Inventories …… are measured at the lower of the acquisition or production cost.	Cost	Inventories …… are measured at the lower of the acquisition or production cost.	Cost	The nuclear fuel rods disclosed in the inventories are measured at amortised cost	Cost
12	RWE	Nuclear fuel assemblies are stated at cost	Cost	Nuclear fuel assemblies are stated at cost	Cost	Nuclear fuel assemblies are stated at cost	Cost
13	CFE	Raw materials and consumables incorporated into the works constitute an essential element of the cost price.	Cost	Raw materials and consumables incorporated into the works constitute an essential element of the cost price.	Cost	Raw materials and consumables incorporated into the works constitute an essential element of the cost price.	Cost

14	EPZ	Inventories are stated at the lower of cost, based on first- in first-out (FIFO), and net realisable value	Cost or NRV	Inventories are stated at the lower of cost, based on first- in first-out (FIFO), and net realisable value	Cost or NRV	Inventories are stated at the lower of cost, based on first-in first-out (FIFO), and net realisable value	Cost or NRV
15	SNN	Inventories are measured at the lower of cost and net realizable value.	Cost or NRV	Inventories are measured at the lower of cost and net realizable value.	Cost or NRV	Inventories are measured at the lower of cost and net realizable value.	Cost or NRV
16	REA	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV
17	SE	Each individual nuclear fuel supply is valued at acquisition costs of particular supply	Cost	Each individual nuclear fuel supply is valued at acquisition costs of particular supply	Cost	Each individual nuclear fuel supply is valued at acquisition costs of particular supply	Cost
18	GEN ENERGIJA	Inventories are measured at the lower of cost and net realizable value	Cost or NRV	Inventories are measured at the lower of cost and net realizable value	Cost or NRV	Inventories are measured at the lower of cost and net realizable value	Cost or NRV

19	ESKOM	Nuclear fuel is stated at the lower of cost and net realisable value.	Cost or NRV	Nuclear fuel is stated at the lower of cost and net realisable value.	Cost or NRV	Nuclear fuel is stated at the lower of cost and net realisable value.	Cost or NRV
20	ID	The IBERDROLA Group measures its nuclear fuel stocks on the basis of the costs actually incurred in acquiring and subsequently processing the fuel.	Cost	The IBERDROLA Group measures its nuclear fuel stocks on the basis of the costs actually incurred in acquiring and subsequently processing the fuel.	Cost	The IBERDROLA Group measures its nuclear fuel stocks on the basis of the costs actually incurred in acquiring and subsequently processing the fuel.	Cost
21	ENDSEA	inventories are measured at the lower of weighted average acquisition cost and net realisable value.	Cost or NRV	inventories are measured at the lower of weighted average acquisition cost and net realisable value.	Cost or NRV	inventories are measured at the lower of weighted average acquisition cost and net realisable value.	Cost or NRV

22	VATTENFAL	The consumption of nuclear fuel is calculated …… on the cost of each batch of fuel loaded into the core	Cost	The consumption of nuclear fuel is calculated …… on the cost of each batch of fuel loaded into the core	Cost	The consumption of nuclear fuel is calculated …… on the cost of each batch of fuel loaded into the core	Cost
23	UNIPER	Inventories are measured at the lower of acquisition or production cost and net realizable value	Cost or NRV	Inventories are measured at the lower of acquisition or production cost and net realizable value	Cost or NRV	Inventories are measured at the lower of acquisition or production cost and net realizable value	Cost or NRV
24	AXPO	Fuel is measured at ... cost	Cost	Fuel is measured at ... cost	Cost	Fuel is measured at ... cost	Cost
25	ALPIQ	Inventories are stated at the lower of cost and net realisable value	Cost or NRV	Inventories are stated at the lower of cost and net realisable value	Cost or NRV	Inventories are stated at the lower of cost and net realisable value	Cost or NRV
26	TPC	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV

27	EDF UK	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV	Inventories are valued at the lower of cost or net realizable value	Cost or NRV

Code- NF3																	
Research Question: 1																	
Nuclear Fuel - Materiality Testing																	
Materiality Benchmarks adopted from FRC 2017		**YE 2019**					**YE 2018**					**YE 2017**					
		PBT >5%	**REV >1%**	**OPT >2%**	**NA >1%**	**TA =1%**	**PBT >5%**	**REV >1%**	**OPT >2%**	**NA >1%**	**TA =1%**	**PBT >5%**	**REV >1%**	**OPT >2%**	**NA >1%**	**TA =1%**
S.NO	**Company**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
1	ANPPCJSC	43%	1%	37%	35%	1%	-257%	54%	-206%	19%	6%	-247%	37%	-226%	19%	9%
2	EBL	-39%	1%	5%	1%	0%	-43%	1%	6%	1%	0%	-44%	1%	6%	1%	0%
3	ELETRONU	13%	3%	12%	1%	0%	5%	3%	6%	1%	0%	-415%	2%	36%	2%	0%
4	BEH	77%	5%	71%	3%	2%	-106%	3%	-144%	2%	1%	213%	4%	124%	2%	1%
5	NBEPC	16%	2%	8%	16%	1%	17%	3%	8%	12%	1%	7%	1%	4%	7%	0%
6	CEZ	77%	7%	24%	6%	2%	107%	8%	29%	6%	2%	67%	8%	28%	6%	2%
7	FORTUMPH	4%	1%	4%	0%	0%	7%	1%	4%	1%	0%	7%	2%	5%	1%	0%
8	TVO	300%	103%	-10736%	14%	3%	-1387%	72%	1725%	14%	3%	-2562%	75%	1213%	15%	3%
9	EDF	166%	15%	64%	19%	4%	2255%	15%	70%	20%	4%	318%	16%	79%	22%	4%

10	EON	84%	2%	12%	5%	1%	16%	2%	11%	6%	1%	13%	2%	12%	9%	1%
11	ENBW	12%	0%	6%	1%	0%	-7%	0%	-9%	2%	0%	4%	1%	3%	2%	0%
12	RWE	-97%	5%	29%	4%	1%	1476%	5%	47%	5%	1%	33%	2%	17%	8%	1%
13	CFE	25%	1%	24%	2%	1%	17%	1%	16%	2%	1%	18%	1%	16%	2%	1%
14	EPZ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
15	SNN	25%	7%	25%	2%	2%	23%	6%	25%	2%	2%	32%	6%	30%	2%	1%
16	REA	48%	10%	43%	4%	3%	25%	8%	35%	3%	2%	71%	15%	67%	5%	4%
17	SE	803%	10%	73%	6%	2%	1064%	10%	91%	7%	3%	262%	12%	88%	7%	3%
18	GEN ENERGIJA	36%	1%	34%	2%	2%	63%	1%	60%	4%	3%	63%	1%	59%	3%	2%
19	ESKOM	-7%	1%	6%	1%	0%	-97%	1%	6%	1%	0%	184%	1%	6%	1%	0%
20	ID	6%	1%	3%	1%	0%	6%	1%	3%	1%	0%	16%	1%	5%	1%	0%
21	ENDSEA	120%	1%	7%	4%	1%	16%	1%	8%	3%	1%	16%	2%	9%	3%	1%
22	VATTENFAL	31%	3%	26%	5%	1%	41%	4%	33%	6%	1%	53%	5%	37%	7%	2%
23	UNIPER	59%	1%	36%	5%	1%	-89%	1%	33%	4%	1%	-63%	1%	34%	5%	1%
24	AXPO	17%	2%	8%	1%	0%	12%	2%	9%	2%	0%	47%	2%	16%	2%	0%
25	ALPIQ	-4%	0%	8%	0%	0%	-11%	1%	367%	1%	0%	-258%	0%	11%	1%	0%
26	TPC	62%	2%	1390%	4%	1%	53%	3%	261%	5%	1%	51%	2%	37%	5%	1%
27	EDF UK	-572%	27%	323%	9%	5%	-465%	28%	312%	10%	6%	-672%	27%	232%	11%	6%

Code- SF1							
Research Question: 1							
Classification of Spent Fuel (IFRS)							
		YE 2019		YE 2018		YE 2017	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	The provision on storage of used nuclear fuel…	Provision	The provision on storage of used nuclear fuel…	Provision	The provision on storage of used nuclear fuel….	Provision
2	EBL	The Group's main long-term provisions are provisions for the back-end of the nuclear fuel cycle,	Provision	The Group's main long-term provisions are provisions for the back-end of the nuclear fuel cycle,	Provision	The Group's main long-term provisions are provisions for the back-end of the nuclear fuel cycle,	Provision
3	ELETRONU	The Company recognizes a provision for obligations with the decommissioning of assets.	Provision	The Company recognizes a provision for obligations with the deactivation of assets related to its nuclear power plants.	Provision	The Company recognizes a provision for obligations with the deactivation of assets related to its thermonuclear plants.	Provision

4	BEH	Provision for transporting, processing and storage of spent nuclear fuel	Provision	Provision for transporting, processing and storage of spent nuclear fuel	Provision	Provision for transporting, processing and storage of spent nuclear fuel	Provision
5	NBEPC	NB Power has recorded provisions for the estimated future costs of managing used nuclear fuel.	Provision	NB Power has recorded provisions for the estimated future costs of managing used nuclear fuel.	Provision	NB Power has recorded provisions for the estimated future costs of managing used nuclear fuel.	Provision
6	CEZ	The Group has recognized provisions for its …. related spent nuclear fuel	Provision	The Group has recognized provisions for its …. related spent nuclear fuel	Provision	The Group has recognized provisions for its …. related spent nuclear fuel	Provision
7	FORTUMPH	The related provisions are the provision for decommissioning and the provision for disposal of spent fuel.	Provision	The related provisions are the provision for decommissioning and the provision for disposal of spent fuel.	Provision	The related provisions are the provision for decommissioning and the provision for disposal of spent fuel.	Provision

8	TVO	The provision is related to future obligations for ….. spent fuel and operating waste	Provision	The provision is related to future obligations for ….. spent fuel and operating waste	Provision	The provision is related to future obligations for ….. spent fuel and operating waste	Provision
9	EDF	Provisions related to nuclear generation mainly cover ….. spent fuel	Provision	Provisions related to nuclear generation mainly cover ….. spent fuel	Provision	Provisions related to nuclear generation mainly cover ….. spent fuel	Provision
10	EON	Provisions for the disposal of spent nuclear-fuel rods	Provision	Provisions for the disposal of spent nuclear-fuel rods	Provision	Provisions for the disposal of spent nuclear-fuel rods	Provision
11	ENBW	Provisions relating to nuclear power cover obligations for the decommissioning	Provision	Provisions relating to nuclear power cover obligations for the decommissioning	Provision	Provisions relating to …… disposal of nuclear power plants, as well as the disposal of fuel rods	Provision

12	RWE	Provisions also include ……. spent fuel assemblies within the framework	Provision	Provisions also include ……. spent fuel assemblies within the framework	Provision	Provisions also include ……. spent fuel assemblies within the framework	Provision
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	Provision for costs of processing and storing nuclear fuels	Provision	Provision for costs of processing and storing nuclear fuels	Provision	Provision for costs of processing and storing nuclear fuels	Provision
15	SNN	The provision related to the intermediary storage of spent nuclear fuel	Provision	The provision related to the intermediary storage of spent nuclear fuel	Provision	The provision related to the intermediary storage of spent nuclear fuel	Provision
16	REA	The group has accrued an estimated liability for SNF	Provision	The group has accrued an estimated liability for SNF	Provision	The group has accrued an estimated liability for SNF	Provision

17	SE	The provision for nuclear decommissioning and ……. spent nuclear fuel	Provision	The provision for nuclear decommissioning and ……. spent nuclear fuel	Provision	The provision for nuclear decommissioning and ……. spent nuclear fuel	Provision
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	A provision is also raised for the management of fuel assemblies and radioactive waste	Provision	A provision is also raised for the management of fuel assemblies and radioactive waste	Provision	A provision is also raised for the management of fuel assemblies and radioactive waste	Provision
20	ID	Amounts used to register provisions to cover the costs incurred in managing radioactive waste and spent fuel	Provision	Amounts used to register provisions to cover the costs incurred in managing radioactive waste and spent fuel	Provision	Amounts used to register provisions to cover the costs incurred in managing radioactive waste and spent fuel	Provision

21	ENDSEA	ENDESA recognises a provision for the expected cost of dismantling some of its plants	Provision	ENDESA recognises a provision for the expected cost of dismantling some of its plants	Provision	ENDESA recognises a provision for the expected cost of dismantling some of its plants	Provision
22	VATTENFAL	Provision for spent nuclear fuel…	Provision	Provision for spent nuclear fuel…	Provision	Provision for spent nuclear fuel…	Provision
23	UNIPER	The provisions comprise all those nuclear obligations relating to the disposal of spent nuclear fuel rods	Provision	The provisions comprise all those nuclear obligations relating to the disposal of spent nuclear fuel rods	Provision	The provisions comprise all those nuclear obligations relating to the disposal of spent nuclear fuel rods	Provision
24	AXPO	"Post-operation, decommissioning, disposal" contains costs incurred for the disposal of spent fuel rods	Provision	"Post-operation, decommissioning, disposal" contains costs incurred for the disposal of spent fuel rods	Provision	"Post-operation, decommissioning, disposal" contains costs incurred for the disposal of spent fuel rods	Provision

25	ALPIQ	The provision ….. covers the estimated costs of decommissioning.	Provision	The provision ….. covers the estimated costs of decommissioning.	Provision	The provision ….. covers the estimated costs of decommissioning.	Provision
26	TPC	In accordance with IAS 37….. The provision is recognised	Provision	In accordance with IAS 37….. The provision is recognised	Provision	In accordance with IAS 37….. The provision is recognised	Provision
27	EDF UK	Provisions - Spent fuel represents all costs associated with the ongoing storage and treatment of spent fuel	Provision	Provisions - Spent fuel represents all costs associated with the ongoing storage and treatment of spent fuel	Provision	Provisions - Spent fuel represents all costs associated with the ongoing storage and treatment of spent fuel	Provision

Code- SF2							
Research Question: 1							
Recognition of Spent Fuel (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	The provision on storage of used nuclear fuel has been created at the discounted value of the estimated present obligation	Present Value Estimate	The provision on storage of used nuclear fuel has been created at the discounted value of the estimated present obligation	Present Value Estimate
2	EBL	Allocations to the provisions for the back-end of the nuclear fuel cycle are computed based on the average unit cost	Average Unit Cost	Allocations to the provisions for the back-end of the nuclear fuel cycle are computed based on the average unit cost	Average Unit Cost	Allocations to the provisions for the back-end of the nuclear fuel cycle are computed based on the average unit cost	Estimated Costs

3	ELETRONU	The amount recognized as a provision is the best estimate	Best Estimate	In order to determine the value of the provision, assumptions and estimates are made	Best Estimate	The amount recognized as a provision is the best estimate	Best Estimate
4	BEH	The amount of the accrued provision is based on an updated reliable estimate	Best Estimate	The amount of the accrued provision is based on an updated reliable estimate	Best Estimate	The amount of the accrued provision is based on an updated reliable estimate	Best Estimate
5	NBEPC	Provisions that are long-term in nature are measured at their present value	Present Value Estimate	Provisions that are long-term in nature are measured at their present value	Present Value Estimate	Provisions that are long-term in nature are measured at their present value	Present Value Estimate
6	CEZ	The provisions recognized represent the best estimate	Best Estimate	The provisions recognized represent the best estimate	Best Estimate	The provisions recognized represent the best estimate	Best Estimate

7	FORTUMPH	The provision for ……. spent fuel is based on long-term cash flow forecasts of estimated future costs.	Best Estimate	The provision for ……. spent fuel is based on long-term cash flow forecasts of estimated future costs.	Best Estimate	The provision for ……. spent fuel is based on long-term cash flow forecasts of estimated future costs.	Best Estimate
8	TVO	Provision is calculated according to IAS 37 based on discounted future cash flows which are based on estimated future expenses.	Best Estimate	Provision is calculated according to IAS 37 based on discounted future cash flows which are based on estimated future expenses.	Best Estimate	Provision is calculated according to IAS 37 based on discounted future cash flows which are based on estimated future expenses.	Best Estimate
9	EDF	The measurement of provisions for the back-end of the nuclear cycle, decommissioning and last cores is sensitive to assumptions	Best Estimate	The measurement of provisions for the back-end of the nuclear cycle, decommissioning and last cores is sensitive to assumptions	Best Estimate	The measurement of provisions for the back-end of the nuclear cycle, decommissioning and last cores is sensitive to assumptions	Best Estimate

10	EON	The cost estimates used to determine the provision amounts are based on studies and analyses	Best Estimate	The cost estimates used to determine the provision amounts are based on studies and analyses	Best Estimate	The cost estimates used to determine the provision amounts are based on studies and analyses	Best Estimate
11	ENBW	The provisions for decommissioning ……. are calculated using external appraisals…... company's own expectations	Best Estimate	The provisions for decommissioning ……. are calculated using external appraisals…... company's own expectations	Best Estimate	Provisions are measured on the best estimate	Best Estimate
12	RWE	Provisions are based on the best estimate	Best Estimate	Provisions are based on the best estimate	Best Estimate	Provisions are based on the best estimate	Best Estimate
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

14	EPZ	Provisions are measured at the present value of expected expenditures less any expected own income.	Present Value Estimate	Provisions are measured at the present value of expected expenditures less any expected own income.	Present Value Estimate	Provisions are measured at the present value of expected expenditures less any expected own income.	Present Value Estimate
15	SNN	The provision related to the intermediary storage of spent nuclear fuel is determined as the present value of future expenditure with its storage.	Present Value Estimate	The provision related to the intermediary storage of spent nuclear fuel is determined as the present value of future expenditure with its storage.	Present Value Estimate	The provision related to the intermediary storage of spent nuclear fuel is determined as the present value of future expenditure with its storage.	Present Value Estimate
16	REA	The value of the estimated liability for SNf and SNF management is determined by estimates of.	Best Estimate	The value of the estimated liability for SNf and SNF management is determined by estimates of.	Best Estimate	The value of the estimated liability for SNf and SNF management is determined by estimates of.	Best Estimate

17	SE	The Group's management has used its best estimates…...of spent nuclear fuel	Best Estimate	The Group's management has used its best estimates…...of spent nuclear fuel	Best Estimate	The Group's management has used its best estimates…...of spent nuclear fuel	Best Estimate
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	The valuation of long-term provisions requires a degree of judgement	Best Estimate	The valuation of long-term provisions requires a degree of judgement	Best Estimate	The valuation of long-term provisions requires a degree of judgement	Best Estimate
20	ID	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
21	ENDSEA	Provisions are quantified based on the best information available	Best Estimate	Provisions are quantified based on the best information available	Best Estimate	Provisions are quantified based on the best information available	Best Estimate

22	VATTENFAL	Provisions for future expenses for nuclear power operations ….. Best estimate	Best Estimate	Provisions for future expenses for nuclear power operations ….. Best estimate	Best Estimate	Provisions for future expenses for nuclear power operations ….. Best estimate	Best Estimate
23	UNIPER	A provision is recognized at the present value of the expected settlement amount…	Present Value Estimate	A provision is recognized at the present value of the expected settlement amount…	Present Value Estimate	A provision is recognized at the present value of the expected settlement amount…	Present Value Estimate
24	AXPO	Present value estimates of….	Present Value Estimate	Present value estimates of….	Present Value Estimate	Present value estimates of….	Present Value Estimate
25	ALPIQ	The amount is determined at …. the best possible estimate.	Best Estimate	The amount is determined at …. the best possible estimate.	Best Estimate	The amount is determined at …. the best possible estimate.	Best Estimate
26	TPC	The company will review the estimation regularly	Best Estimate	The company will review the estimation regularly	Best Estimate	The company will review the estimation regularly	Best Estimate

27	EDF UK	The provision has been calculated ….. Discounted value….	Present Value Estimate	The provision has been calculated ….. Discounted value….	Present Value Estimate	The provision has been calculated ….. Discounted value….	Present Value Estimate

Code- GE1							
Research Question: 1							
Classification of Granted Emission Allowances (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory
3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
4	BEH	Allowances free of charge are not accounted for	Not Accounted For	Allowances free of charge are not accounted for	Not Accounted For	Allowances free of charge are not accounted for	Not Accounted For
5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

6	CEZ	The emission rights which were granted free of charge .... are presented within current assets in the line Emission rights.	Other Current Asset	The emission rights which were granted free of charge .... are presented within current assets in the line Emission rights.	Other Current Asset	The emission rights which were granted free of charge .... are presented within current assets in the line Emission rights.	Other Current Asset
7	FORTUMPH	The group accounts for emission allowances based on currently valid IFRS standards where purchased emission allowances are accounted for as intangible assets	Intangible Asset	The group accounts for emission allowances based on currently valid IFRS standards where purchased emission allowances are accounted for as intangible assets	Intangible Asset	The group accounts for emission allowances based on currently valid IFRS standards where purchased emission allowances are accounted for as intangible assets	Intangible Asset
8	TVO	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset

9	EDF	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded in intangible assets.	Intangible Asset	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded in intangible assets.	Intangible Asset	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded in intangible assets.	Intangible Asset
10	EON	Emission rights held ……. are reported as other operating assets	Other Current Asset	Emission rights held ..... are reported as intangible assets.	Intangible Asset	Emission rights held ..... are reported as intangible assets.	Intangible Asset
11	ENBW	Inventories …… are measured at the lower of the acquisition or production cost and the market price.	Inventory	Inventories …… are measured at the lower of the acquisition or production cost and the market price.	Inventory	Not Stated	Not Disclosed
12	RWE	CO2 emission allowances……. are accounted for as intangible assets.	Intangible Asset	CO2 emission allowances……. are accounted for as intangible assets.	Intangible Asset	CO2 emission allowances……. are accounted for as intangible assets.	Intangible Asset
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

14	EPZ	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Emission allowances are included in Inventory.	Inventory
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
17	SE	Allowances acquired for free are not accounted for.	Not Accounted For	Allowances acquired for free are not accounted for.	Not Accounted For	Allowances acquired for free are not accounted for.	Not Accounted For
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
20	ID	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
21	ENDSEA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
22	VATTENFAL	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
23	UNIPER	Assets reported as miscellaneous operating assets include emission rights	Other Current Asset	Assets reported as miscellaneous operating assets include emission rights	Other Current Asset	Emission rights …… are reported under other operating assets.	Other Current Asset
24	AXPO	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

25	ALPIQ	Not Stated	Not Disclosed	Allocated CO2 emission allowances are initially recognised ….. Displayed in Inventory.	Inventory	Allocated CO2 emission allowances are initially recognised ….. Displayed in Inventory.	Inventory
26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
27	EDF UK	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

Code- GE2							
Research Question: 1							
Recognition of Granted Emission Allowances (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	Emissions allowances granted free of charge are recorded in the statement of financial position for a value of nil	Nil Value	Emission rights granted free of charge are recorded in the statement of financial position for a value of nil.	Nil Value	Emission rights granted free of charge are recorded in the statement of financial position for a value of nil.	Nil Value
3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

4	BEH	Not Accounted For	Not Accounted For	Not Accounted For	Not Accounted For	Not Accounted For	Not Accounted For
5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
6	CEZ	The emission rights which were granted free of charge are stated at their nominal value, i.e. at zero.	Nil Value	The emission rights which were granted free of charge are stated at their nominal value, i.e. at zero.	Nil Value	The emission rights which were granted free of charge are stated at their nominal value, i.e. at zero.	Nil Value
7	FORTUMPH	Emission allowances received free of charge are accounted for at nominal value.	Nominal Value	Emission allowances received free of charge are accounted for at nominal value.	Nominal Value	Emission allowances received free of charge are accounted for at nominal value.	Nominal Value
8	TVO	Emission rights are recognized at historical cost.	Cost	Emission rights are recognized at historical cost.	Cost	Emission rights are recognized at historical cost.	Cost

9	EDF	Rights held to comply with regulatory requirements on greenhouse gas emissions ..... at nil value when allocated free of charge.	Nil Value	Rights held to comply with regulatory requirements on greenhouse gas emissions ..... at nil value when allocated free of charge.	Nil Value	Rights held to comply with regulatory requirements on greenhouse gas emissions ..... at nil value when allocated free of charge.	Nil Value
10	EON	Emission rights are capitalized at cost at the time of acquisition.	Cost	Emission rights are capitalized at cost at the time of acquisition.	Cost	Emission rights are capitalized at cost at the time of acquisition.	Cost
11	ENBW	CO2 allowances that were allocated free of charge are recognised at €0.	Nil Value	CO2 allowances that were allocated free of charge are recognised at €0.	Nil Value	Not Stated	Not Disclosed
12	RWE	CO2 emission allowances …… allocated free of charge are stated at cost.	Cost	CO2 emission allowances …… allocated free of charge are stated at cost.	Cost	CO2 emission allowances …… allocated free of charge are stated at cost.	Cost
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

14	EPZ	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Inventories are stated at the lower of weighted average cost, based on first-in first-out (FIFO), and net realisable value.	Cost or NRV
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
17	SE	Allowances acquired for free are not accounted for.	Not Accounted For	Allowances acquired for free are not accounted for.	Not Accounted For	Allowances acquired for free are not accounted for.	Not Accounted For
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
20	ID	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
21	ENDSEA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
22	VATTENFAL	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
23	UNIPER	These rights are capitalized at cost at the time of acquisition	Cost	These rights are capitalized at cost at the time of acquisition	Cost	These rights are capitalized at cost at the time of acquisition	Cost

24	AXPO	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
25	ALPIQ	Not Stated	Not Disclosed	Allocated CO2 emission allowances are initially recognised at nil value.	Nil Value	Allocated CO2 emission allowances are initially recognised at nil value.	Nil Value
26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
27	EDF UK	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

Code- PE1							
Research Question: 1							
Classification of Purchased Emission Allowances - Business Use (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory

3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
4	BEH	The allowances for greenhouse gas emissions are reported in "net liability method". The Group currently recognizes an expense for the emissions in excess of the allocations.	Expense	The allowances for greenhouse gas emissions are reported in "net liability method". The Group currently recognizes an expense for the emissions in excess of the allocations.	Expense	The allowances for greenhouse gas emissions are reported in "net liability method". The Group currently recognizes an expense for the emissions in excess of the allocations.	Expense
5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

6	CEZ	The emission rights purchased for own use purpose in the next year are presented within current assets in the line Emission rights. The emission rights with an expected later use are presented as part of the intangible assets.	Other Current Asset	The emission rights purchased for own use purpose in the next year are presented within current assets in the line Emission rights. The emission rights with an expected later use are presented as part of the intangible assets.	Other Current Asset	The emission rights purchased for own use purpose in the next year are presented within current assets in the line Emission rights. The emission rights with an expected later use are presented as part of the intangible assets.	Other Current Asset
7	FORTUMPH	Purchased emission allowances are accounted for as intangible assets.	Intangible Asset	Purchased emission allowances are accounted for as intangible assets.	Intangible Assets	Purchased emission allowances are accounted for as intangible assets.	Intangible Assets
8	TVO	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset

9	EDF	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded in "Greenhouse gas emission rights – green certificates" in intangible assets.	Intangible Asset	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded in "Greenhouse gas emission rights – green certificates" in intangible assets.	Intangible Asset	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded in "Greenhouse gas emission rights – green certificates" in intangible assets.	Intangible Asset
10	EON	Emission rights held ……. are reported as other operating assets	Other Current Asset	Emission rights held ..... are reported as intangible assets.	Intangible Asset	Emission rights held ..... are reported as intangible assets.	Intangible Asset
11	ENBW	Inventories ….. are measured at the lower of the acquisition or production cost and the market price.	Inventory	Inventories ….. are measured at the lower of the acquisition or production cost and the market price.	Inventory	Emission allowances acquired for production purposes are recognised at cost as inventories.	Inventory

12	RWE	CO2 emission allowances ..... are accounted for as intangible assets.	Intangible Asset	CO2 emission allowances ..... are accounted for as intangible assets.	Intangible Asset	CO2 emission allowances ..... are accounted for as intangible assets.	Intangible Asset
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	Trade receivables includes….. Carbon allowances intended for the company's own use..	Receivables	Trade receivables includes….. Carbon allowances intended for the company's own use..	Receivables	Emission allowances are included in Inventory.	Inventory
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
17	SE	Emission allowances…. are accounted for as inventory.	Inventory	Emission allowances…. are accounted for as inventory.	Inventory	Emission allowances…. are accounted for as inventory.	Inventory
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
20	ID	Energy resources are …… in inventory.	Inventory	Inventories of emission allowances.	Inventory	Energy resources are ….. In inventory.	Inventory

21	ENDSEA	The principle for recognising CO2 emission rights, CERs and ERUs is to recognise them as inventories.	Inventory	The criteria for recognising CO2 emission rights …… to recognise them as inventories.	Inventory	The criteria for recognising CO2 emission rights.....to recognise them as inventories.	Inventory
22	VATTENFAL	Purchased emission allowances held for own use are reported as intangible assets.	Intangible Asset	Purchased emission allowances held for own use are reported as intangible assets.	Intangible Asset	Purchased emission allowances held for own use are reported as intangible assets.	Intangible Asset
23	UNIPER	Assets reported as miscellaneous operating assets include emission rights	Other Current Asset	Assets reported as miscellaneous operating assets include emission rights	Other Current Asset	Emission rights …… are reported under other operating assets.	Other Current Asset
24	AXPO	Inventories held for own use ..... emission and green certificates.	Inventory	Inventories mainly comprise ..... emission and green certificates for own use and trading.	Inventory	Inventories mainly comprise ..... emission and green certificates for own use and trading.	Inventory

25	ALPIQ	Inventories are stated at the lower of cost and net realisable value.	Inventory	CO2 emission allowances purchased to meet the Group's generation requirements are initially recognised under inventories at cost.	Inventory	CO2 emission allowances purchased to meet the Group's generation requirements are initially recognised under inventories at cost.	Inventory
26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
27	EDF UK	Purchased Emission Allowances are initially recognised at cost (purchase price) within intangible assets.	Intangible Asset	Purchased Emission Allowances are initially recognised at cost (purchase price) within intangible assets.	Intangible Asset	Purchased Emission Allowances are initially recognised at cost (purchase price) within intangible assets.	Intangible Asset

Code- PE2							
Research Question: 1							
Recognition of Purchased Emission Allowances - Business Use (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	Emissions allowances purchased on the market are recognized at acquisition cost;	Cost	Emission rights purchased on the market are recognized at acquisition cost;	Cost	Emission rights purchased on the market are recognized at acquisition cost;	Cost
3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
4	BEH	The allowances for greenhouse gas emissions are reported in "net liability method"…. estimation of such allowances …… is their market price at the end of the reporting period.	Market Value	The allowances for greenhouse gas emissions are reported in "net liability method"…. estimation of such allowances …… is their market price at the end of the reporting period.	Market Value	The allowances for greenhouse gas emissions are reported in "net liability method"…. estimation of such allowances …… is their market price at the end of the reporting period.	Market Value

5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
6	CEZ	Purchased emission rights are carried at cost (except for emission rights for trading).	Cost	Purchased emission rights are carried at cost (except for emission rights for trading).	Cost	Purchased emission rights are carried at cost (except for emission rights for trading).	Cost
7	FORTUMPH	Purchased emission allowances are accounted for as intangible assets at costs.	Cost	Purchased emission allowances are accounted for as intangible assets at costs.	Cost	Purchased emission allowances are accounted for as intangible assets at costs.	Cost
8	TVO	Emission rights are recognized at historical cost.	Cost	Emission rights are recognized at historical cost.	Cost	Emission rights are recognized at historical cost.	Cost

9	EDF	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded ..... at acquisition cost when purchased on the market.	Cost	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded ..... at acquisition cost when purchased on the market.	Cost	Rights held to comply with regulatory requirements on greenhouse gas emissions are recorded ..... at acquisition cost when purchased on the market.	Cost
10	EON	Emission rights are capitalized at cost at the time of acquisition.	Cost	Emission rights are capitalized at cost at the time of acquisition.	Cost	Emission rights are capitalized at cost at the time of acquisition.	Cost
11	ENBW	Inventories ….. are measured at the lower of the acquisition or production cost and the market price.	Cost or Market Value	Inventories ….. are measured at the lower of the acquisition or production cost and the market price.	Cost or Market Value	Emission allowances acquired for production purposes are recognised at cost as inventories.	Cost

12	RWE	Allowances which are purchased ..... stated at cost and are not amortised.	Cost	Allowances which are purchased ..... stated at cost and are not amortised.	Cost	Allowances which are purchased ..... stated at cost and are not amortised.	Cost
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	Carbon allowances intended for the company's own use ..... are stated at historical cost on a FIFO basis.	Cost	Carbon allowances intended for the company's own use ..... are stated at historical cost on a FIFO basis.	Cost	Inventories are stated at the lower of weighted average cost, …... and net realisable value.	Cost or NRV
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
17	SE	Emission allowances purchased from third parties are measured at cost.	Cost	Emission allowances purchased from third parties are measured at cost.	Cost	Emission allowances purchased from third parties are measured at cost.	Cost
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

20	ID	Energy resources are measured at acquisition cost, calculated….. or net realisable value, if the latter is lower.	Cost or NRV	Inventories of emission allowances are measured at acquisition cost…. net realisable value, if it were lower.	Cost or NRV	Energy resources are measured at acquisition cost….or net realisable value, if the latter is lower.	Cost or NRV
21	ENDSEA	CO2 emissions rights held in cover of emissions are valued at the lower of the average weighted acquisition price and the net realisable value.	Cost or NRV	CO2 emissions rights held as hedges on emissions are valued at the average weighted acquisition price, or the net realisable value, if the latter is lower.	Cost or NRV	CO2 emissions rights held as hedges on emissions are valued at the average weighted acquisition price, or the net realisable value, if the latter is lower.	Cost or NRV
22	VATTENFAL	Purchased emission allowances held for own use are reported as intangible assets ... at cost.	Cost	Purchased emission allowances held for own use are reported as intangible assets ... at cost.	Cost	Purchased emission allowances held for own use are reported as intangible assets ... at cost.	Cost

23	UNIPER	These rights are capitalized at cost at the time of acquisition	Cost	These rights are capitalized at cost at the time of acquisition	Cost	These rights are capitalized at cost at the time of acquisition	Cost
24	AXPO	Green and emission certificates for own use are initially recognised at cost.	Cost	Green certificates and emission certificates for own use are initially recognised at cost.	Cost	Green certificates and emission certificates for own use are initially recognised at cost.	Cost
25	ALPIQ	Inventories are stated at the lower of cost and net realisable value.	Cost or NRV	CO2 emission allowances purchased to meet the Group's generation requirements are initially recognised under inventories at cost.	Cost	CO2 emission allowances purchased to meet the Group's generation requirements are initially recognised under inventories at cost.	Cost
26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

27	EDF UK	Purchased Emission Allowances are initially recognised at cost.	Cost	Purchased Emission Allowances are initially recognised at cost.	Cost	Purchased Emission Allowances are initially recognised at cost.	Cost

Code- PT1							
Research Question: 1							
Classification of Purchased Emission Allowances - Trading (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory	Emissions allowances are classified as inventories, as they are consumed in the production process.	Inventory
3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
4	BEH	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

6	CEZ	The emission rights and credits for the trading purposes are presented within current assets in the line Emission rights.	Other Current Asset	The emission rights and credits for the trading purposes are presented within current assets in the line Emission rights.	Other Current Asset	The emission rights and credits for the trading purposes are presented within current assets in the line Emission rights.	Other Current Asset
7	FORTUMPH	Purchased emission allowances are accounted for as intangible assets.	Intangible Assets	Purchased emission allowances are accounted for as intangible assets.	Intangible Assets	Purchased emission allowances are accounted for as intangible assets.	Intangible Assets
8	TVO	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset	Intangible assets include carbon dioxide (CO2) emission rights.	Intangible Asset
9	EDF	Emission rights held ……. are reported as other operating assets	Other Current Asset	Emission rights held ..... are reported as intangible assets.	Intangible Asset	Emission rights held ..... are reported as intangible assets.	Intangible Asset
10	EON	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

11	ENBW	Inventories …… are measured at the lower of the acquisition or production cost and the market price.	Inventory	Inventories …… are measured at the lower of the acquisition or production cost and the market price.	Inventory	Emission allowances acquired for trading purposes are recognised as other assets at fair value through profit or loss.	Other Current Asset
12	RWE	CO2 emission allowances ..... are accounted for as intangible assets.	Intangible Asset	CO2 emission allowances ..... are accounted for as intangible assets.	Intangible Asset	CO2 emission allowances ..... are accounted for as intangible assets.	Intangible Asset
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	Under IFRS 9, energy commodity contracts (emission allowances) .... are classified as derivatives.	Derivatives	Under IFRS 9, energy commodity contracts (emission allowances) .... are classified as derivatives.	Derivatives	Under IAS 39, energy commodity contracts (emission allowances) ..... are classified as derivatives.	Derivatives
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

17	SE	Emission allowances ..... are accounted for as inventory.	Inventory	Emission allowances ..... are accounted for as inventory.	Inventory	Emission allowances ..... are accounted for as inventory.	Inventory
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
20	ID	Energy resources are …… in inventory.	Inventory	Inventories of emission allowances.	Inventory	Energy resources are ….. In inventory.	Inventory
21	ENDSEA	The principle for recognising CO2 emission rights, CERs and ERUs is to recognise them as inventories.	Inventory	The criteria for recognising CO2 emission rights …… to recognise them as inventories.	Inventory	The criteria for recognising CO2 emission rights.....to recognise them as inventories.	Inventory
22	VATTENFAL	Inventories held for trading are valued at fair value.	Inventory	Inventories held for trading are valued at fair value.	Inventory	Inventories held for trading are valued at fair value.	Inventory
23	UNIPER	Assets reported as miscellaneous operating assets include emission rights	Other Current Asset	Assets reported as miscellaneous operating assets include emission rights	Other Current Asset	Not Stated	Not Disclosed

24	AXPO	Inventories held for trading mainly include emission and green certificates.	Inventory	Inventories that have been purchased for resale ….. concerns trading in emission certificates, green certificates and gas.	Inventory	Inventories that have been purchased for resale ….. mainly concerns trading in emission certificates, green certificates and gas.	Inventory
25	ALPIQ	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
27	EDF UK	Purchased Emission Allowances are initially recognised ….. within intangible assets.	Intangible Asset	Purchased Emission Allowances are initially recognised ….. within intangible assets.	Intangible Asset	Purchased Emission Allowances are initially recognised …. within intangible assets.	Intangible Asset

Code- PT2							
Research Question: 1							
Recognition of Purchased Emission Allowances - Trading (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	Emissions allowances purchased on the market are recognized at acquisition cost;	Cost	Emission rights purchased on the market are recognized at acquisition cost;	Cost	Emission rights purchased on the market are recognized at acquisition cost;	Cost
3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
4	BEH	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
6	CEZ	The portfolio of emission rights and credits held for trading is measured at fair value.	Fair Value	The portfolio of emission rights and credits held for trading is measured at fair value.	Fair Value	The portfolio of emission rights and credits held for trading is measured at fair value.	Fair Value

7	FORTUMPH	Purchased emission allowances are accounted for as intangible assets at costs.	Cost	Purchased emission allowances are accounted for as intangible assets at costs.	Cost	Purchased emission allowances are accounted for as intangible assets at costs.	Cost
8	TVO	Emission rights are recognized at historical cost.	Cost	Emission rights are recognized at historical cost.	Cost	Emission rights are recognized at historical cost.	Cost
9	EDF	Emission rights are capitalized at cost at the time of acquisition.	Cost	Emission rights are capitalized at cost at the time of acquisition.	Cost	Emission rights are capitalized at cost at the time of acquisition.	Cost
10	EON	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
11	ENBW	Inventories ….. are measured at the lower of the acquisition or production cost and the market price.	Cost or Market Value	Inventories ….. are measured at the lower of the acquisition or production cost and the market price.	Cost or Market Value	Emission allowances acquired for trading purposes are recognised as other assets at fair value.	Fair Value

12	RWE	Allowances which are purchased ..... are stated at cost and are not amortised.	Cost	Allowances which are purchased ..... are stated at cost and are not amortised.	Cost	Allowances which are purchased ..... are stated at cost and are not amortised.	Cost
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	All derivatives are measured at fair value on initial recognition.	Fair Value	All derivatives are measured at fair value on initial recognition.	Fair Value	All derivatives are measured at fair value on initial recognition.	Fair Value
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
17	SE	Emission allowances acquired …. for the purpose of further sale on the market are measured at fair value.	Fair Value	Emission allowances acquired …. for the purpose of further sale on the market are measured at fair value.	Fair Value	Emission allowances acquired …. for the purpose of further sale on the market are measured at fair value.	Fair Value
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
20	ID	Emission allowances acquired for the	Fair Value	Emission allowances and	Fair Value	Emission allowances	Fair Value

		purpose of benefiting through fluctuations in their market price are measured at fair value.		ROCs acquired to obtain benefits from fluctuations in their market price are measured at fair value.		acquired for the purpose of benefiting through fluctuations in their market price are measured at fair value.	
21	ENDSEA	CO2 emissions rights held for trading constitute a trading portfolio, and are recognised at their fair value.	Fair Value	CO2 emissions rights held for trading represent a trading portfolio, and are recognised at their fair value.	Fair Value	CO2 emissions rights held for trading represent a trading portfolio, and are recognised at their fair value.	Fair Value
22	VATTENFAL	For CO2 emission allowances that are held for trading, fair value is based on quoted prices.	Fair Value	For CO2 emission allowances that are held for trading, fair value is based on quoted prices.	Fair Value	For CO2 emission allowances that are held for trading, fair value is based on quoted prices.	Fair Value
23	UNIPER	These rights are capitalized at cost at the time of acquisition	Cost	These rights are capitalized at cost at the time of acquisition	Cost	Not Stated	Not Disclosed

24	AXPO	They are measured at fair value.	Fair Value	Inventories that have been purchased for resale ..... are measured at fair value.	Fair Value	Inventories that have been purchased for resale ..... are measured at fair value.	Fair Value
25	ALPIQ	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
27	EDF UK	Purchased Emission Allowances are initially recognised at cost	Cost	Sales of emission allowances are measured at fair value	Fair Value	Sale of emissions allowances are measured at fair value.	Fair Value

Code- CE3																
Research Question: 1																
Carbon Emission Allowances - Materiality Testing (IFRS)																
Materiality Benchmarks adopted from FRC 2017		YE 2019					YE 2018					YE 2017				
		PBT >5%	REV >1%	OPT >2%	NA >1%	TA =1%	PBT >5%	REV >1%	OPT >2%	NA >1%	TA =1%	PBT >5%	REV >1%	OPT >2%	NA >1%	TA =1%
S.NO	**Company**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
1	ANPPCJSC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2	EBL	-49%	1%	7%	2%	0%	-47%	1%	7%	2%	0%	-50%	1%	7%	2%	0%
3	ELETRONU	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	BEH	110%	7%	101%	4%	2%	-177%	6%	-240%	3%	2%	62%	1%	36%	1%	0%
5	NBEPC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	CEZ	190%	17%	58%	14%	5%	136%	10%	37%	8%	3%	34%	4%	14%	3%	1%
7	FORTUMPH	1%	0%	1%	0%	0%	2%	0%	1%	0%	0%	0%	0%	0%	0%	0%
8	TVO	4%	1%	-154%	0%	0%	-48%	3%	60%	1%	0%	-7%	0%	3%	0%	0%
9	EDF	7%	1%	3%	1%	0%	106%	1%	3%	1%	0%	13%	1%	3%	1%	0%
10	EON	0%	0%	0%	0%	0%	4%	0%	3%	2%	0%	3%	0%	3%	2%	0%
11	ENBW	6%	0%	3%	0%	0%	-4%	0%	-5%	1%	0%	0%	0%	0%	0%	0%
12	RWE	-54%	3%	16%	2%	1%	671%	2%	21%	2%	0%	4%	0%	2%	1%	0%
13	CFE	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
14	EPZ	86%	4%	157%	2%	1%	-42%	4%	-76%	2%	1%	0%	0%	0%	0%	0%
15	SNN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
16	REA	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
17	SE	147%	2%	13%	1%	0%	134%	1%	11%	1%	0%	12%	1%	4%	0%	0%

18	GEN ENERGIJA	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
19	ESKOM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
20	ID	9%	1%	5%	1%	0%	8%	1%	4%	1%	0%	17%	1%	5%	1%	0%
21	ENDSEA	177%	2%	11%	5%	1%	23%	2%	11%	4%	1%	15%	1%	8%	3%	1%
22	VATTENFAL	11%	1%	9%	2%	0%	16%	1%	12%	2%	0%	36%	3%	25%	5%	1%
23	UNIPER	151%	2%	93%	12%	3%	-196%	1%	73%	10%	2%	-105%	1%	57%	8%	2%
24	AXPO	37%	5%	19%	3%	1%	11%	2%	8%	2%	0%	160%	7%	55%	7%	2%
25	ALPIQ	-14%	1%	28%	1%	1%	-12%	1%	411%	1%	0%	-142%	0%	6%	0%	0%
26	TPC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
27	EDF UK	0%	0%	0%	0%	0%	-16%	1%	11%	0%	0%	-11%	0%	4%	0%	0%

Code- EA1							
Research Question: 1							
Classification of Emission Allowances Obligation (IFRS)							
		YE 2019		YE 2018		YE 2017	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	The Group records a liability at the year-end in the event that it does not have enough emissions allowances to cover its GHG emissions during the year.	Provision	The Group records a liability at the year-end in the event that it does not have enough emissions allowances to cover its GHG emissions during the year.	Provision	The Group records a liability at the year-end in the event that it does not have enough emissions allowances to cover its GHG emissions during the year.	Provision
3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

4	BEH	The Group recognizes a provision for the cost of greenhouse gas emissions under the terms of the long-term power purchase agreements	Provision	The Group recognizes a provision for the cost of greenhouse gas emissions under the terms of the long-term power purchase agreements	Provision	The Group recognizes a provision for the cost of greenhouse gas emissions under the terms of the long-term power purchase agreements	Provision
5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
6	CEZ	The Group recognizes a provision to cover emissions made, which corresponds to the difference between emissions made and amount of the emission rights which were granted free.	Provision	The Group recognizes a provision to cover emissions made, which corresponds to the difference between emissions made and amount of the emission rights which were granted free.	Provision	The Group recognizes a provision to cover emissions made, which corresponds to the difference between emissions made and amount of the emission rights which were granted free.	Provision

7	FORTUMPH	To the extent that the Group already holds allowances to cover emission costs, the provision is measured at the carrying value of those allowances.	Provision	To the extent that the Group already holds allowances to cover emission costs, the provision is measured at the carrying value of those allowances.	Provision	To the extent that the Group already holds allowances to cover emission costs, the provision is measured at the carrying value of those allowances.	Provision
8	TVO	The current liability for returning emission rights is recognized.	Provision	The current liability for returning emission rights is recognized.	Provision	The current liability for returning emission rights is recognized.	Provision
9	EDF	When the estimated emissions by a Group entity over a given period are higher than the rights allocated for no consideration ….. a provision is established to cover the excess emissions.	Provision	When the estimated emissions by a Group entity over a given period are higher than the rights allocated for no consideration ….. a provision is established to cover the excess emissions.	Provision	When the estimated emissions by a Group entity over a given period are higher than the rights allocated for no consideration ….. a provision is established to cover the excess emissions.	Provision

10	EON	A provision is recognized for emissions produced.	Provision	A provision is recognized for emissions produced.	Provision	A provision is recognized for emissions produced.	Provision
11	ENBW	Not Stated	Not Disclosed	Not Stated	Not Disclosed	The obligation to return CO2 allowances is accounted for under other provisions.	Provision
12	RWE	A provision is recognised to cover the obligation to submit CO2 emission allowances .... to the respective authorities.	Provision	A provision is recognised to cover the obligation to submit CO2 emission allowances .... to the respective authorities.	Provision	A provision is recognised to cover the obligation to submit CO2 emission allowances .... to the respective authorities.	Provision
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
17	SE	Provision for emission allowances was recognised for the actual quantity of greenhouse gas emissions discharged during the period, in excess of the emission allowances acquired by the Group for free.	Provision	Provision for emission allowances was recognised for the actual quantity of greenhouse gas emissions discharged during the period, in excess of the emission allowances acquired by the Group for free.	Provision	Provision for emission allowances was recognised for the actual quantity of greenhouse gas emissions discharged during the period, in excess of the emission allowances acquired by the Group for free.	Provision
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

20	ID	When the allowances are delivered, they are derecognised with a charge to the provision made when the CO2 emissions were produced.	Provision	The IBERDROLA Group records a provision for liabilities and charges in order to recognise the obligation to deliver CO2 emission allowances.	Provision	When the allowances are delivered, they are derecognised with a charge to the provision made when the CO2 emissions were produced.	Provision
21	ENDSEA	The obligation to deliver CO2 emission rights for the emissions of the previous year is recognised under Other Current Provisions.	Provision	The obligation to deliver emission allowances for the CO2 emitted during the year is recognised as a current provision.	Provision	The obligation to deliver emission allowances for the CO2 emitted during the year is recognised as a current provision.	Provision
22	VATTENFAL	As carbon dioxide is emitted, an obligation arises to deliver emission allowances to the authorities .... is reported as .... a liability.	Provision	As carbon dioxide is emitted, an obligation arises to deliver emission allowances to the authorities ….. is reported as …. a liability.	Provision	As carbon dioxide is emitted, an obligation arises to deliver emission allowances to the authorities ….. is reported as …. a liability.	Provision

23	UNIPER	A provision is recognized for the obligations arising from CO2 emissions produced within the framework of the EU Emissions Trading System.	Provision	A provision is recognized for the obligations arising from CO2 emissions produced within the framework of the EU Emissions Trading System.	Provision	A provision is recognized for emissions produced.	Provision
24	AXPO	The provision for CO2 emissions …. is measured at fair value at the end of the reporting period.	Provision	The provision for CO2 emissions …. is measured at fair value at the end of the reporting period.	Provision	The provision for CO2 emissions …. is measured at fair value at the end of the reporting period.	Provision
25	ALPIQ	Not Stated	Not Disclosed	A liability is recognised when CO2 emissions exceed the emission allowances that were allocated originally, plus those purchased subsequently.	Provision	A liability is recognised when CO2 emissions exceed the emission allowances that were allocated originally, plus those purchased subsequently.	Provision

26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
27	EDF UK	A liability is recognised when the level of emissions exceeds the level of allowances granted.	Provision	A liability is recognised when the level of emissions exceeds the level of allowances granted.	Provision	A liability is recognised when the level of emissions exceeds the level of allowances granted.	Provision

Code- EA2							
Research Question: 1							
Recognition of Emission Allowances Obligation (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	This liability is measured at the market value of the allowances required to meet its obligations at the year-end	Market Value	This liability is measured at the market value of the allowances required to meet its obligations at the year-end	Market Value	This liability is measured at the market value of the allowances required to meet its obligations at the year-end	Market Value
3	ELETRONU	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

4	BEH	The Group recognizes a provision for the cost of greenhouse gas emissions under the terms of the long-term power purchase agreements	Cost	The Group recognizes a provision for the cost of greenhouse gas emissions under the terms of the long-term power purchase agreements	Cost	The Group recognizes a provision for the cost of greenhouse gas emissions under the terms of the long-term power purchase agreements	Cost
5	NBEPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
6	CEZ	This provision is measured firstly with regard to the cost of emission rights and credits purchased with the intention of covering the greenhouse gases emissions of the reporting period.	Cost	This provision is measured firstly with regard to the cost of emission rights and credits purchased with the intention of covering the greenhouse gases emissions of the reporting period.	Cost	This provision is measured firstly with regard to the cost of emission rights and credits purchased with the intention of covering the greenhouse gases emissions of the reporting period.	Cost

7	FORTUMPH	To the extent that the Group already holds allowances to cover emission costs, the provision is measured at the carrying value of those allowances.	Carrying Value	To the extent that the Group already holds allowances to cover emission costs, the provision is measured at the carrying value of those allowances.	Carrying Value	To the extent that the Group already holds allowances to cover emission costs, the provision is measured at the carrying value of those allowances.	Carrying Value
8	TVO	The current liability for returning emission rights is recognized at the carrying value of possessed emission rights.	Carrying Value	The current liability for returning emission rights is recognized at the carrying value of possessed emission rights.	Carrying Value	The current liability for returning emission rights is recognized at the carrying value of possessed emission rights.	Carrying Value
9	EDF	Provision is measured on the basis of the acquisition cost up to the amount of rights acquired on the spot or forward markets.	Cost	Provision is measured on the basis of the acquisition cost up to the amount of rights acquired on the spot or forward markets.	Cost	Provision is measured on the basis of the acquisition cost up to the amount of rights acquired on the spot or forward markets.	Cost

10	EON	The provision is measured at the carrying amount of the emission rights held or, in the case of a shortfall, at the current fair value of the emission rights needed.	Carrying Value	The provision is measured at the carrying amount of the emission rights held or, in the case of a shortfall, at the current fair value of the emission rights needed.	Carrying Value	The provision is measured at the carrying amount of the emission rights held or, in the case of a shortfall, at the current fair value of the emission rights needed.	Carrying Value
11	ENBW	Not Stated	Not Disclosed	Not Stated	Not Disclosed	The carrying amount of the provision is determined based on the carrying amount of the existing emission allowances.	Carrying Value

12	RWE	This provision is primarily measured at the secured forward price of the CO2 allowances.	Forward Price	This provision is measured at the carrying amount of the CO2 allowances ..... capitalised for this purpose.	Carrying Value	This provision is measured at the carrying amount of the CO2 allowances ..... capitalised for this purpose.	Carrying Value
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
15	SNN	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
17	SE	The provision is measured at the estimated quantity of the emissions discharged for the period of a calendar year, valued by the unit market price.	Market Value	The provision is measured at the estimated quantity of the emissions discharged for the period of a calendar year, valued by the unit market price.	Market Value	The provision is measured at the estimated quantity of the emissions discharged for the period of a calendar year, valued by the unit market price.	Market Value
18	GEN ENERGIJA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
19	ESKOM	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
20	ID	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

21	ENDSEA	This obligation is recognised at the same amount as the CO2 emission rights to be delivered to cover this obligation.	Cost or NRV	This obligation is recognised at the same amount as the CO2 emission allowances, to be delivered to cover this obligation.	Cost or NRV	This obligation is recognised at the same amount as the CO2 emission allowances ..... to be delivered to cover this obligation	Cost or NRV
22	VATTENFAL	This liability is valued in the amount at which it is expected to be settled.	Cost	This liability is valued in the amount at which it is expected to be settled.	Cost	This liability is valued in the amount at which it is expected to be settled.	Cost
23	UNIPER	The provision is measured at the carrying amount of the emission rights held.	Carrying Value	The provision is measured at the carrying amount of the emission rights held.	Carrying Value	The provision is measured at the carrying amount of the emission rights held.	Carrying Value
24	AXPO	The provision for CO2 emissions …. is measured at fair value at the end of the reporting period.	Fair Value	The provision for CO2 emissions …. is measured at fair value at the end of the reporting period.	Fair Value	The provision for CO2 emissions …. is measured at fair value at the end of the reporting period.	Fair Value

25	ALPIQ	Not Stated	Not Disclosed	The liability is measured at the cost of purchased allowances up to the level of purchased allowances held.	Cost	The liability is measured at the cost of purchased allowances up to the level of purchased allowances held.	Cost
26	TPC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
27	EDF UK	The liability is measured at the cost of purchased allowances.	Cost	The liability is measured at the cost of purchased allowances.	Cost	The liability is measured at the cost of purchased allowances.	Cost

Code- EA3																
Research Question: 1																
Emission Allowances Obligation - Materiality Testing (IFRS)																
Materiality Benchmarks adopted from FRC 2017		YE 2019					YE 2018					YE 2017				
		PBT >5%	REV >1%	OPT >2%	NA >1%	TA =1%	PBT >5%	REV >1%	OPT >2%	NA >1%	TA =1%	PBT >5%	REV >1%	OPT >2%	NA >1%	TA =1%
S.NO	Company	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
1	ANPPCJSC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
2	EBL	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
3	ELETRONU	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
4	BEH	73%	5%	68%	3%	2%	-3%	0%	-4%	0%	0%	195%	4%	113%	2%	1%
5	NBEPC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
6	CEZ	37%	3%	11%	3%	1%	41%	3%	11%	2%	1%	16%	2%	7%	1%	1%
7	FORTUMPH	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
8	TVO	4%	1%	-154%	0%	0%	-48%	3%	60%	1%	0%	-7%	0%	3%	0%	0%
9	EDF	6%	1%	2%	1%	0%	37%	0%	1%	0%	0%	4%	0%	1%	0%	0%
10	EON	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
11	ENBW	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	9%	1%	7%	5%	1%
12	RWE	-103%	6%	31%	4%	1%	1806%	7%	58%	6%	1%	52%	4%	28%	13%	2%
13	CFE	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
14	EPZ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
15	SNN	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%

16	REA	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
17	SE	139%	2%	13%	1%	0%	133%	1%	11%	1%	0%	12%	1%	4%	0%	0%
18	GEN ENERGIJA	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
19	ESKOM	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
20	ID	11%	1%	5%	1%	0%	10%	1%	5%	1%	0%	21%	1%	6%	1%	0%
21	ENDSEA	158%	2%	9%	5%	1%	20%	2%	10%	4%	1%	11%	1%	6%	2%	1%
22	VATTENFAL	28%	3%	23%	5%	1%	34%	3%	27%	5%	1%	12%	1%	8%	2%	0%
23	UNIPER	105%	2%	64%	8%	2%	-160%	1%	60%	8%	2%	-85%	1%	46%	6%	2%
24	AXPO	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
25	ALPIQ	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
26	TPC	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
27	EDF UK	-16%	1%	9%	0%	0%	-15%	1%	10%	0%	0%	-11%	0%	4%	0%	0%

Code- DL1							
Research Question: 1							
Classification of Decommissioning Liabilities (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Estimate of the provision on decommissioning…	Provision	Estimate of the provision on decommissioning…	Provision
2	EBL	Provisions are set aside in the Group's accounts to cover all costs relating to…... decommissioning and cleaning up the site.	Provision	Provisions are set aside in the Group's accounts to cover all costs relating to…... decommissioning and cleaning up the site.	Provision	Provisions are set aside in the Group's accounts to cover all costs relating to…... decommissioning and cleaning up the site.	Provision

3	ELETRONU	As provided for in IAS 37 ….. a provision is set up over the economic useful life of thermonuclear power plants.	Provision	As provided for in IAS 37 ….. a provision is set up over the economic useful life of thermonuclear power plants.	Provision	As provided for in IAS 37 ….. a provision is set up over the economic useful life of thermonuclear power plants.	Provision
4	BEH	The group has not recognized provision for the decommissioning of nuclear installations	No Provision	The group has not recognized provision for the decommissioning of nuclear installations	No Provision	The group has not recognized provision for the decommissioning of nuclear installations	No Provision
5	NBEPC	NB Power has recorded provisions for the estimated future costs of managing used nuclear fuel, and decommissioning	Provision	NB Power has recorded provisions for the estimated future costs of managing used nuclear fuel, and decommissioning	Provision	NB Power has recorded provisions for the estimated future costs of managing used nuclear fuel, and decommissioning	Provision

6	CEZ	The Company has recognized provisions for its obligations to decommission its nuclear power plants	Provision	The Company has recognized provisions for its obligations to decommission its nuclear power plants	Provision	The Company has recognized provisions for its obligations to decommission its nuclear power plants	Provision
7	FORTUMPH	Nuclear provisions include the provision for decommissioning and the provision for disposal of spent fuel	Provision	Nuclear provisions include the provision for decommissioning and the provision for disposal of spent fuel	Provision	Nuclear provisions include the provision for decommissioning and the provision for disposal of spent fuel	Provision
8	TVO	The provision is related to future obligations for decommissioning of the power plant,	Provision	The provision is related to future obligations for decommissioning of the power plant,	Provision	The provision is related to future obligations for decommissioning of the power plant,	Provision

9	EDF	Provisions for decommissioning of nuclear plants result from the Group management's best estimates.	Provision	Provisions for decommissioning of nuclear plants result from the Group management's best estimates.	Provision	Provisions for decommissioning of nuclear plants result from the Group management's best estimates.	Provision
10	EON	Provisions - Obligations arising from the decommissioning or dismantling of property, plant and equipment are recognized	Provision	Provisions - Obligations arising from the decommissioning or dismantling of property, plant and equipment are recognized	Provision	Provisions - Obligations arising from the decommissioning or dismantling of property, plant and equipment are recognized	Provision
11	ENBW	Provisions relating to nuclear power cover obligations for the decommissioning and dismantling of nuclear power plants,	Provision	Provisions relating to nuclear power cover obligations for the decommissioning and dismantling of nuclear power plants,	Provision	Provisions relating to nuclear power cover obligations for the decommissioning and dismantling of nuclear power plants,	Provision

12	RWE	Decommissioning, restoration and similar provisions are recognised	Provision	Decommissioning, restoration and similar provisions are recognised	Provision	Decommissioning, restoration and similar provisions are recognised	Provision
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	The provision for the decommissioning and dismantling of the nuclear power plant is structured in such	Provision	The provision for the decommissioning and dismantling of the nuclear power plant is structured in such	Provision	The provision for the decommissioning and dismantling of the nuclear power plant is structured in such	Provision
15	SNN	The Group has not recorded a provision for the decommissioning of the two units because it is not responsible for the decommissioning works.	No Provision	The Group has not recorded a provision for the decommissioning of the two units because it is not responsible for the decommissioning works.	No Provision	The Group has not recorded a provision for the decommissioning of the two units because it is not responsible for the decommissioning works.	No Provision

16	REA	The group has used key assumptions to calculate provision for decommissioning…	Provision	The group has used key assumptions to calculate provision for decommissioning…	Provision	The group has used key assumptions to calculate provision for decommissioning…	Provision
17	SE	The provision for nuclear decommissioning and storage costs is recognised	Provision	The provision for nuclear decommissioning and storage costs is recognised	Provision	The provision for nuclear decommissioning and storage costs is recognised	Provision
18	GEN ENERGIJA	Due to the unchanged production capacities of NEK, provisions were not drawn in the period under review	No Provision	Due to the unchanged production capacities of NEK, provisions were not drawn in the period under review	No Provision	Due to the unchanged production capacities of NEK, provisions were not drawn in the period under review	No Provision
19	ESKOM	The provision includes the estimated decommissioning cost of nuclear and other generating plant.	Provision	The provision includes the estimated decommissioning cost of nuclear and other generating plant.	Provision	The provision includes the estimated decommissioning cost of nuclear and other generating plant.	Provision

20	ID	The IBERDROLA Group also maintains provisions to meet a series of costs needed for dismantling work at its nuclear and thermal power plants	Provision	The IBERDROLA Group also maintains provisions to meet a series of costs needed for dismantling work at its nuclear and thermal power plants	Provision	The IBERDROLA Group also maintains provisions to meet a series of costs needed for dismantling work at its nuclear and thermal power plants	Provision
21	ENDSEA	ENDESA recognises a provision for the expected cost of dismantling	Provision	ENDESA recognises a provision for the expected cost of dismantling	Provision	ENDESA recognises a provision for the expected cost of dismantling	Provision
22	VATTENFAL	Other provisions than pension provisions and provisions for future expenses for nuclear power operations	Provision	Other provisions than pension provisions and provisions for future expenses for nuclear power operations	Provision	Other provisions than pension provisions and provisions for future expenses for nuclear power operations	Provision

23	UNIPER	The provisions recognized for nuclear asset retirement obligations include t	Provision	The provisions recognized for nuclear asset retirement obligations include t	Provision	The provisions recognized for nuclear asset retirement obligations include t	Provision
24	AXPO	The provision for decommissioning the Group's own power plant	Provision	The provision for decommissioning the Group's own power plant	Provision	The provision for decommissioning the Group's own power plant	Provision
25	ALPIQ	Post-operation, decommissioning, disposal" contains …... the cost of decommissioning	Provision	Post-operation, decommissioning, disposal" contains …... the cost of decommissioning	Provision	Post-operation, decommissioning, disposal" contains …... the cost of decommissioning	Provision
26	TPC	The company is required to undetake decommissioning obligations. In accordance with IAS 37	Provision	The company is required to undetake decommissioning obligations. In accordance with IAS 37	Provision	The company is required to undetake decommissioning obligations. In accordance with IAS 37	Provision

27	EDF UK	Nuclear liabilities represents provision for ..	Provision	Nuclear liabilities represents provision for ..	Provision	Nuclear liabilities represents provision for ..	Provision

Code- DL2							
Research Question: 1							
Recognition of Decommissioning Liabilities (IFRS)							
		YE 2019		**YE 2018**		**YE 2017**	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	The Company makes certain judgements, estimates and assumptions related to ….. Decommissioning	Present Value Estimate	The Company makes certain judgements, estimates and assumptions related to ….. Decommissioning	Present Value Estimate

2	EBL	The present value of the engagement at the time of commissioning represents the initial amount of the provision for dismantling	Present Value Estimate	The present value of the engagement at the time of commissioning represents the initial amount of the provision for dismantling	Present Value Estimate	The present value of the engagement at the time of commissioning represents the initial amount of the provision for dismantling	Present Value Estimate
3	ELETRONU	decommissioning liability adjusted to present value	Present Value Estimate	decommissioning liability adjusted to present value	Present Value Estimate	decommissioning liability adjusted to present value	Present Value Estimate
4	BEH	The group has not recognized provision for the decommissioning of nuclear installations	No Provision	The group has not recognized provision for the decommissioning of nuclear installations	No Provision	The group has not recognized provision for the decommissioning of nuclear installations	No Provision

5	NBEPC	The calculations of the anticipated future costs are based on detailed studies that take into account various assumptions	Present Value Estimate	The calculations of the anticipated future costs are based on detailed studies that take into account various assumptions	Present Value Estimate	The calculations of the anticipated future costs are based on detailed studies that take into account various assumptions	Present Value Estimate
6	CEZ	The provisions recognized represent the best estimate of the expenditures	Present Value Estimate	The provisions recognized represent the best estimate of the expenditures	Present Value Estimate	The provisions recognized represent the best estimate of the expenditures	Present Value Estimate
7	FORTUMPH	Provision is calculated using the present value of	Present Value Estimate	Provision is calculated using the present value of	Present Value Estimate	Provision is calculated using the present value of	Present Value Estimate
8	TVO	The present initial value of the provision for the decommissioning of a nuclear power plant	Present Value Estimate	The present initial value of the provision for the decommissioning of a nuclear power plant	Present Value Estimate	The present initial value of the provision for the decommissioning of a nuclear power plant	Present Value Estimate

9	EDF	Provisions for decommissioning of nuclear plants result from the Group management's best estimates.	Present Value Estimate	Provisions for decommissioning of nuclear plants result from the Group management's best estimates.	Present Value Estimate	Provisions for decommissioning of nuclear plants result from the Group management's best estimates.	Present Value Estimate
10	EON	The estimates for nuclear decommissioning provisions are derived from studies, cost estimates, le	Present Value Estimate	The estimates for nuclear decommissioning provisions are derived from studies, cost estimates, le	Present Value Estimate	The estimates for nuclear decommissioning provisions are derived from studies, cost estimates, le	Present Value Estimate
11	ENBW	The provisions for decommissioning …..are calculated using external appraisals, based on the contractual regulations and the company's own expectations.	Present Value Estimate	The provisions for decommissioning …..are calculated using external appraisals, based on the contractual regulations and the company's own expectations.	Present Value Estimate	The provisions for decommissioning …..are calculated using external appraisals, based on the contractual regulations and the company's own expectations.	Present Value Estimate

12	RWE	Provisions are carried at their prospective settlement amount	Present Value Estimate	Provisions are carried at their prospective settlement amount	Present Value Estimate	Provisions are carried at their prospective settlement amount	Present Value Estimate
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	Provisions are measured at the present value of expected expenditures less any expected own income.	Present Value Estimate	Provisions are measured at the present value of expected expenditures less any expected own income.	Present Value Estimate	Provisions are measured at the present value of expected expenditures less any expected own income.	Present Value Estimate
15	SNN	The Group has not recorded a provision for the decommissioning of the two units because it is not responsible for the decommissioning works.	No Provision	The Group has not recorded a provision for the decommissioning of the two units because it is not responsible for the decommissioning works.	No Provision	The Group has not recorded a provision for the decommissioning of the two units because it is not responsible for the decommissioning works.	No Provision

16	REA	The amount of the estimated liability for the decommissioning of ….	Present Value Estimate	The amount of the estimated liability for the decommissioning of ….	Present Value Estimate	The amount of the estimated liability for the decommissioning of ….	Present Value Estimate
17	SE	based on discounted future cash flows estimated in relation to the decommissioning of nuclear facilities,	Present Value Estimate	based on discounted future cash flows estimated in relation to the decommissioning of nuclear facilities,	Present Value Estimate	based on discounted future cash flows estimated in relation to the decommissioning of nuclear facilities,	Present Value Estimate
18	GEN ENERGIJA	Due to the unchanged production capacities of NEK, provisions were not drawn in the period under review	No Provision	Due to the unchanged production capacities of NEK, provisions were not drawn in the period under review	No Provision	Due to the unchanged production capacities of NEK, provisions were not drawn in the period under review	No Provision

19	ESKOM	The estimated cost of decommissioning ……. is based on engineering and technical estimates	Present Value Estimate	The estimated cost of decommissioning ……. is based on engineering and technical estimates	Present Value Estimate	The estimated cost of decommissioning ……. is based on engineering and technical estimates	Present Value Estimate
20	ID	The estimated present value of these costs is capitalised with a credit to "Provisions	Present Value Estimate	The estimated present value of these costs is capitalised with a credit to "Provisions	Present Value Estimate	The estimated present value of these costs is capitalised with a credit to "Provisions	Present Value Estimate
21	ENDSEA	Changes in provision resulting from re-calculations of present value are recognised a	Present Value Estimate	Changes in provision resulting from re-calculations of present value are recognised a	Present Value Estimate	Changes in provision resulting from re-calculations of present value are recognised a	Present Value Estimate
22	VATTENFAL	provisions for future expenses for decommissioning….. Estimates	Present Value Estimate	provisions for future expenses for decommissioning….. Estimates	Present Value Estimate	provisions for future expenses for decommissioning….. Estimates	Present Value Estimate

23	UNIPER	anticipated costs of post-operation and service operation of the facility, dismantling costs, and the cost of removal	Present Value Estimate	anticipated costs of post-operation and service operation of the facility, dismantling costs, and the cost of removal	Present Value Estimate	anticipated costs of post-operation and service operation of the facility, dismantling costs, and the cost of removal	Present Value Estimate
24	AXPO	covers the estimated costs of decommissioning and restoration obligations	Present Value Estimate	covers the estimated costs of decommissioning and restoration obligations	Present Value Estimate	covers the estimated costs of decommissioning and restoration obligations	Present Value Estimate
25	ALPIQ	The present value of the estimated decommissioning and disposal costs	Present Value Estimate	The present value of the estimated decommissioning and disposal costs	Present Value Estimate	The present value of the estimated decommissioning and disposal costs	Present Value Estimate
26	TPC	In order to reflect the best estimate of the nuclear decommissioning provisions.	Present Value Estimate	In order to reflect the best estimate of the nuclear decommissioning provisions.	Present Value Estimate	In order to reflect the best estimate of the nuclear decommissioning provisions.	Present Value Estimate

27	EDF UK	The provision is based on the present value of..	Present Value Estimate	The provision is based on the present value of..	Present Value Estimate	The provision is based on the present value of..	Present Value Estimate

Code- DL3																	
Research Question: 1																	
Decommissioning Liabilities - Materiality Testing (IFRS)																	
Materiality Benchmarks adopted from FRC 2017		**YE 2019**					**YE 2018**					**YE 2017**					
		PBT >5%	**REV >1%**	**OPT >2%**	**NA >1%**	**TA =1%**	**PBT >5%**	**REV >1%**	**OPT >2%**	**NA >1%**	**TA =1%**	**PBT >5%**	**REV >1%**	**OPT >2%**	**NA >1%**	**TA =1%**
S.NO	**Company**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**	**1**	**2**	**3**	**4**	**5**
1	ANPPCJSC	0	0	0	0	0	-315	66	-253	23	7	-262	40	-239	21	9
2	EBL	-545	13	73	20	5	-440	10	66	15	4	-442	9	61	13	4
3	ELETRONU	39	9	34	3	1	15	10	19	5	1	-1233	7	107	6	1
4	BEH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	NBEPC	173	27	84	178	7	157	24	79	113	6	128	22	69	113	5
6	CEZ	412	37	126	30	11	471	34	128	27	9	271	31	114	24	10
7	FORTUMP	47	15	46	6	3	86	17	54	7	4	77	19	53	6	4
8	TVO	1194	409	-42674	57	13	-5223	272	6498	55	12	-10104	297	4785	57	13
9	EDF	897	80	343	103	19	10787	74	334	97	18	1417	69	351	99	17
10	EON	1225	24	176	75	10	301	33	204	116	18	226	28	211	156	19
11	ENBW	1055	10	495	94	14	-361	16	-436	85	14	203	26	155	99	15

12	RWE	-894	51	270	39	10	12131	44	386	42	7	196	14	104	50	9
13	CFE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	EPZ	1284	63	2342	27	16	-586	50	-1075	24	13	-113	48	-122	21	13
15	SNN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	REA	42	9	38	3	2	17	6	23	2	1	0	0	0	0	0
17	SE	6976	89	633	48	19	8131	80	692	52	19	1872	86	632	47	19
18	GEN ENER	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	ESKOM	-61	10	57	12	2	-612	9	35	9	2	1523	10	47	10	2
20	ID	14	2	7	1	1	14	2	7	1	1	29	2	8	1	1
21	ENDSEA	278	3	17	8	2	30	3	15	6	2	28	3	15	6	2
22	VATTENFA	469	52	388	79	19	555	50	441	75	17	558	53	385	76	18
23	UNIPER	267	4	164	21	6	-431	3	160	22	5	-253	3	138	19	6
24	AXPO	521	65	267	46	14	377	63	264	52	15	1377	60	476	58	13
25	ALPIQ	-13	1	27	1	1	-14	1	478	1	0	-375	1	16	1	0
26	TPC	2477	75	55407	146	21	1527	74	7515	151	21	1828	75	1330	163	21
27	EDF UK	-2941	138	1661	48	27	-1795	107	1205	40	23	-2563	102	884	42	23

Code- DR2							
Research Question: 1							
Discounting Rates for Decommissioning Liabilities (IFRS)							
		YE 2019		YE 2018		YE 2017	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Disclosed	Not Disclosed	3.00%	Rate	3.00%	Rate
2	EBL	2.50%	Rate	3.50%	Rate	3.50%	Rate
3	ELETRONU	5.86%	Rate	Not Disclosed	Not Disclosed	5.88%	Rate
4	BEH	Not Discounted	No Rate	Not Discounted	No Rate	Not Discounted	No Rate
5	NBEPC	4.16%	Rate	4.30%	Rate	4.51%	Rate
6	CEZ	0.70%	Rate	1.25%	Rate	1.25%	Rate
7	FORTUMPH	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed
8	TVO	4%	Rate	5.50%	Rate	5.50%	Rate
9	EDF	2.30%	Rate	2.40%	Rate	2.60%	Rate
10	EON	2.00%	Rate	2.00%	Rate	1.50%	Rate
11	ENBW	2.40%	Rate	2.40%	Rate	1.70%	Rate
12	RWE	-1.50%	Rate	-1.10%	Rate	-0.90%	Rate
13	CFE	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed
14	EPZ	2.50%	Rate	3.50%	Rate	3.50%	Rate
15	SNN	Not Discounted	No Rate	Not Discounted	No Rate	Not Discounted	No Rate
16	REA	6.78%	Rate	8.88%	Rate	Not Disclosed	Not Disclosed
17	SE	3.88%	Rate	3.97%	Rate	4.15%	Rate
18	GEN ENERGIJA	Not Discounted	No Rate	Not Discounted	No Rate	Not Discounted	No Rate

19	ESKOM	3.40%	Rate	3.30%	Rate	3.30%	Rate
20	ID	1.46%	Rate	2.61%	Rate	2.84%	Rate
21	ENDSEA	0.00%	Rate	0.30%	Rate	0.10%	Rate
22	VATTENFAL	2.75%	Rate	3.00%	Rate	3.25%	Rate
23	UNIPER	2%	Rate	2.20%	Rate	3.00%	Rate
24	AXPO	2.75%	Rate	3.50%	Rate	3.50%	Rate
25	ALPIQ	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed
26	TPC	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed	Not Disclosed
27	EDF UK	2.00%	Rate	2.50%	Rate	2.70%	Rate

Code- AR1							
Research Question: 1							
Classification of Asset Retirement Funds (IFRS)							
		YE 2019		YE 2018		YE 2017	
S.NO	**Company**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**	**Disclosure**	**Coded Term**
1	ANPPCJSC	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
2	EBL	Group's wholly-owned subsidiary Synatom responsibility for managing and investing funds received from operators of nuclear power plants in Belgium and designed to cover the costs of dismantling nuclear power plants	Unsegregated Funds	Group's wholly-owned subsidiary Synatom responsibility for managing and investing funds received from operators of nuclear power plants in Belgium and designed to cover the costs of dismantling nuclear power plants	Unsegregated Funds	Group's wholly-owned subsidiary Synatom responsibility for managing and investing funds received from operators of nuclear power plants in Belgium and designed to cover the costs of dismantling nuclear power plants	Unsegregated Funds

3	ELETRONU	The Company recognizes a provision for obligations with the decommissioning of assets related to its thermonuclear power plants.	Provision	The Company recognizes a provision for obligations with the decommissioning of assets related to its thermonuclear power plants.	Provision	The Company recognizes a provision for obligations with the decommissioning of assets related to its thermonuclear power plants.	Provision
4	BEH	The company is subject to specific regulations ……decommissioning of nuclear facilities fund	Segregated Funds	The company is subject to specific regulations ……decommissioning of nuclear facilities fund	Segregated Funds	The company is subject to specific regulations ……decommissioning of nuclear facilities fund	Segregated Funds
5	NBEPC	NB Power's nuclear fund investments, the nuclear decommissioning and used fuel management funds include an investment in a unit trust, the "NBP Canadian Long-Term Bond Fund",	Segregated Funds	NB Power's nuclear fund investments, the nuclear decommissioning and used fuel management funds include an investment in a unit trust, the "NBP Canadian Long-Term Bond Fund",	Segregated Funds	NB Power's nuclear fund investments, the nuclear decommissioning and used fuel management funds include an investment in a unit trust, the "NBP Canadian Long-Term Bond Fund",	Segregated Funds

6	CEZ	The Company makes contributions to a restricted bank accounts in the amount of the nuclear provisions recorded under the Nuclear Act.	Segregated Funds	The Company makes contributions to a restricted bank accounts in the amount of the nuclear provisions recorded under the Nuclear Act.	Segregated Funds	The Company makes contributions to a restricted bank accounts in the amount of the nuclear provisions recorded under the Nuclear Act.	Segregated Funds
7	FORTUMPH	Fortum does not have control or joint control over the State Nuclear Waste Management Fund. The Nuclear Waste Management Fund is managed by governmental authorities.	Segregated Funds	Fortum does not have control or joint control over the State Nuclear Waste Management Fund. The Nuclear Waste Management Fund is managed by governmental authorities.	Segregated Funds	Fortum does not have control or joint control over the State Nuclear Waste Management Fund. The Nuclear Waste Management Fund is managed by governmental authorities.	Segregated Funds

8	TVO	TVO does not have control or joint control over the Finnish State Nuclear Waste Management Fund.	Segregated Funds	TVO does not have control or joint control over the Finnish State Nuclear Waste Management Fund.	Segregated Funds	TVO does not have control or joint control over the Finnish State Nuclear Waste Management Fund.	Segregated Funds
9	EDF	EDF has set up "reserved" investment funds for some of its funds set aside for secure financing of nuclear plant decommissioning expenses ….. he Group considers that it does not have control,	Segregated Funds	EDF has set up "reserved" investment funds for some of its funds set aside for secure financing of nuclear plant decommissioning expenses ….. he Group considers that it does not have control,	Segregated Funds	EDF has set up "reserved" investment funds for some of its funds set aside for secure financing of nuclear plant decommissioning expenses ….. he Group considers that it does not have control,	Segregated Funds
10	EON	The majority of the assets are held in investment funds managed by external fund managers.	Unsegregated Funds	The majority of the assets are held in investment funds managed by external fund managers.	Unsegregated Funds	The majority of the assets are held in investment funds managed by external fund managers.	Unsegregated Funds

11	ENBW	paid in full to the government as part of the payment to the disposal fund.	Segregated Funds	paid in full to the government as part of the payment to the disposal fund.	Segregated Funds	paid in full to the government as part of the payment to the disposal fund.	Segregated Funds
12	RWE	We made contributions to the German nuclear energy fund in the middle of 2017.	Segregated Funds	We made contributions to the German nuclear energy fund in the middle of 2017.	Segregated Funds	We made contributions to the German nuclear energy fund in the middle of 2017.	Segregated Funds
13	CFE	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
14	EPZ	A savings fund has been formed for this long-term liability. These savings are invested conservatively in a mix of equities and bonds	Unsegregated Fund	A savings fund has been formed for this long-term liability. These savings are invested conservatively in a mix of equities and bonds	Unsegregated Fund	A savings fund has been formed for this long-term liability. These savings are invested conservatively in a mix of equities and bonds	Unsegregated Fund
15	SNN	the Company is required to make two types of contributions to the ANDR:	Segregated Funds	the Company is required to make two types of contributions to the ANDR:	Segregated Funds	the Company is required to make two types of contributions to the ANDR:	Segregated Funds
16	REA	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed

17	SE	According to the Act on the National Nuclear Fund the Group is one of the contributors to the National Nuclear Fund. The National Nuclear Fund, reporting to the Ministry of Economy of the Slovak Republic, is not controlled by the Group.	Segregated Funds	According to the Act on the National Nuclear Fund the Group is one of the contributors to the National Nuclear Fund. The National Nuclear Fund, reporting to the Ministry of Economy of the Slovak Republic, is not controlled by the Group.	Segregated Funds	According to the Act on the National Nuclear Fund the Group is one of the contributors to the National Nuclear Fund. The National Nuclear Fund, reporting to the Ministry of Economy of the Slovak Republic, is not controlled by the Group.	Segregated Funds
18	GEN ENERGIJA	On the basis of the Intergovernmental Agreement on NEK, the Fund for Financing the decommissioning of the Krško Nuclear Power Plant	Segregated Funds	On the basis of the Intergovernmental Agreement on NEK, the Fund for Financing the decommissioning of the Krško Nuclear Power Plant	Segregated Funds	On the basis of the Intergovernmental Agreement on NEK, the Fund for Financing the decommissioning of the Krško Nuclear Power Plant	Segregated Funds

19	ESKOM	The trust funds are controlled by third parties and will be solely used for the environmental rehabilitation	Segregated Funds	The trust funds are controlled by third parties and will be solely used for the environmental rehabilitation	Segregated Funds	The trust funds are controlled by third parties and will be solely used for the environmental rehabilitation	Segregated Funds
20	ID	Not Stated	Not Disclosed	Not Stated	Not Disclosed	Not Stated	Not Disclosed
21	ENDSEA	This provision includes the amount that ENDESA estimates that it will have to pay until such time as the government-owned company Empresa Nacional de Residuos Radioactivos, S.A. (EN- RESA) takes charge of decommissioning	Provision	This provision includes the amount that ENDESA estimates that it will have to pay until such time as the government-owned company Empresa Nacional de Residuos Radioactivos, S.A. (EN- RESA) takes charge of decommissioning	Provision	This provision includes the amount that ENDESA estimates that it will have to pay until such time as the government-owned company Empresa Nacional de Residuos Radioactivos, S.A. (EN- RESA) takes charge of decommissioning	Provision
22	VATTENFAL	The reactor owner is required to pay a generation-based fee to the board of the Swedish Nuclear Waste Fund, which	Segregated Funds	The reactor owner is required to pay a generation-based fee to the board of the Swedish Nuclear Waste Fund, which	Segregated Funds	The reactor owner is required to pay a generation-based fee to the board of the Swedish Nuclear Waste Fund, which manages paid-in funds	Segregated Funds

		manages paid-in funds		manages paid-in funds			
23	UNIPER	Uniper is required to pay fees to the KAF for its Swedish nuclear operations	Segregated Funds	Uniper is required to pay fees to the KAF for its Swedish nuclear operations	Segregated Funds	Uniper is required to pay fees to the KAF for its Swedish nuclear operations	Segregated Funds
24	AXPO	The law requires operators of nuclear power plants to make payments to two state-controlled funds for the decommissioning of nuclear power plants	Segregated Funds	The law requires operators of nuclear power plants to make payments to two state-controlled funds for the decommissioning of nuclear power plants	Segregated Funds	The law requires operators of nuclear power plants to make payments to two state-controlled funds for the decommissioning of nuclear power plants	Segregated Funds

25	ALPIQ	Switzerland's nuclear power plants are required to make payments into the decommissioning fund and the waste disposal fund	Segregated Funds	Switzerland's nuclear power plants are required to make payments into the decommissioning fund and the waste disposal fund	Segregated Funds	Switzerland's nuclear power plants are required to make payments into the decommissioning fund and the waste disposal fund	Segregated Funds
26	TPC	The company assumes the obligation for decommissioning and does not have control or joint control of, or significant influence over the fund.	Segregated Funds	The company assumes the obligation for decommissioning and does not have control or joint control of, or significant influence over the fund.	Segregated Funds	The company assumes the obligation for decommissioning and does not have control or joint control of, or significant influence over the fund.	Segregated Funds
27	EDF UK	The Group makes fixed decommissioning obligations payable to the NLF	Segregated Funds	The Group makes fixed decommissioning obligations payable to the NLF	Segregated Funds	The Group makes fixed decommissioning obligations payable to the NLF	Segregated Funds

Code- NF1 & NF2				
Research Question: 1				
Initial Nuclear Fuel (NON-IFRS)				
YE 2019			Classification (NF1)	Recognition (NF2)
S.NO	**Company**	**Disclosure**	**Coded Term**	**Coded Term**
1	OPG	Inventories, consisting of fuel and materials and supplies, are measured at the lower of cost and net realizable value. Cost is determined as weighted average cost for fuel inventory and average cost for materials and supplies	Inventory	Cost or NRV
2	YJNPC	The Group's inventories mainly include raw materials, nuclear fuel, spare parts, products in stock, consigned processing materials, materials in transit and turnover materials. Inventories are initially measured at cost.	Inventory	Cost
3	CNNO	Not Stated	Not Disclosed	Not Disclosed
4	NPCIL	NPCIL is not maintaining any inventory with respect to Fuel and Heavy Water. All Fuel and Heavy Water costs are charged as per directives of DAE as applicable from time to time. Fuel Charges related to KKNPP Unit - 1&2 are accounted on provisional basis pending finalisation of notification from DAE. Being confidential in nature, the quantitative details of above are not disclosed.	Not Disclosed	Not Disclosed
5	TEPCO	Nuclear fuel is stated at cost less accumulated amortization. The amortization of loaded nuclear fuel is computed based on the quantity of energy produced in the generation of electricity.	Property, Plant and Equipment	Cost

6	KYUSHU	Amortization of nuclear fuel is computed based on the proportion of current heat produced to the estimated total potential heat production over the estimated useful life of the nuclear fuel.	Property, Plant and Equipment	Cost
7	CHUBU	Nuclear fuel is stated at cost, less amortization. The amortization of loaded nuclear fuel is computed based on the quantity of energy produced for the generation of electricity in accordance with the provisions prescribed by the regulatory authorities.	Property, Plant and Equipment	Cost
8	TOHOKU	Nuclear fuel is stated at cost less accumulated amortization. The amortization of loaded nuclear fuel is computed based on the proportion of heat production for the current year to the total heat production estimated over the life of the nuclear fuel.	Property, Plant and Equipment	Cost
9	SHIKOKU	Amortization of nuclear fuel is computed based on the quantity of heat produced for the generation of electricity.	Property, Plant and Equipment	Cost
10	KEPCO	Amortization of nuclear fuel is computed based on the quantity of heat produced for the generation of electricity.	Property, Plant and Equipment	Cost
11	HOKURIKU	Nuclear fuel is stated in non-current assets	Property, Plant and Equipment	Cost
12	CHUGOKU	Nuclear fuel is stated at cost less accumulated amortization. The amortization of loaded nuclear fuel is computed based on the quantity of heat produced for electricity generation.	Property, Plant and Equipment	Cost

13	HEPCO	Nuclear fuel is stated in non-current assets	Property, Plant and Equipment	Cost
14	KHNP	Property, plant and equipment are initially measured at cost……. depreciated…..For loaded nuclear fuel……the company uses the production method to measure and recognize…..	Property, Plant and Equipment	Cost
15	EXELON	Inventory is recorded at the lower of weighted average cost or net realizable value. Fossil fuel, materials and supplies, and emissions allowances are generally included in inventory when purchased.	Inventory	Cost or NRV
16	ENTERGY	Entergy amortizes nuclear fuel using a units-of-production method. Nuclear fuel amortization is included in fuel expense in the income statements.	Property, Plant and Equipment	Cost
17	TVA	Inventory…..Total monthly fuel costs include costs for natural gas, fuel oil, coal, purchased power, emission allowances, nuclear fuel, and other fuel-related commodities..	Inventory	Cost
18	DUKEENER	Nuclear fuel is classified as Property, Plant and Equipment on the Consolidated Balance Sheets. Amortization of nuclear fuel is included within Fuel	Property, Plant and Equipment	Cost
19	DOMINION	Nuclear fuel is stated in non-current assets	Property, Plant and Equipment	Cost
20	SOUTHERN	Nuclear fuel is stated in non-current assets	Property, Plant and Equipment	Cost

21	NEXTERA	Nuclear fuel is stated in non-current assets	Property, Plant and Equipment	Cost
22	FENOC	Fuel inventory is accounted for at weighted average cost when purchased and recorded to fuel expense when consumed.	Inventory	Cost
23	NSP	Nuclear fuel is stated in non-current assets	Property, Plant and Equipment	Cost
24	PSEG	The Group's inventories mainly include raw materials, nuclear fuel, spare parts, products in stock, consigned processing materials, materials in transit and turnover materials. Inventories are initially measured at cost.	Property, Plant and Equipment	Cost
25	APS	Property, plant and equipment - APS amortizes nuclear fuel by using the unit-of-production method.	Property, Plant and Equipment	Cost
26	PG&E	Nuclear fuel is stated in non-current assets	Property, Plant and Equipment	Cost
27	LUMINANT	Nuclear fuel is capitalized and reported as a component of our property, plant and equipment in our consolidated balance sheets.	Property, Plant and Equipment	Cost

Code- SF1 & SF2				
Research Question: 1				
Spent Nuclear Fuel (NON-IFRS)				
YE 2019			Classification (SF1)	Recognition (SF2)
S.NO	**Company**	**Disclosure**	**Coded Term**	**Coded Term**
1	OPG	This organization, the NWMO, is responsible for the design and implementation of Canada's plan for the long-term management of used nuclear fuel waste. To estimate its liability for used nuclear fuel management costs, OPG has adopted an approach consistent with the APM concept approved by the Government of Canada. The significant assumptions used in estimating future nuclear fixed asset removal costs include a deferred dismantlement basis for decommissioning of the station	Provision	Present Value Estimate
2	YJNPC	The increase in provision for spent fuel management was primarily due to the commencement of provision and payment for spent fuel management as Yangjiang Unit 1 and Ningde Unit 2 commenced commercial operation for five years in 2019. Provision for nuclear power plant decommissioning is estimated on the basis of best estimate, and the discounted amount.	Provision	Present Value Estimate
3	CNNO	Not Stated	Not Disclosed	Not Disclosed

4	NPCIL	NPCIL is not maintaining any inventory with respect to Fuel and Heavy Water. All Fuel and Heavy Water costs are charged as per directives of DAE as applicable from time to time. Fuel Charges related to KKNPP Unit - 1&2 are accounted on provisional basis pending finalisation of notification from DAE. Being confidential in nature, the quantitative details of above are not disclosed	Not Disclosed	Not Disclosed
5	TEPCO	Before nuclear power plants can be scrapped, nuclear fuels in the reactors must be removed, ... Accordingly, the Company records the amounts.	Provision	Present Value Estimate
6	KYUSHU	The annual provision was calculated in accordance with the accounting regulations set by the Japanese Government applicable to electric utility providers in Japan.	Provision	Present Value Estimate
7	CHUBU	Not Stated	Not Disclosed	Not Disclosed
8	TOHOKU	amount corresponding to costs necessary to dismantle the components of the nuclear fuel	Provision	Present Value Estimate
9	SHIKOKU	...amount corresponding to costs necessary to dismantle the components of the nuclear fuel…...Contributions include those made in relation to reprocessing of spent fuel, and these contributions have been organized into a special account related to reprocessing of spent nuclear fuel.	Provision	Present Value Estimate
10	KEPCO	The Company mainly recognizes an asset retirement obligation with regard to the costs for decommissioning of nuclear power units, which are regulated under the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material,	Provision	Present Value Estimate

11	HOKURIKU	The Company mainly recognizes an asset retirement obligation with regard to the costs for decommissioning of nuclear power units, which are regulated under the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material,	Provision	Present Value Estimate
12	CHUGOKU	The Company mainly recognizes an asset retirement obligation with regard to the costs for decommissioning of nuclear power units, which are regulated under the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material,	Provision	Present Value Estimate
13	HEPCO	The Company mainly recognizes an asset retirement obligation with regard to the costs for decommissioning of nuclear power units, which are regulated under the Act on the Regulation of Nuclear Source Material, Nuclear Fuel Material,	Provision	Present Value Estimate
14	KHNP	The group is leived to pay the spent nuclear fuel fund for the management of spent nuclear fuel. The group recognizes the provision of present value of the payments.	Provision	Present Value Estimate
15	EXELON	The NRC granted Generation's exemption request to use the TMI Unit 1 NDT funds for spent fuel management costs.	Provision	Present Value Estimate
16	ENTERGY	Provisions to recover such costs have been or will be made in applications to regulatory authorities for the Utility plants.	Provision	Present Value Estimate
17	TVA	TVA has been storing the spent fuel in accordance with NRC regulations in anticipation that a final storage site for all such waste will be developed and put in operation by the U.S. government. If no such site is forthcoming or if no alternative disposal or reuse plan is developed, then TVA	Provision	Present Value Estimate

		might be required to arrange for the safe and permanent disposal of the spent fuel itself. Such a requirement would cause TVA to incur substantial expense, including substantial capital expenditures, and could cause TVA to change how it operates its nuclear plants.		
18	DUKEENER	The nuclear power industry faces uncertainties with respect to the cost and long-term availability of disposal sites for spent nuclear fuel and other radioactive waste, compliance with changing regulatory requirements, capital outlays for modifications and new plant construction.	Provision	Present Value Estimate
19	DOMINION	Dominion Energy and Virginia Power entered into contracts with the DOE for the disposal of spent nuclear fuel……..provision…..	Provision	Present Value Estimate
20	SOUTHERN	On-site dry spent fuel storage facilities are operational at all three plants and can be expanded to accommodate spent fuel through the expected life of each plant. Alabama Power's decommissioning costs are based on the site study and Georgia Power's decommissioning costs are based on the NRC generic estimate to decommission the radioactive portion of the facilities and the site study estimate for spent fuel management.	Provision	Present Value Estimate
21	NEXTERA	PL's nuclear facilities use both on-site storage pools and dry storage casks to store spent nuclear fuel generated by these facilities, which are expected to provide sufficient storage of spent nuclear fuel that is generated at these facilities through license expiration. FPL accrues and funds for nuclear plant	Provision	Present Value Estimate

		decommissioning costs over the expected service life of each unit based on studies that are approved by the FPSC.		
22	FENOC	The remaining balance …… reflects liabilities for spent nuclear fuel disposal costs from former nuclear generating facilities	Provision	Present Value Estimate
23	NSP	Environmental costs include accruals for nuclear plant decommissioning and payments for storage of spent nuclear fuel,	Provision	Present Value Estimate
24	PSEG	In addition, the on-site storage for spent nuclear fuel may significantly increase the decommissioning costs of our nuclear units.	Provision	Present Value Estimate
25	APS	PS is directly involved in legal proceedings related to the DOE's failure to meet its statutory and contractual obligations regarding acceptance of spent nuclear fuel and high level waste…..The DOE is responsible for the permanent disposal of spent nuclear fuel and charged APS $0.001 per kWh of nuclear generation through May 2014, at which point the DOE reduced the fee to zero. In accordance with a settlement agreement with the DOE in August 2014, we now accrue a receivable and an offsetting regulatory liability through the settlement period ending December of 2019…	Provision	Present Value Estimate
26	PG&E	The Utility …… sued the DOE to recover the costs that they incurred …… for spent nuclear fuel. Considerable uncertainty continues to exist regarding when and whether the DOE will meet its contractual obligation to the Utility and other nuclear power plant owners to dispose of spent	Provision	Present Value Estimate

		fuel……To estimate its liability, the Utility uses a discounted cash flow model based upon significant estimates and assumptions about future decommissioning costs, inflation rates, and the estimated date of decommissioning.		
27	LUMINANT	Luminant stores its used nuclear fuel on-site in storage pools or dry cask storage facilities and believes its on-site used nuclear fuel storage capability is sufficient for the foreseeable future…….These liabilities primarily relate to nuclear generation plant decommissioning…… removal of coal/lignite-fueled plant ash treatment facilities and generation plant disposal costs. The estimate of the asset retirement obligations requires management to make significant estimates and assumptions.	Provision	Present Value Estimate

Code- GE1 & GE2				
Research Question: 1				
Granted Emission Allowances (NON-IFRS)				
YE 2019			Classification (GE1)	Recognition (GE2)
S.NO	**Company**	**Disclosure**	**Coded Term**	**Coded Term**
1	OPG	Not Stated	Not Disclosed	Not Disclosed
2	YJNPC	Not Stated	Not Disclosed	Not Disclosed
3	CNNO	Not Stated	Not Disclosed	Not Disclosed
4	NPCIL	Not Stated	Not Disclosed	Not Disclosed
5	TEPCO	Not Stated	Not Disclosed	Not Disclosed
6	KYUSHU	Not Stated	Not Disclosed	Not Disclosed
7	CHUBU	Not Stated	Not Disclosed	Not Disclosed
8	TOHOKU	Not Stated	Not Disclosed	Not Disclosed
9	SHIKOKU	Not Stated	Not Disclosed	Not Disclosed
10	KEPCO	Not Stated	Not Disclosed	Not Disclosed
11	HOKURIKU	Not Stated	Not Disclosed	Not Disclosed
12	CHUGOKU	Not Stated	Not Disclosed	Not Disclosed
13	HEPCO	Not Stated	Not Disclosed	Not Disclosed
14	KHNP	Allowances received free of charge from the government….held by the group to fulfil legal obligation and recorded as intangible assets…..initially measured at cost.	Intangible Asset	Cost

15	EXELON	Inventory is recorded at the lower of weighted average cost or net realizable value. Fossil fuel, materials and supplies, and emissions allowances are generally included in inventory when purchased.	Inventory	Cost or NRV
16	ENTERGY	Not Stated	Not Disclosed	Not Disclosed
17	TVA	Allowances granted to TVA by the Environmental Protection Agency ("EPA") are recorded at zero cost.	Inventory	Nil Value
18	DUKEENER	Allowances are issued by the EPA at zero cost and may also be bought and sold via third-party transactions. Allowances allocated to or acquired by the Duke Energy Registrants are held primarily for consumption. Carrying amounts for emission allowances are based on the cost to acquire the allowances.	Intangible Asset	Cost
19	DOMINION	Not Stated	Not Disclosed	Not Disclosed
20	SOUTHERN	Emissions allowances granted by the EPA are included in inventory at zero cost.	Inventory	Nil Value
21	NEXTERA	Not Stated	Not Disclosed	Not Disclosed
22	FENOC	Not Stated	Not Disclosed	Not Disclosed
23	NSP	Not Stated	Not Disclosed	Not Disclosed
24	PSEG	Not Stated	Not Disclosed	Not Disclosed
25	APS	Not Stated	Not Disclosed	Not Disclosed
26	PG&E	Not Stated	Not Disclosed	Not Disclosed
27	LUMINANT	Not Stated	Not Disclosed	Not Disclosed

Code- PE1 & PE2				
Research Question: 1				
Purchased Emission Allowances - Business Use (NON-IFRS)				
YE 2019			Classification (PE1)	Recognition (PE2)
S.NO	**Company**	**Disclosure**	**Coded Term**	**Coded Term**
1	OPG	Not Stated	Not Disclosed	Not Disclosed
2	YJNPC	Not Stated	Not Disclosed	Not Disclosed
3	CNNO	Not Stated	Not Disclosed	Not Disclosed
4	NPCIL	Not Stated	Not Disclosed	Not Disclosed
5	TEPCO	Not Stated	Not Disclosed	Not Disclosed
6	KYUSHU	Not Stated	Not Disclosed	Not Disclosed
7	CHUBU	Not Stated	Not Disclosed	Not Disclosed
8	TOHOKU	Not Stated	Not Disclosed	Not Disclosed
9	SHIKOKU	Not Stated	Not Disclosed	Not Disclosed
10	KEPCO	Not Stated	Not Disclosed	Not Disclosed
11	HOKURIKU	Not Stated	Not Disclosed	Not Disclosed
12	CHUGOKU	Not Stated	Not Disclosed	Not Disclosed
13	HEPCO	Not Stated	Not Disclosed	Not Disclosed
14	KHNP	Allowances received free of charge from the government and the ones purchased….held by the group to fulfil legal obligation and recorded as intangible assets…..initially measured at cost.	Intangible Asset	Cost

15	EXELON	Inventory is recorded at the lower of weighted average cost or net realizable value. Fossil fuel, materials and supplies, and emissions allowances are generally included in inventory when purchased.	Inventory	Cost or NRV
16	ENTERGY	Not Stated	Not Disclosed	Not Disclosed
17	TVA	TVA has emission allowances for sulfur dioxide ("SO2") and nitrogen oxide ("NOx") which are accounted for as inventory. inventories are valued using an average unit cost method.	Inventory	Cost
18	DUKEENER	Allowances are issued by the EPA at zero cost and may also be bought and sold via third-party transactions. Allowances allocated to or acquired by the Duke Energy Registrants are held primarily for consumption. Carrying amounts for emission allowances are based on the cost to acquire the allowances.	Intangible Asset	Cost
19	DOMINION	Not Stated	Not Disclosed	Not Disclosed
20	SOUTHERN	Fuel inventory for Southern Power, which is included in other current assets, includes the average cost of oil, natural gas, biomass, and emissions allowances. Fuel is recorded to inventory when purchased …. at weighted average cost	Inventory	Cost
21	NEXTERA	Not Stated	Not Disclosed	Not Disclosed

22	FENOC	Not Stated	Not Disclosed	Not Disclosed
23	NSP	Emission allowances are recorded at cost, including broker commission fees. The inventory accounting model is utilized for all emission allowances and sales of these allowances are included in electric revenues.	Inventory	Cost
24	PSEG	Intangible assets - emissions allowances and RECs are recorded at cost…	Intangible Asset	Cost
25	APS	Not Stated	Not Disclosed	Not Disclosed
26	PG&E	The Utility purchases GHG emission allowances to satisfy its compliance obligations. Associated costs are recorded as inventory …... Costs are carried at weighted-average and are recoverable through rates.	Inventory	Cost
27	LUMINANT	As we use the emission allowances that we have purchased on the open market, costs associated with such purchases will be recognized as operating expense.	Expense	Cost

Code- PT1 & PT2				
Research Question: 1				
Purchased Emission Allowances - Trading (NON-IFRS)				
YE 2019			Classification (PT1)	Recognition (PT2)
S.NO	**Company**	**Disclosure**	**Coded Term**	**Coded Term**
1	OPG	Not Stated	Not Disclosed	Not Disclosed
2	YJNPC	Not Stated	Not Disclosed	Not Disclosed
3	CNNO	Not Stated	Not Disclosed	Not Disclosed
4	NPCIL	Not Stated	Not Disclosed	Not Disclosed
5	TEPCO	Not Stated	Not Disclosed	Not Disclosed
6	KYUSHU	Not Stated	Not Disclosed	Not Disclosed
7	CHUBU	Not Stated	Not Disclosed	Not Disclosed
8	TOHOKU	Not Stated	Not Disclosed	Not Disclosed
9	SHIKOKU	Not Stated	Not Disclosed	Not Disclosed
10	KEPCO	Not Stated	Not Disclosed	Not Disclosed
11	HOKURIKU	Not Stated	Not Disclosed	Not Disclosed
12	CHUGOKU	Not Stated	Not Disclosed	Not Disclosed
13	HEPCO	Not Stated	Not Disclosed	Not Disclosed
14	KHNP	Not Stated	Not Disclosed	Not Disclosed
15	EXELON	Inventory is recorded at the lower of weighted average cost or net realizable value. Fossil fuel, materials and supplies, and emissions allowances are generally included in inventory when purchased.	Inventory	Cost or NRV

16	ENTERGY	Not Stated	Not Disclosed	Not Disclosed
17	TVA	TVA has emission allowances for sulfur dioxide ("SO2") and nitrogen oxide ("NOx") which are accounted for as inventory. inventories are valued using an average unit cost method.	Inventory	Cost
18	DUKEENER	Not Stated	Not Disclosed	Not Disclosed
19	DOMINION	Not Stated	Not Disclosed	Not Disclosed
20	SOUTHERN	Fuel inventory for Southern Power, which is included in other current assets, includes the average cost of oil, natural gas, biomass, and emissions allowances. Fuel is recorded to inventory when purchased …. at weighted average cost	Inventory	Cost
21	NEXTERA	Not Stated	Not Disclosed	Not Disclosed
22	FENOC	Not Stated	Not Disclosed	Not Disclosed
23	NSP	Emission allowances are recorded at cost, including broker commission fees. The inventory accounting model is utilized for all emission allowances and sales of these allowances are included in electric revenues.	Inventory	Cost
24	PSEG	Intangible assets - emissions allowances and RECs are recorded at cost…	Intangible Asset	Cost
25	APS	Not Stated	Not Disclosed	Not Disclosed
26	PG&E	Not Stated	Not Disclosed	Not Disclosed
27	LUMINANT	Not Stated	Not Disclosed	Not Disclosed

Code- EA1 & EA2				
Research Question: 1				
Emission Allowances Obligations (NON-IFRS)				
YE 2019			Classification (EA1)	Recognition (EA2)
S.NO	**Company**	**Disclosure**	**Coded Term**	**Coded Term**
1	OPG	Not Stated	Not Disclosed	Not Disclosed
2	YJNPC	Not Stated	Not Disclosed	Not Disclosed
3	CNNO	Not Stated	Not Disclosed	Not Disclosed
4	NPCIL	Not Stated	Not Disclosed	Not Disclosed
5	TEPCO	Not Stated	Not Disclosed	Not Disclosed
6	KYUSHU	Not Stated	Not Disclosed	Not Disclosed
7	CHUBU	Not Stated	Not Disclosed	Not Disclosed
8	TOHOKU	Not Stated	Not Disclosed	Not Disclosed
9	SHIKOKU	Not Stated	Not Disclosed	Not Disclosed
10	KEPCO	Not Stated	Not Disclosed	Not Disclosed
11	HOKURIKU	Not Stated	Not Disclosed	Not Disclosed
12	CHUGOKU	Not Stated	Not Disclosed	Not Disclosed
13	HEPCO	Not Stated	Not Disclosed	Not Disclosed
14	KHNP	Obligations are measured as the sum of the carrying amount of the allocated rights that will be submitted to the government	Provision	Carrying Value
15	EXELON	Not Stated	Not Disclosed	Not Disclosed
16	ENTERGY	Not Stated	Not Disclosed	Not Disclosed
17	TVA	Not Stated	Not Disclosed	Not Disclosed

18	DUKEENER	Not Stated	Not Disclosed	Not Disclosed
19	DOMINION	Not Stated	Not Disclosed	Not Disclosed
20	SOUTHERN	Not Stated	Not Disclosed	Not Disclosed
21	NEXTERA	Not Stated	Not Disclosed	Not Disclosed
22	FENOC	Not Stated	Not Disclosed	Not Disclosed
23	NSP	Not Stated	Not Disclosed	Not Disclosed
24	PSEG	Not Stated	Not Disclosed	Not Disclosed
25	APS	Not Stated	Not Disclosed	Not Disclosed
26	PG&E	Not Stated	Not Disclosed	Not Disclosed
27	LUMINANT	Not Stated	Not Disclosed	Not Disclosed

Code- DL1 & DL2				
Research Question: 1				
Decommissioning Liabilities (NON-IFRS)				
YE 2019			Classification (DL1)	Recognition (DL2)
S.NO	**Company**	**Disclosure**	**Coded Term**	**Coded Term**
1	OPG	OPG recognizes asset retirement obligations (ARO) …...The costs of decommissioning activities are charged to a previously established decommissioning provision…….includes the estimated costs…	Provision	Present Value Estimate
2	YJNPC	The provision for nuclear power plant decommissioning presented in the consolidated financial statements of CGN Power…..to estimate the costs provision associated with these obligations. Provision for nuclear power plant decommissioning is estimated on the basis of best estimate, and the discounted amount shall be included in the initial cost of fixed assets	Provision	Present Value Estimate
3	CNNO	Not Stated	Not Disclosed	Not Disclosed
4	NPCIL	The cost does not include site restoration cost or decommissioning liability as de-commissioning of nuclear power plant/ facility is the responsibility of DAE, GOI	Not Recognised	Not Recognised
5	TEPCO	The company …… records the decommissioning costs of nuclear power units. The present value of total estimated amount of obligations is recorded as an asset retirement obligation.	Provision	Present Value Estimate

6	KYUSHU	The Company recognizes the asset retirement obligation as the sum of the future decommissioning costs….The decommissioning of nuclear facilities and the back-end of nuclear operations such as the storage, reprocessing, and disposal of spent nuclear fuel require long-term projects that involve uncertainties	Provision	Present Value Estimate
7	CHUBU	A provision was made based on a reasonable estimate of possible future expenses and losses related to the decommissioning …… based on the estimated total cost of decommissioning	Provision	Present Value Estimate
8	TOHOKU	With regards to decommissioning ..... related asset retirement obligations were recognized……estimate…	Provision	Present Value Estimate
9	SHIKOKU	decommissioning of a nuclear reactor resulting from changes in energy policies, based on the accounting regulations, the following assets and costs may be posted as or transferred to a special account related to nuclear power decommissioning …	Provision	Present Value Estimate
10	KEPCO	An asset retirement obligation is recorded for a legal obligation imposed…..is recognized as the sum of the discounted cash flows required for the future asset	Provision	Present Value Estimate
11	HOKURIKU	asset retirement obligations are recognized for decommissioning of specific nuclear power units	Provision	Present Value Estimate
12	CHUGOKU	Asset retirement obligations are recorded mainly in conjunction with measures to decommission specified nuclear power generation facilities…..The value of the asset retirement obligations was calculated mainly by taking as the estimated use period	Provision	Present Value Estimate

13	HEPCO	The Company records asset retirement obligations for the decommissioning of specified nuclear power plant facilities prescribed in the Act on the Regulation of Nuclear So	Provision	Present Value Estimate
14	KHNP	The group records estimted decommissioning costs as a liability in the period…..	Provision	Present Value Estimate
15	EXELON	NRC regulations require that licensees of nuclear generating facilities demonstrate reasonable assurance that funds will be available in certain minimum amounts at the end of the life of the facility to decommission the facility. Generation recognizes as a liability the present value of the estimated future costs to decommission its nuclear facilities.	Provision	Present Value Estimate
16	ENTERGY	asset retirement obligations consist of its liability for decommissioning	Provision	Present Value Estimate
17	TVA	TVA recognizes legal obligations associated with the future retirement of certain tangible long-lived assets. Utilities that own and operate nuclear plants are required to recognize a liability for legal obligations related to nuclear decommissioning.	Provision	Present Value Estimate
18	DUKEENER	Accounting for nuclear decommissioning recognizes…..AROs are recognized for legal obligations associated with the retirement of property, plant and equipment….. reasonable estimate	Provision	Present Value Estimate
19	DOMINION	Dominion Energy's AROs include a significant balance related to the future decommissioning of its merchant and utility …..decommissioning funds and their expected earnings will be sufficient to cover expected decommissioning costs	Provision	Present Value Estimate

20	SOUTHERN	The NRC requires licensees of commercial nuclear power reactors to establish a plan for providing reasonable assurance of funds for future decommissioning	Provision	Present Value Estimate
21	NEXTERA	NRC regulations require FPL to submit a plan for decontamination and decommissioning five years before the projected end of plant operation. NEE accounts for asset retirement obligations …….can be reasonably estimated	Provision	Present Value Estimate
22	FENOC	FE recognizes an ARO for the future remediation of environmental liabilities associated with all of its long-lived assets. The ARO liability represents an estimate	Provision	Present Value Estimate
23	NSP	Xcel Energy recognizes liabilities for the expected cost of retiring tangible long-lived assets for which a legal obligation exists.	Provision	Present Value Estimate
24	PSEG	NRC regulations require that licensees of nuclear generating facilities demonstrate reasonable assurance that funds will be available to decommission a nuclear facility at the end of its useful life.	Provision	Present Value Estimate
25	APS	We recognize an ARO for the future decommissioning or retirement of our tangible long-lived assets for which a legal obligation exists. The ARO liability represents an estimate of the fair value of the current obligation related to decommissioning	Provision	Present Value Estimate
26	PG&E	To estimate its liability, the Utility uses a discounted cash flow model based upon significant estimates and assumptions about future decommissioning costs,	Provision	Present Value Estimate
27	LUMINANT	A liability is initially recorded ..... for an asset retirement obligation ..... is reasonably estimable.	Provision	Present Value Estimate

Code- AR1			
Research Question: 1			
Asset Retirement Funds (NON-IFRS)			
YE 2019			Classification (AR1)
S.NO	**Company**	**Disclosure**	**Coded Term**
1	OPG	OPG has established and sets aside funds in a Used Fuel Segregated Fund and a Decommissioning Segregated Fund (together, the Nuclear Segregated Funds).	Segregated Funds
2	YJNPC	Provision for nuclear power plant decommissioning is estimated on the basis of best estimate, and the discounted amount shall be included in the initial cost of fixed assets.	Provisions
3	CNNO	Not Stated	Not Disclosed
4	NPCIL	the Corporation is collecting decommissioning levy from customers for decommissioning of power plant at the end of their useful lives on behalf of DAE, GOI. these funds and related investments including the interest have been disclosed in the Financial Statement of the Corporation separately as 'Funds held on behalf of others' net off 'Investment of funds held on behalf of others'	Unsegregated Funds
5	TEPCO	The amount of reserve fund for nuclear reactor decommissioning is provided based on the notice received from the Nuclear Damage Compensation and Decommissioning Facilitation Corporation	Segregated Fund

6	KYUSHU	The Nuclear Reprocessing Organization of Japan (the "NuRO") was established on October 3, 2016 under the Act. Nuclear operators are obliged to contribute the funds for reprocessing nuclear fuel to the NuRO every year.	Segregated Funds
7	CHUBU	contributions to the Nuclear Reprocessing Organization of Japan	Segregated Funds
8	TOHOKU	contributions to the Nuclear Reprocessing Organization of Japan	Segregated Funds
9	SHIKOKU	contributions to the Nuclear Reprocessing Organization of Japan	Segregated Funds
10	KEPCO	contributions to the Nuclear Reprocessing Organization of Japan	Segregated Funds
11	HOKURIKU	contributions to the Nuclear Reprocessing Organization of Japan	Segregated Funds
12	CHUGOKU	contributions to the Nuclear Reprocessing Organization of Japan	Segregated Funds
13	HEPCO	by paying the contributions to the Nuclear Reprocessing Organization of Japan (herein after referred to as "NuRO"), the obligation of the cost burden to nuclear operators is fulfilled, and NuRO performs the reprocessing. Furthermore, contributions related to the reprocessing of spent nuclear fuel in accordance with the provisions of Article 2 of the Revised Act are recorded in the special account related to reprocessing of spent nuclear fuel	Segregated Funds
14	KHNP	Not Stated	Not Disclosed
15	EXELON	NRC regulations require that licensees of nuclear generating facilities demonstrate reasonable assurance that sufficient funds will be available in certain minimum amounts to decommission the facility.	Segregated Funds

16	ENTERGY	investments in equity securities held by the nuclear decommissioning trust funds are recorded. The NRC requires Entergy subsidiaries to maintain nuclear decommissioning trusts to fund the costs of decommissioning.	Segregated Funds
17	TVA	TVA maintains a Nuclear Decommissioning Trust ("NDT") for the purpose of providing funds to decommission its nuclear facilities. The NDT is invested in securities generally designed to achieve a return in line with overall equity and debt market performance	Segregated Funds
18	DUKEENER	Duke Energy maintain trust funds to fund the costs of nuclear decommissioning	Segregated Funds
19	DOMINION	If the decommissioning trust funds and benefit plan assets are negatively impacted by market fluctuations or other factors, the Companies' results of operations, financial condition and/or cash flows could be negatively affected.	Segregated Funds
20	SOUTHERN	external trust funds for nuclear decommissioning costs.	Segregated Funds
21	NEXTERA	NEE and FPL maintain decommissioning funds and external insurance coverage which are intended to reduce the financial exposure to some of these risks; however, the cost of decommissioning nuclear generation facilities	Segregated Funds
22	FENOC	Nuclear decommissioning and spent fuel disposal costs - Reflects a regulatory liability representing amounts collected from customers and placed in external trusts including income	Segregated Funds

23	NSP	Restricted funds for the payment of future decommissioning expenditures for NSP-Minnesota's nuclear facilities are included in nuclear decommissioning fund and other assets on the consolidated balance sheets.	Segregated Funds
24	PSEG	nuclear owner places funds in independent external trust accounts it maintains to provide for decommissioning.	Segregated Funds
25	APS	To fund the future costs APS expects to incur to decommission Palo Verde, APS established external decommissioning trusts in accordance with NRC regulations.	Segregated Funds
26	PG&E	Nuclear decommissioning costs are generally collected in advance through rates and are held in nuclear decommissioning trusts to be used for the eventual decommissioning of each nuclear unit. Since the Utility's nuclear decommissioning trust assets are managed by external investment managers, the Utility does not have the ability to sell its investments at its discretion.	Segregated Funds
27	LUMINANT	Investments in a nuclear decommissioning trust fund are carried at current market value in the consolidated balance sheets.	Segregated Funds

Code- DR2			
Research Question: 1			
Discounting Rates for Decommissioning Liabilities (NON-IFRS)			
YE 2019			
S.NO	**Company**	**Disclosure**	**Coded Term**
1	OPG	Not Stated	Not Disclosed
2	YJNPC	Not Stated	Not Disclosed
3	CNNO	Not Stated	Not Disclosed
4	NPCIL	Not Stated	Not Disclosed
5	TEPCO	2.30%	Rate
6	KYUSHU	2.30%	Rate
7	CHUBU	2.30%	Rate
8	TOHOKU	2.30%	Rate
9	SHIKOKU	2.30%	Rate
10	KEPCO	2.30%	Rate
11	HOKURIKU	2.30%	Rate
12	CHUGOKU	2.30%	Rate
13	HEPCO	2.30%	Rate
14	KHNP	2.43%	Rate
15	EXELON	Not Stated	Not Disclosed
16	ENTERGY	Not Stated	Not Disclosed
17	TVA	Not Stated	Not Disclosed
18	DUKEENER	Not Stated	Not Disclosed

19	DOMINION	Not Stated	Not Disclosed
20	SOUTHERN	Not Stated	Not Disclosed
21	NEXTERA	Not Stated	Not Disclosed
22	FENOC	Not Stated	Not Disclosed
23	NSP	Not Stated	Not Disclosed
24	PSEG	Not Stated	Not Disclosed
25	APS	Not Stated	Not Disclosed
26	PG&E	Not Stated	Not Disclosed
27	LUMINANT	Not Stated	Not Disclosed

IFRS (EU-ETS)						
Country Count	Country	Operator Code		Owner		
		NPP Count	Code	Count	Name	Code
1	BELGIUM	7	EBL+EDF	1	Electrabel	EBL
2	BULGARIA	2	KOZNPP	2	Bulgarian Energy Holding	BEH
3	CZECH REP.	6	CEZ	3	Czech Power Co	CEZ
4	FINLAND	2	FORTUMPH	4	Fortum Power And Heat Oy (Former Ivo)	FORTUMPH
4	FINLAND	2	TVO	5	Teollisuuden Voima Oyj	TVO
5	FRANCE	58	EDF	6	Electricite De France	EDF
6	GERMANY	3	PElectra	7	E.ON Kernkraft	EON
6	GERMANY	1	EnKK	8	ENBW Kernkraft Gmbh	ENBW
6	GERMANY	1	KLE	9	RWE	RWE
6	GERMANY	1	KKG	9	RWE	RWE
7	NETHERLANDS	1	BORSSELE	10	N.V. Elektriciteits-Produktiemaatschappij Zuid-Nederland	EPZ
8	ROMANIA	2	SNN	11	Societatea Nationala Nuclearelectrica S.A.	SNN
9	SLOVAKIA	4	SE	12	Slovenské Elektrárne, A.S.	SE
10	SLOVENIA	1	KRSKO	13	Gen Energija D.O.O	GEN ENER
11	SPAIN	1	ID	14	Iberdrola, S.A.	ID
11	SPAIN	3	CNAT	14	Iberdrola, S.A.	ID
11	SPAIN	3	ANAV	15	Endsea	EDNSEA
12	SWEDEN	6	FKA	16	Vattenfal AB	VATTENFALL
12	SWEDEN	1	OKG	17	Uniper	UNIPER
13	SWITZERLAND	2	Axpo AG	18	Axpo Holding	AXPO
13	SWITZERLAND	1	KKL	18	Axpo Holding	AXPO

13	SWITZERLAND	1	KKG	19	Alpiq Group	ALPIQ
	TOTAL	109				

IFRS (NON-EU-ETS)						
Country Count	**Country**	**Operator Code**		**Owner**		
		NPP Count	**Code**	**Count**	**Name**	**Code**
1	ARMENIA	1	ANPPCJSC	20	Ministry of Energy and Natrual Resources of Armenia	ANPPCJSC
8	BRAZIL	2	ELETRONU	21	Eletrobras Eletronuclear S.A.	ELETRONU
2	CANADA	1	NBEPC	22	Energie NB Power Commission	NBEPC
3	MEXICO	2	CFE	23	Comision Federal De Electricidad	CFE
4	RUSSIA	38	REA	24	Atomenergoprom	REA
5	SOUTH AFRICA	2	ESKOM	25	Eskom	ESKOM
6	TAIWAN	4	TPC	26	Taiwan Power Co	TPC
7	UK	15	EDF UK	27	Edf Energy	EDF UK
	TOTAL	65				

Total IFRS	174	27	38%

NON-IFRS						
Country Count	Country	Operator Code		Owner		
		NPP Count	Code	Count	Name	Code
1	CANADA	10	OPG	1	Ontario Power Generation	OPG
1	CANADA	8	BRUCEPOW	1	Ontario Power Generation	OPG
2	CHINA	24	YJNPC	2	China General Nuclear Power Group	YJNPC
2	CHINA	21	CNNO	3	China National Nuclear Corporation	CNNO
3	INDIA	22	NPCIL	4	Nuclear Power Corporation Of India Ltd.	NPCIL
4	JAPAN	7	TEPCO	5	Tokyo Electric Power Co.,Inc.	TEPCO
4	JAPAN	4	KYUSHU	6	Kyushu Electric Power Co.,Inc.	KYUSHU
4	JAPAN	3	CHUBU	7	Chubu Electric Power Co.,Inc	CHUBU
4	JAPAN	3	TOHOKU	8	Tohoku Electric Power Co.,Inc	TOHOKU
4	JAPAN	1	SHIKOKU	9	Shikoku Electric Power Co.,Inc	SHIKOKU
4	JAPAN	7	KEPCO	10	Kansai Electric Power Co.	KEPCO
4	JAPAN	2	HOKURIKU	11	Hokuriku Electric Power Co.	HOKURIKU
4	JAPAN	1	CHUGOKU	12	The Chugoku Electric Power Co.,Inc.	CHUGOKU
4	JAPAN	3	HEPCO	13	Hokkaido Electric Power Co.,Inc.	HEPCO
5	SOUTH KOREA	24	KHNP	14	Korea Hydro And Nuclear Power Co.	KHNP
6	USA	21	EXELON	15	Exelon Generation Co., Llc	EXELON
6	USA	9	ENTERGY	16	Entergy Nuclear Operations, Inc	ENTERGY
6	USA	7	TVA	17	Tennessee Valley Authority	TVA
6	USA	5	DUKEENER	18	Duke Energy Corp.	DUKEENER
6	USA	4	PROGRESS	18	Duke Energy Corp.	DUKEENER
6	USA	7	DOMINION	19	Dominion Energy	DOMINION
6	USA	6	SOUTHERN	20	Southern Nuclear Operating Company, Inc.	SOUTHERN
6	USA	4	FPL	21	Nextera Energy Corp	NEXTERA

6	USA	4	NEXTERA	21	Nextera Energy Corp	NEXTERA
6	USA	4	FENOC	22	First Energy Nuclear Operating Co.	FENOC
6	USA	3	NSP	23	Xcel Energy	NSP
6	USA	3	PSEG	24	Pseg Nuclear LLC	PSEG
6	USA	3	APS	25	Pinnacle West Capital Corp	APS
6	USA	2	PG&E	26	Pacific Gas And Electric Company	PG&E
6	USA	2	LUMINANT	27	Vistra Energy	LUMINANT
	TOTAL	224				
Total NON-IFRS		224		27		38%

EXCLUDED						
Country Count	Country	Operator Code		Owner		
		NPP Count	Code	Count	Name	Code
1	ARGENTINA	3	ATUCHA-1	1	Nucleoelectrica Argentina S.A.	ATUCHA
2	HUNGARY	4	PAKS Zrt	2	MVM Group	PAKS Zrt
3	CHINA	2	SDNPC	3	China Power Investment Corp	SDNPC
3	CHINA	1	CIAE	4	China Institute Of Atomic Energy	CIAE
4	IRAN	1	NPPDCO	5	Nuclear Power Production & Developement Co. Of Iran	NPPDCO
5	JAPAN	2	JAPCO	6	Japan Atomic Power Co.	JAPCO
6	PAKISTAN	5	PAEC	7	Pakistan Atomic Energy Commission	PAEC
7	UKRAINE	15	NNEGC	8	Energoatom	NNEGC
8	USA	1	AmerenUE	9	Ameren Ue, Union Electric Company	AmerenUE
8	USA	1	DTEDISON	10	DTE Emergy Co	DTEDISON
8	USA	1	DUKEENER	11	North Carolina Electric Corp	NCEC
8	USA	1	DUKEENER	12	North Carolina Munincipal Power	NCMP
8	USA	1	ENERGYNW	13	Energy Northwest	ENERGYNW
8	USA	2	AEP	14	American Electric Power Company, Inc.	AEP
8	USA	2	PPL_SUSQ	15	Talen Energy	PPL_SUSQ
8	USA	2	STP	16	NRG Energy	STP
8	USA	1	WCNOC	17	Evergy Inc	WCNOC
	TOTAL	45				
Total Excluded		45		17		24%
TOTAL NPP		443	TOTAL OWNERS	71		

Disclosure vs Non-Disclosure Percentages for IFRS and NON-IFRS Samples
Year-End 2019

Category	Type	Accounting Guidance Available	Materially Significant	Disclosure	IFRS	NON-IFRS
Nuclear Fuel	Nuclear Fuel (Front End)	Yes	Yes	Disclosed	100.00%	92.59%
				Not Disclosed	0.00%	7.41%
	Spent Fuel (Back End)	Yes	Yes	Disclosed	92.59%	88.88%
				Not Disclosed	7.41%	11.11%
Carbon Emission Allowances	Granted Emissions	No	Yes	Disclosed	40.74%	18.51%
				Not Disclosed	59.26%	81.48%
	Purchased Emission (Own Use)	No	Yes	Disclosed	66.67%	33.33%
				Not Disclosed	33.33%	66.67%
	Purchased Emission (Trading)	No	Yes	Disclosed	55.56%	18.51%
				Not Disclosed	44.44%	81.48%
	Emissions Liability	No	Yes	Disclosed	55.56%	3.70%
				Not Disclosed	44.44%	96.30%
Asset Retirement Obligations	Decommissioning Liability	Yes	Yes	Disclosed	92.59%	96.30%
				Not Disclosed	7.41%	3.70%
	Asset Retirement Funds	Yes	Yes	Disclosed	85.18%	92.59%
				Not Disclosed	14.81%	7.41%

Materiality Benchmarks and Significance for IFRS Sample
Year-End 2017, 18 and 19

Category	Type	Materially Significant	Materiality Metrics	2017	2018	2019	Three Years Average
Nuclear Fuel	Nuclear Fuel (Front End)	Yes	Profit B.Tax >5%	96%	96%	93%	95%
		Yes	Revenue >1%	78%	78%	74%	77%
		Yes	OPT >2%	100%	100%	96%	99%
		Yes	Net Assets >1%	85%	85%	85%	85%
		Yes	Total Assets = 1%	63%	67%	63%	64%
Carbon Emission Allowances	Emissions Allowances (Granted and Purchased)	Yes	Profit B.Tax >5%	82%	89%	82%	85%
		Yes	Revenue >1%	47%	67%	76%	63%
		Yes	OPT >2%	94%	94%	88%	92%
		Yes	Net Assets >1%	47%	56%	65%	56%
		No	Total Assets = 1%	29%	28%	47%	35%
	Emissions Liability	Yes	Profit B.Tax >5%	92%	100%	91%	94%
		Yes	Revenue >1%	67%	73%	82%	74%
		Yes	OPT >2%	92%	91%	100%	94%
		Yes	Net Assets >1%	58%	45%	64%	56%
		Yes	Total Assets = 1%	50%	45%	55%	50%
Asset Retirement Obligations	Decommissioning Liability	Yes	Profit B.Tax >5%	85%	85%	81%	84%
		Yes	Revenue >1%	81%	81%	81%	81%
		Yes	OPT >2%	85%	85%	81%	84%
		Yes	Net Assets >1%	85%	85%	81%	84%
		Yes	Total Assets = 1%	78%	78%	78%	78%