UNIVERSITY OF GOTHENBURG

DEPARTMENT OF POLITICAL SCIENCE
CENTRE FOR EUROPEAN STUDIES (CES)

NON-COMPLIANCE AS PROCRASTINATION?

Analysing how EU-member states live up to the Nuclear Waste Directive

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Master's thesis:	30 credits
Programme:	Master's Programme in European Studies
Level:	Second Cycle
Semester year:	Spring 2023
Supervisor:	Urban Strandberg

Abstract

This thesis seeks to better understand how EU member states express motivations for not complying with EU law. Using the case of the Councils Directive 2011/70/Euratom, also known as the nuclear waste directive, this study analyzes member states' motivations for not complying with the requirements established in the directive, guided theoretically by the management and enforcement approaches. Existing research on compliance puts emphasis on the implementation and transposition process of EU directives, focusing on cross-country variations in quantitative studies. By contrast, this study considers policy-specific factors to analyze motivations. Using qualitative content analysis, this study analyzes the member states national nuclear waste programs and implementation reports. The result of the analysis uncovers that most member states find ways to procrastinate their obligations under the nuclear waste directive. The most salient motivation for not complying with all the requirements of the directive is expensive nuclear waste management solutions.

Master's thesis:	30 credits
Programme:	Executive Master's Programme in European Studies
Level:	Second Cycle
Semester year:	Spring 2023
Supervisor:	Urban Strandberg
Keyword:	Compliance, motivations, enforcement, management, European Union, directive, radioactive waste, qualitative content analysis,
Word count:	14.657

Contents

Figures and Tables

Abbreviations

EU- European Union

EC-European Commission

ECJ-European Court of Justice

MS-Member State

SNF- Spent Nuclear Fuel

RW- Radioactive waste

HLW- High-level waste

IMW- Intermediate-level waste

LLW-Low-level waste

DGR- Deep Geological Repository

1. Introduction

The European Union (EU) has an impressive performance history. What started out a Coal and Steel Community is now an extremely potent supranational union that regulates a variety of policies. The fact that EU member states (MS) have come together in collective action to create a system of jointly decided rules operating throughout the member states, but at the same time remaining sovereign and independent, makes the EU a unique political and economic union. Enforcing the EU´s legislative power through the treaties, whilst considering division among the member states national governments, has proven difficult in certain policy areas. Consequently, the EU has come to face a critical compliance dilemma. On the one hand, each member state bears the sole responsibility for implementing and enforcing EU regulations. On the other hand, member states constantly try to evade the EU´s influence on domestic policy by recurrently neglecting their legal obligations. Scholars of European integration have long sought to understand and explain the implementation and compliance deficit that threatens EU policy's effectiveness (Gelderman, Ghijsen & Brugman, 2006). In response to the implementation deficit, the European Commission (EC) and the European Court of Justice (ECJ) have adjusted their strategies and instruments to improve the overall implementation of European law. However, the issue of non-compliance remains (Veormans, 2015). Compliance, including full and correct implementation of EU law, is essential for the EU's regulatory functions. Lack of compliance represents a pressing challenge to the credibility and legitimacy of the EU as a legislative power. Understandably, the topic of compliance with EU regulation occupies the minds of many researchers of European integration.

Despite a wealth of literature on EU compliance, research is primarily concerned with environmental and social policy cases, providing mixed answers for what factors cause non-compliance among the member states (Börzel & Buzogány, 2019; Anker et al., 2015). This thesis will contribute to the compliance research field by studying the EU's policy for managing Spent Nuclear Fuel (SNF) and Radioactive Waste (RW), analyzing member states' motivations for non-compliance. Over the past decades, European countries have produced several million cubic meters of radioactive waste (World Nuclear Waste Report, 2019). Most of which is generated from electricity production in nuclear power plants but can also be generated from non-power-related industries' use of radioactive materials (European Commission, n.d. a). It is

characterized by exceptional circumstances, making nuclear waste a particularly complex policy field. Deciding on appropriate management methods for large quantities of SNF and radioactive waste whilst taking into consideration all aspects of safety and protection, as well as political and social perspectives, is a challenging task. Consequently, complying with all the requirements of the nuclear waste directive has proven difficult. The amount of waste is constantly increasing but has no full disposal solution in any of the member states or countries outside the EU (World Nuclear Waste Report, 2019). To tackle the European SNF and RW issues, the Euratom Treaty was updated in 2011, meaning that the EU increased its ambitions considerably regarding joint regulation on how to manage SNF and RW in a safe and responsible manner to avoid imposing undue burdens on future generations (Directive 2011/70/Euratom). Yet, after more than twelve years, member states are still struggling to comply with the requirements set out in the nuclear waste directive.

1.1. Research problem

While there are considerable amounts of literature on policy implementation and transposition performance seeking to explain cross-country variations across the member states and directives in numerous policy fields (Haverland & Romeijn, 2007), the issue of compliance is not addressed to the same extent. The European compliance deficit is one of the EUs most critical challenges. Therefore, the question to ask is not how well the member states transpose and implement directives into national law but rather how well the member states comply with their legal obligations stipulated in those directives. Compliance research has so far limited itself to quantitatively studying how country-level variables can explain why EU member states often fail to comply with EU directives. Consequently, compliance literature lacks in-depth studies on motivations for non-compliance. Eva Thomann and Fritz Sager argue that empirical analyses of member states' motivations are urgently needed for a better understanding of the potential and limits of European integration (Thomann & Sager, 2017). This study will attempt to close this research gap by analyzing member states' motivations for not complying to the EU joint policy for spent nuclear fuel and radioactive waste management, as laid down in the Directive 2011/70/Euratom.

1.2. Aim and Contribution

This study analyzes non-compliance in regard to the EU's joint policy for spent nuclear fuel and radioactive waste management, by analyzing member states' motivations for not complying with the requirements established in the Directive 2011/70/Euratom. The analysis is guided theoretically by the management and enforcement approaches which are central in the compliance literature. The aim of the thesis is to analyze member states' motivations for not complying with Directive 2011/70/Euratom.

This study aims to answer the research question: How do EU member states motivate non-compliance with the requirements established in Directive 2011/70/Euratom?

The importance of conducting this research is twofold. Firstly, this study will contribute to the compliance research field by attaining a deeper understanding of motivations for non-compliance in a policy sector that has so far not been studied. Thus, this work will contribute to the existing body of knowledge by broadening the research field of compliance by conducting a qualitative empirical study focusing on the nuclear waste management policy sector that has received far less attention in scholarly writings on EU compliance. Secondly, this qualitative study will contribute to an increased understanding of present and future challenges related to nuclear waste management in the member states.

2. Theory and previous research

This section will provide a literature overview focusing on the theoretical foundations within compliance research, establishing the most influential and commonly used compliance theories. Furthermore, this section will establish what is meant by compliance and how it has been used as a subject of study within a European context.

2.1. (Non)Compliance

Research on non-compliance includes a large body of theory concerned with compliance behaviors spanning several disciplines. The concept of compliance and non-compliance has been widely used in international relations research, addressing domestic fulfillment of international agreements (Haverland & Romeijn, 2007). Due to the issues of the implementation and compliance deficit in the EU, researchers have turned to studying EU law. Previous studies indicate that directives are of particular interest and make up the majority of cases in the compliance research field (Falkner et al., 2007). Directives are binding legislative acts that set out specific goals that all EU member states must achieve. Each individual state is responsible to transpose the directive into national law but remains free to choose the manner they see fit to achieve the required objective of the directive (European Union, n.d.). Directives are often seen as more "technical, consensual, even apolitical" (Blom-Hansen et al., 2022) than regulations. Because directives must be transposed into national law to take effect and are only binding as to the result that must be achieved, literature suggests that directives leave too much freedom for national implementation concerning form and method, which contributes to the overall compliance deficit (Haverland & Romeijin, 2007).

Efforts to enhance better transposition of EU directives and proper implementation have not resulted in better compliance (Mastenbroek, 2005). MS have neglected their legal obligation since the EU´s establishment in the late 1950s. Still, there are competing theoretical views on what factors cause non-compliance with EU law. Miriam Hartlapp and Gerda Falkner argue that contradicting views are shaped by how we define compliance (Hartlapp & Falkner, 2009). Concerning EU directives, three aspects of compliance have become the norm for what is considered non-compliant behavior in the EU. "Member states can fail to notify the European Commission of the national measures taken to legally implement the directive on time

(notification failure). They can incorrectly and incompletely transpose the directive (incorrect transposition), and they can incompletely implement the directive (incorrect implementation)" (Börzel et al., 2010, p. 1373). These aspects can be studied individually or together. If either of the aspects is not fulfilled by the member states, it signals that a member state has failed to comply.

The directive compliance aspects have caused division among researchers. Previous literature on EU compliance shows different opinions and understandings of how these aspects of non-compliant behavior should be measured. This uncertainty is considered one of the more problematic aspects of using the concept of compliance as an indicator of violation of EU law (Thomson, 2010). One of the most commonly used measurements is transposition performance across the member states (Thomson, 2010), relating to how well and correctly member states transpose directives. This method has been the subject of a large debate in compliance and implementation research. Researchers have identified a gap in quantitative data on the transposition of EU directives when using transposition as a compliance measure (Börzel & Buzogany, 2019). Transposition data rely on notifications by member states referring only to the timely transposition of directives into national law. Member states are in practice careful to notify the European Commission of the necessary measures to transpose the directive, to avoid infringement procedures (Azzi, 2000). Based on this data, the commission finds that the transposition record is, on average, 98% (Mastenbroek, 2005). The data suggest that the compliance deficit is not as large as expressed by earlier research. However, the data is based on notifications by the member states and do not tell us anything about the correctness of transposition or the actual application and enforcement, which is necessary for compliance (Mastenbroek, 2005). Taking measures to transpose the directive is often not enough if the measures conform with the directive and the aim that is to be achieved (Azzi, 2000).

2.2. Compliance and Implementation

Studies on EU compliance tend to incorporate the concept of implementation. Despite the two concepts being closely linked in terms of how and when they are used in research, they have slightly different meanings. Understanding the differences between the concepts is important when conducting a compliance-based study. Policy implementation refers to "what happens after a bill becomes a law" (Bardach, 1977, as cited in Trieb, 2014, p. 5), which can further be

described as the process of putting policy into action. Whilst implementation research is more concerned with the process of implementing EU regulation into national law, compliance focuses on the outcome of the implementation. Oliver Trieb defines compliance as ”a state of conformity or identity between an actor's behavior and a specified rule” (Trieb, 2014, p. 5). Arguably, compliance research includes most aspects of implementation owing to the fact that compliance includes all formal stages of EU implementation. A wealth of research exists on compliance with EU law. However, it tends to focus on the implementation deficit, analyzing why states do not implement EU law in a timely or correct manner. Such studies are most often case-oriented, focusing on EU directives in specific policy fields (Börzel et al., 2010).

2.3. Theoretical Compliance Perspectives

In this section, I will provide an overview of the current state of theoretical literature on non-compliance. The theoretical landscape within compliance research speaks to the complexity behind motivational factors influencing the member states willingness or unwillingness to comply with EU law. Consequently, literature tends to combine multiple academic disciplines, most of which come from international relations, economics, and law. In comparison to international compliance research, the EU context has received less attention. This theoretical overview will bring forward compliance theories from an EU perspective.

2.3.1. Non-Compliance due to administrative shortcomings

Early scholars of EU compliance lacked strong theoretical frameworks, resulting in a combination of theoretical insights from implementation research, international relations theory, and law. Drawing from a wide field of theory, early literature portrays non-compliance as a political process where governments cannot meet EU policy demands (Mastenbroek, 2005). During this time, theory was mostly focused on the implementation deficit, analyzing why MS does not implement EU directives in a correct or timely manner rather than explaining factors influencing non-compliance. Early scholars were mostly concerned with domestic implementation processes, arguing that successful implementation of EU law depended on effective administrative organization and legislative procedures (Mastenbroek, 2005). Furthermore, it was colored by the disciplinary background of researchers, who mainly came from administrative studies and law. Studies on European integration have since moved on from some of the early implementation assumptions. However, the hypothesis of the “one size fits

all" approach remains relevant. The approach, which was first developed by Giuseppe Ciavarini Azzi, analyzes the domestic implementation of EU regulation, arguing that implementation issues occurred due to the one size fits all nature of EU legislation (Azzi, 2000). Specific domestic circumstances and traditions in the member states hindered the adaptation of the EU´s common policies (Mastenbroek, 2005). Ellen Mastenbroek finds that quantitative studies have tried to determine the relevance of administrative, legal, and political variables explaining non-compliance. It has been shown that efficient administration as well as administrative capacity come forward as positive for implementation and may counteract transposition delays but cannot systematically explain why member states comply or non-comply (Pircher, 2017). Over time, the relative effects of the theoretical framework have influenced the research field, but the empirical records are not conclusive and are unable to systematically explain cross-national differences in compliance. Since then, compliance has been argued to be a result of legal, technical, and financial reasons rather than administrative shortcomings (Mastenbroek, 2005).

Contemporary studies on compliance in the EU are marked by a plurality of theoretical and methodological approaches. The importance of domestic circumstances in previous research now includes a wide range of factors affecting non-compliant behavior, most notably the role of the European Commission. The commission is the guardian of the treaties and the enforcer of EU law. The commission is constantly confronted with the implementation and compliance dilemma, having to answer for "how to ensure effective EU policy delivery and, hence, resolve pressing collective actions problems while the responsibility for implementing and directly enforcing EU policies remain with the member states" (Martinsen et al., 2022, p. 1530). Researchers argue that member states incentives to deviate are reduced when the commission explicitly supports a directives provision. When such support is expressed by the commission, it may signal that the commission intends to monitor compliance more strictly in those member states that express inventiveness to deviate from the directive (Thomson, 2010). To what extent provision support by the commission affects compliance needs further investigation. Other studies have shown that the commission makes extensive use of its capability-enhancing instruments by offering financial assistance, training, and knowledge in order to make implementation easier, which increases the member states willingness to comply with EU law (Schmälter, 2018). However, research shows that the effect of the commission's efforts to increase compliance-willingness is uncertain, suggesting that the EC takes more deliberate

endeavors to punish or criticize member states who non-comply. Such endeavors could have further effects on their willingness to comply (Schmälter, 2018). To improve national implementation, the commission has gradually developed administrative networks to allow the member states to address policy problems arising during the implementation process of common policies without having to turn to one of the major institutions (Martinsen et al., 2022). However, encouraging the member states to implement EU policies in a current and timely manner by introducing institutional networks is less effective when member states lack the willingness to comply. Penalty for disrespecting the rule of law would arguably have a more significant effect on governments, influencing and pressuring national authorities to respect EU provisions. Karolina Boiret suggests that the commission's enforcement instruments could improve compliance in member States such as Poland, where governments pay little attention to EU rules and procedures (Boiret, 2019).

2.3.2. Non-compliance due to Policy misfit

Compliance research has, since the early 70s, discovered the importance of national politics in determining the speed of correctness of legal adaptation to European directives. Research in the field of implementation of EU directives identifies domestic opposition as one of the main reasons for non-compliance. The "goodness of fit" theory has been a central hypothesis in the literature on European integration. The theory suggests that the adaptation of EU directives depends upon the extent to which they fit with already existing national policies and institutions (Mastenbroek & Kaeding, 2006). The institutionalist idea of the goodness of fit is seen as one of the most prominent theories explaining non-compliant behavior in member states. Further, the goodness of fit approach builds on the assumption that member states try to minimize the costs of adaptation by uploading domestic policies to the EU level (Mastenbroek, 2005).

Tanja Börzel argues that member states who lack existing policy precedent in a particular EU field will negotiate against it or delay its transposition. The misfit, as we may call it leads to a lack of motivation and lack of ability to implement, which ultimately leads to non-compliance (Leventon, 2013). Two dimensions of the goddess of fit approach are essential. A distinction is made between institutional and policy misfits. Policy dimensions relate to policy content. The institutional dimension, on the other hand, relates to the regulatory style and structure of a certain policy sector (Mastenborek, 2005). Falkner further identifies a distinction between the

legal and practical status quo, assuming that some rules are not laid down and implemented in national law but exist informally in the member states (Falkner, 2003). Since the late 90s, the goodness of fit theory has been used in EU integration literature due to its advantage of forming precise empirical expectations. Researchers have conducted comparative research on the goodness of not hypothesis, most often related to environmental policy (Matenborek, 2005). Despite its advantages, contemporary studies have shown that good policy fit is not necessary for smooth implementation and compliance. Member states sometimes delay implementation even when national laws fit EU law perfectly. At the same time, member states comply with directives even when they are required to make adaptations to existing national institutions and legislation (Mastenborek, 2006).

In line with the hypothesis of misfit is the argument that member states who were unable to advocate their preferences during the decision-making process at the EU level might evade implementation and compliance in order to oppose the introduction of certain EU policies and send a signal of displeasure to the commission (Mastenborek, 2006). This hypothesis is particularly sensitive when it comes to directives. One of the issues with directives is that objections from member states do not always lead to changes in the directives that are adopted. Robert Thomson argues that this leaves a gap between states' revealed policy preferences and the contents of the adopted directives (Thomson, 2010).

In the case of the Council's Directive 2011/70/Euratom, several member states opposed the commission's proposal due to disagreements on the export of spent nuclear fuel and radioactive waste (Legislative Observatory European Parliament, 2011). The directive went through several amendments before the council was able to decide on a final directive, which had to incorporate a section on exports and imports of SNF and radioactive waste to compromise the objections from some of the member states. Thomson further argues that member states preferences during the decision-making process affect states' behavior during the transposition stage. Non-compliant behavior following opposition at the decision-making stage can therefore be seen as the continuation of opposition after a directive has been decided. This is what Falkner et al. refer to as ”opposition through the back door” (Falkner et al, 2007). The importance of opposition play for non-compliant behavior has been proven minimal in later research (Thomson, 2007). The hypothesis was tested by Thomson (2007), analyzing to what extent

opposition affected the implementation of directives using the example of Austria. The study comes to the conclusion that in five out of eight cases, the opposition did not affect the implementation process. Oppositional voting in the EU Council did not play a role during the national implementation of the directive (Thomson, 2007).

3. Analytical Framework

This thesis will build on two well-established theoretical approaches in compliance theory to analyze motivations for non-compliance, using the case of the council's directive 2011/70/Euratom.

The enforcement, management and legitimacy approaches of compliance theory are well-established within this field. Most often, the frameworks are used in qualitative research to test how country-level explanations affect the overall compliance behavior across the member states (Börzel et al., 2010). This analysis is guided by two out of the three dominant compliance approaches. Drawn from the constructivist logic, the legitimacy approach assumes that member states are socialized into the norms and rules of international institutions, therefore complying out of normative belief that laws ought to be followed, and not because it may suit their self-interest (Börzel et al., 2010). The approach put weight on member states general attitude towards the judicial stem and its values. With regard to the aim of this thesis and the empirical material used to conduct this analysis, the legitimacy approach is less suited compared to the enforcement and management approaches. Including the legitimacy approach will require an in-depth investigation of support for the principle of law in the member states and their legal cultures. For this reason, the legitimacy approach has been deducted from the theoretical framework, which otherwise tends to use an integrated approach combining all three approaches (Börzel et al., 2010).

The enforcement and management approaches have been used to explain why some member states comply better than others (Börzel et al., 2010). However, in studies on compliance with international agreements, enforcement and management have been used as competing perspectives of which only one best describes reality. In the EU context, the two approaches have been proven most effective when combined (Tallberg, 2002). Jonas Tallberg argues that real-life international cooperation, including EU legislation, the two approaches are

”complementary and mutually reinforcing, not discrete alternatives” (Tallberg, 2002, p. 610). In this thesis, management and enforcement approaches will be used as the theoretical base to analyze member states' motivations for not complying with the requirements established in Directive 2011/70/Euratom.

3.1. Enforcement

The enforcement approach assumes that states willingly choose to violate EU law because they are not willing to bear the costs of compliance. The cost of complying with the nuclear waste directive entails establishing and maintaining national policies on spent fuel and radioactive waste management, including implementation of measures following the general principles of the directive. If the cost of compliance is greater than non-complying, the enforcement approach suggests that the cost itself serves as motivation for non-compliance. In line with this hypothesis, non-compliance can only be prevented if the costs of non-compliance are increased (Börzel et al., 2010). Consequently, MS with less political and economic power are more likely to comply, as they are sensitive to reputational and material costs. Powerful states can bear the costs of non-compliance. Their political and economic power safeguards their influence in the EU and can cover for any material or reputational damage caused by non-compliant behavior (Börzel et al., 2010). In the EU context, punishment for non-compliance would include infringement procedures from the EC to increase non-compliance costs by naming and shaming member states who do not comply. The commission's power to initiate infringement proceedings can ultimately lead to imposed sanctions on the member states by the ECJ (Börzel & Buzogany, 2019). Another important aspect is national governments policy preferences. The likelihood of compliance is expected to decrease if national policymakers disagree with the content of the directive (Zhelyazkova et al., 2016) and may therefore only comply with those parts of the directive that benefit their self-interest.

3.2. Management

The management approach highlights the importance of well-functioning institutions rather than enforcing compliance by increasing the cost of non-compliance (Börzel & Buzogany, 2019). Even when states are willing to comply, they are prevented from doing so due to a lack of preconditions that enable compliance such as financial and institutional capacity. The use of the approach is somewhat divided in the literature. Whilst resource-oriented studies define

capacity as the state's ability to act which is enabled by its legal authority, financial, military, and human resources (Haas, 1998., Prezeworski, 1990., Simmons, 1998., cited in Börzel et al., 2010), neo-institutionalists argue that national institutional structures influence a state's capacity to act and make decisions. The management approach further suggests that non-compliance is triggered when legislative acts use unclear language that allows for national interpretations of rules (Tallberg, 2002). Non-compliance can therefore be prevented depending on how effective the commission is in managing compliance by clarifying directive requirements and assisting the member states to comply (Börzel & Buzogany, 2019).

Traditionally, the management approach suggests that a lack of adequate state capacity and resources can lead to an involuntary compliance deficit. Compliance studies using a management approach typically hypothesize that states with lower financial capacity violate European law more often (Börzel et al., 2010). Whilst the approach has proven appropriate for analyzing cross-country variations of compliance, the management concepts can also be used as a baseline framework in which lack of financial capacity can be tested on specific legal acts.

3.3. Expectations

In terms of results, I expect member states to non-comply due to unwillingness to decide about the future of SNF and radioactive waste. Despite decades of research, long-term disposal methods remain without empirical proof (Ramana, 2018). The many uncertainties surrounding any long-term plans for storage and disposal methods for radioactive waste are controversial for national policymakers. Making definite decisions on the implementation of these sensitive issues is, therefore, difficult, which leads to a certain level of avoidance in complying with all requirements of the nuclear waste directive. Furthermore, it is likely that some member states are waiting for new advancements in scientific research and technology before deciding on any long-term plans, especially for SNF, but even more potential is the idea that member states are awaiting a shared disposal solution. This has been indicated by several multinational organizations promoting the development of such a solution (Association for Multinational Radioactive Waste Solutions, 2023). The directive does not encourage MS to rely on cross-national solutions but rather for the MS to establish national policies having regard to the MS ultimate responsibility for the management of radioactive waste generated in it.

The enforcement approach will provide explanatory value because it assumes that member states willingly non-comply with the nuclear waste directive. However, it is my belief that costs of compliance are not the key motivation but rather the consequences of determining a national nuclear waste management program and implementing the program in practice with real technological solutions. However, costly management solutions such as deep geological repositories (DGR) could contribute to the overall compliance deficit. Because nuclear waste is in many ways a political issue, the enforcement approach, suggesting that non-compliance is expected to decrease if national policymakers disagree with the content of the directive (Zhelyazkova et al., 2016), could further explain why member states have failed to comply.

The management approach will provide less explanatory value because it assumes that non-compliance is involuntary. Lack of financial and institutional resources may explain why member states don't comply to a certain degree, but most likely cannot account to explain all factors affecting non-compliance. Most of the member states have used radioactive materials in nuclear power reactors or for industrial purposes for decades. They should have established well-functioning institutions for the management of all types of radioactive waste and should, therefore not be hindered from complying because of inadequate institutional structures.

4. Method and material

4.1. The Councils Directive 2011/70/Euratom

To identify motivational factors influencing non-compliant behavior among the EU member states, this study will use the case of the Councils Directive 2011/70/Euratom, also known as the nuclear waste directive.

In 2011, the European Council introduced an EU wide directive, aimed at solving some of the major problems related to radioactive waste generated in the EU member states. Having regard to the treaty establishing the European Atomic Energy Community (Euratom Treaty), which forms the basis of most legal frameworks within the EU, related to nuclear activities, including safe management strategies for storage and disposal of SNF and radioactive waste (Sanders & Sanders, 2016), the council passed directive 2011/70/Euratom to supplement the basic standards referred to in the treaty. The main objective of the directive is to ensure responsible and safe management of SNF and radioactive waste to avoid imposing undue burdens on future generations (Directive 2011/70/Euratom). All member states must establish and maintain national policies in line with the scope and general principles of the directive. National governments must further implement national programs for the management of radioactive materials, covering all stages of SNF and radioactive waste, from generation to disposal (Directive 2011/70/Euratom). SNF and Radioactive waste management programs are large-scale industrial projects. Depending on national management strategies, the programs include conditioning, reprocessing, storage, and plans for final disposal (Grambow, 2022). The directive had to be transposed into national law by all the member states, regardless of nuclear status, by August 23, 2013 (Directive 2011/70/Euratom).

There are several reasons why the nuclear waste directive was chosen for this compliance study. Firstly, the high number of infringement procedures indicates that nearly all member states are failing to comply with the obligations set out in the directive. Since 2013, only three member states have implemented the directive in such a way as to avoid infringement procedures (European Commission, n.d. c). Secondly, member states argue to have successfully transposed and implemented the directive. Yet, there are currently infringement procedures against 18 member states open due to failure to adopt a national program compliant with the requirements of the directive, making this case relevant from a compliance perspective to this day.

The nuclear waste directive applies to all member states, regardless of nuclear power status. This means that each member state has different management strategies. Some currently generate and store radioactive waste classified as high-level waste (HLW), most of which comes from nuclear power-related activities, including decommissioning. Even if a member state does not have nuclear power reactors in operation, they can still generate HLW from decommissioning of nuclear power reactors and facilities. They can also generate intermediate-level waste (ILW) and low-level waste (LLW) when radioactive materials are used for medical, research, industrial and agricultural purposes, which also fall under the obligations of the directive (European Commission, n.d. a). Production of nuclear materials for defense purposes will not be included in this analysis, as the nuclear waste directive only applies to nuclear waste management when the radioactive waste results from civilian activities. With this said, combining MS with varying radioactive waste status will highlight all aspects and characteristics of radioactive waste management, representing the EU as a whole.

4.2. Concept definitions

This thesis's main objective is to analyze motivations for non-compliance guided by the theoretical framework enforcement and management, using the Councils Directive 2011/70/Euratom. However, with regard to the nuclear waste directive and the empirical material used to conduct this study, this section aims to introduce some of the main concepts related to spent nuclear fuel and radioactive waste management.

Despite its name, the nuclear waste directive is the legal act intending to ensure safe management of all types of radioactive waste within the EU. Spent nuclear fuel is mainly generated from the production of electricity in nuclear power reactors. In 2021, Belgium, Bulgaria, Czech Republic, Germany, Spain, France, Hungary, The Netherlands, Romania, Slovenia, Slovakia, Finland and Sweden had operational nuclear reactors (Eurostat, 2021). Member states with operational nuclear reactors have nuclear power programs, meaning that nuclear power is used to produce electricity for civilian purposes. Member states without nuclear power programs also produce radioactive waste generated from non-power-related use of radioactive materials (European Commission, n.d. a). One specific type of waste referred to in the directive is spent nuclear fuel. SNF is the somewhat confusing term used for nuclear fuel that has been irradiated in nuclear reactors. This type of high-level radioactive waste is small

in volume but holds the most radioactivity, making it highly hazardous to humans and the environment (Brikholzer, Houseworth & Tsang, 2012). After the withdrawal from the core of the reactor, the fuel must be stored for several years for heat to decay. EU member states use different temporary interim storage methods. The waste is often kept in spent-fuel pools or dry casks at nuclear power plant facilities (Brikholzer, Houseworth & Tsang, 2012). The directive highlights that interim/temporary storage should not be considered a long-term strategy. Member states must establish a plan for permanent waste disposal methods in which long-term safety and security of the radioactive waste can be maintained without human management (Brikholzer, Houseworth & Tsang, 2012). According to the directive, the deep geological repository (DGR) is considered the safest and most suitable option for final disposal of high-level waste. Some member states also operate reprocessing of spent nuclear fuel. Reprocessing is when spent fuel is separated into its chemical component parts (Uranium, plutonium, fission parts) so that some of the material can be reused in nuclear reactors. The process method creates dispersible forms of highly dangerous radioactive waste, which poses increased challenges to management strategies (World Nuclear Waste Report, 2019).

4.3. Material

The empirical material used for this thesis includes the member states national nuclear waste management programs and reports on the implementation of directive 2011/70/Euratom, commission reports, the staff working document, and infringement procedures. The commission requires all member states to implement national programs for the management of all stages of spent nuclear fuel and radioactive waste from generation to disposal (Directive 2011/70/Euarom). The responsible authority for each member state provides this program with an overview of national nuclear waste policy, the organizational and legal framework, and the strategies governing the management of SNF and radioactive waste occurring today and in the future. Additionally, every three years since August 2015, all member states submit national reports on the implementation progress of the directive. The report describes the current transposition of Directive 2011/70/Euratom in each member state. Both the national program and reports are published by the European Commission (European Commission, n.d. a). The table below gives an overview of the analyzed material, including publication date, number of documents and pages. The national nuclear waste program for nearly all member states was submitted to the commission between 2015 and 2018 and was made public by the commission in 2020. In one case, the national program has not been updated. The Spanish programs date

back to 2006, as Spain has not revised their program since. This means the Spanish program was created before the nuclear waste directive entered into force. Further, Slovenia submitted a revised program in 2023, providing some additional details on national provisions. Nevertheless, as they are the only national nuclear waste programs published by the commission, they will be used and treated the same as other member states' programs.

This study further uses the European Commission's report on the progress of the implementation of the directive. It provides an inventory of radioactive waste and spent nuclear fuel present in the community's territory and future prospects. The report is a compilation of all the member states and one can, therefore only make generalizing assumptions based on this document. However, the reports make up crucial empirical data, as it reveals how the commission's oversight function and monitoring of the member states manifests. This study will use the latest report, which was published in 2019. Furthermore, this study will include the so-called staff working document. This document provides details on the outcome of the commission's assessment of the member states notifications on the implementation of the directive. The document provides background information related to the main findings, progress, challenges, and trends, presented in the commission's report. The document is made for the Council of the European Union and the European Parliament. It will be used as a complementary document since most of the information in the staff working document can also be found in the commission's report.

Lastly, this study uses the European Commission's Infringement database to analyze instances when the commission identified any violation of directive 2011/70/Euratom. The aim of this study is not to investigate infringement procedures. However, infringement procedures make up an important compliance mechanism that needs to be considered when studying non-compliance. When a member state fails to fulfill its obligations under EU law, the European Commission may launch an infringement procedure. The commission identifies possible infringements based on its own investigations or following complaints from citizens, industries, and stakeholders (European Commission, n.d. b). When a procedure has been initiated, it typically follows several steps. In the case of the nuclear waste directive, the procedure starts with a formal letter of notice, to which the MS must reply within two months. If the MS continues to non-comply, the Commission will send a reasoned opinion explaining why the

Commission considers the MS in breach of the directive. If the MS continues to non-comply, the case will be referred to the ECJ. The court can thereafter impose penalties (European Commission, n.d. b). The infringement procedure data does not only give an indication of compliance status but can also provide evidence for theoretical arguments.

The selected material is suitable for this compliance study, as the material is based on the obligations established in the nuclear waste directive, making them highly relevant. Further, each program and report are similar in terms of form and outline and can therefore provide this study with comparable data without having to use additional material.

Table 1. Analyzed Material

	Date	Quantity	Pages
National Reports	2018-2021	27	12-152
National Nuclear Waste Programmes	2006-2023	15	18-270
Commission Report	21/12/2019	1	18
Staff-Working Document	15/5/2017	1	48
Infringement Procedures	10/11/2013-19/05/2022	84	Not applicable

Note: Name of analyzed documents followed by the date of submission to the commission, quantity of documents, and the number of pages. Infringement procedures are not documents; pages are therefore not applicable.

4.4. Qualitative Content Analysis

In order to empirically investigate motivations for not complying with the nuclear waste directive, this work will analyze member states national nuclear waste programs and implementation reports, as well as the European Commission's implementation report and staff working document. To identify how motivations for non-compliance appear in the selected material, this thesis will use qualitative content analysis. In political science, researchers are often interested in the meaning of the text. Content analysis has therefore grown to become an often-used method in both qualitative and quantitative studies (Bryman, 2018). The method involves a systematic approach to identifying patterns, themes, and arguments in any given text,

and interpreting them to gain insight into the underlying meaning and context (Bryman, 2018). Due to the fact that most compliance studies are based on the member states implementation and transposition records rather than studying how well the member states comply after a directive is correctly implemented, most compliance research is predominantly quantitative (Pircher, 2017).

Considering the aim of this thesis and the selected material, qualitative content analysis will allow for more complex interpretations and assessments of what is relevant in the text. Sorting out what is relevant without taking into consideration every detail to find themes and arguments of what can be identified as motivations for non-compliance, both expressed explicitly and hidden in the text (Berström & Boréus, 2012). This is essential for the analytical process as the material constitutes of more than 40 documents. Furthermore, using qualitative content analysis is advantageous when research aims to reveal latent meaning in the text. Analyzing latent meaning in this study will require a certain level of interpretation from the researcher. This view of conducting qualitative research using content analysis is characterized by how certain themes are emphasized in the texts (Bryman, 2002). Such hidden meanings in the text hold clues to a deeper and potentially unaware message, as communicated in the text (Denscombe, 2016).

The analysis follows a deductive approach, guided by theory-driven concepts drawn from the well-established theoretical framework approaches enforcement and management. Theory is used to identify certain key aspects of non-compliance, that directly relates to the aim of this study.

4.5. Analytical Process and Coding Scheme

As previously mentioned, this analysis will use a deductive research approach. With deductive coding, themes are selected before the analytical process begins (David et al., 2016). The theoretical framework has been operationalized and adapted to fit the selected case and the analyzed material. Instead of identifying relevant words, the analysis aims to find themes and arguments that can be categorized into specific motivations for non-compliance based on the theoretical approaches.

Qualitative content analysis requires coding, which can be done manually or computerized. What best suits the study, depends on the material (Berström & Boréus, 2012). In this study, the coding procedure will be done manually, which requires thorough reading of all the material. The data-driven coding has the advantage of saving time if the material can be coded through a coding program. On the other hand, the data-driven coding has the disadvantage of only finding themes and arguments provided, without considering the bigger picture and the context in which arguments are placed. In this thesis, qualitative content analysis is used so that both hidden and obvious motivations for non-compliance can be identified. Manual coding will better correspond with the selected material and the aim of the analysis because it gives the author the opportunity to select what is relevant in large quantities of material (Berström & Boréus, 2012).

Rather than quantifying specific themes and arguments in the material, the qualitative content analysis will be applied to identify the strength between the analytical framework and motivations for not complying with the nuclear waste directive, as they appear in the selected material (David et al., 2016). As a first step in the analytical process, the analytical framework will be broken down into relevant motivations presented in the analytical scheme below. The scheme will not follow some of the more traditional coding schemes where relevant words are searched for in the material and then counted. Instead, key motivations for non-compliance, drawn from the enforcement and management approach, will guide the analytical process. Codes are themes or arguments that correspond with themes in the actual text that I being analyzed. This kind of coding enables the researcher to highlight parts of the material in which themes of interest can be identified and how they reoccur (David et al., 2016). However, there is a risk that the application of codes on texts for the purpose of finding motivations leads to fragmentation of the actual meaning of the text when the text is put outside of its context.

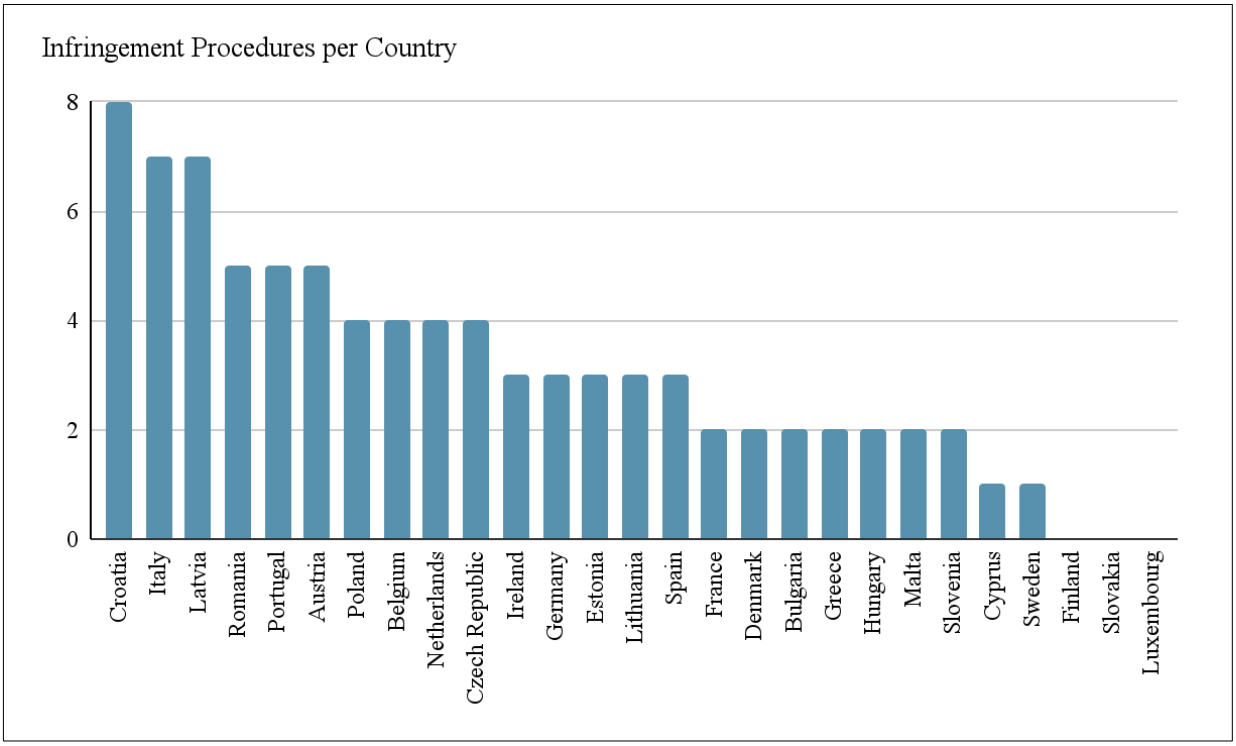
Table 2. Analytical Scheme

Analytical Scheme	Key motivations for non-compliance based on the theoretical frameworks	Operationalized motivations for non-compliance
Enforcement Approach	Compliance costs, decision making preferences, economic size of the member state, self- interest, power	Non-compliance less costly than compliance with the directive, MS with larger economy more likely to comply, Complying with the requirements of the directive contradict MS self-interest, national policy makers disagree with the content of the directive
Management Approach	Functioning institutions, directive requirements clear?, legal capacity, financial capacity, own interpretations	Lack of financial capacity/ability to comply with all directive requirements, Directive definitions and general principles not clear which leave MS to interpret requirements of the directive

5. Results and Analysis

Guided by the theoretical framework management and enforcement, and qualitative content analysis, this study aims to analyze motivations for non-compliance, using the case of the nuclear waste directive. Figure 1 quantitatively illustrates the result of the infringement procedure analysis. The result indicates a large spread of infringement cases among the member states.

Figure 1: Infringement Procedures per country, from 2013-2022



Note: Bar-Chart of all Infringement procedure cases against each member state, from 2013-2022. Own work.

Since 2013, the commission has initiated 84 infringement procedures against the member states, excluding Finland, Slovakia, and Luxembourg. Austria, Italy, and Croatia have been referred to the ECJ due to failure to notify the national program for the implementation of a spent fuel and radioactive waste management policy (European Commission, n.d. c). However, their cases were withdrawn from the court or closed before they could receive some form of penalty. As of September 2022, 21 infringement procedures were open for 18 member states (Italy, Slovenia, Portugal, Croatia, Estonia, Ireland, Latvia, Germany, Poland, Romania, Netherlands,

Lithuania, Greece, Bulgaria, Denmark, Belgium, Spain & Czech Republic) (European Commission, n.d. c). In two cases, the commission has sent a formal notice requesting further information on the details of the implementation of the national nuclear waste program. The remaining 19 cases are reasoned opinions (European Commission, n.d. c). The procedure implies that in 19 open cases, the commission concludes that MS continues to non-comply with the nuclear waste directive after having received a formal notice. The affected member states have two months to inform the Commission of the measures taken (European Commission, n.d. b). The most common infringement procedure is related to the member states national programs. 18 out of the 21 open cases are due to failure to adopt a national program compliant with the requirements of the directive (European Commission, n.d. c). Two times the infringement procedures have been initiated due to non-conformity of the MS legislation with certain requirements of the radioactive waste directive, and once for failure to correctly transpose certain requirements of the directive (European Commission, n.d. c). Despite the cases being open and therefore still under the watch of the commission, the infringement cases do not reveal what specific requirements the commission finds non-compliant with the directive. This will be further explored in the analysis.

Evidently, the nuclear waste directive suffers from comprehensive compliance issues. However, the infringement analysis only gives an indication of what the commission identifies as violation of the nuclear waste directive, following Article 258 of the Treaty of the Functioning of the European Union. Rather than identifying any motivations for non-compliance, the infringement procedures signify that the directive is not properly applied and respected. In agreement with previous literature, infringement procedures reveal" only the tip of the iceberg" (Mastenbroek, 2005) as it only represents a small part of non-compliance. Failure in transposition and national implementation does not mean that national legislation complies with the directive (Thomson, 2010).

In order to analyze motivations for non-compliance, it is necessary to investigate cases when such motivations are made visible. This will be done using qualitative content analysis, analyzing national nuclear waste management programs and national reports for all member states, except for Finland, Slovakia, and Luxembourg as they have never been called out by the

commission for non-compliance. The analysis will further use the European Commission's report on implementation progress and staff working document.

5.1. Enforcement

5.1.1. Cost of compliance

The enforcement approach suggests that member states willingly non-comply due to the costs of compliance. In the case of directive 2011/70/Euratom, cost of compliance implies being able to financially support the implementation of the national nuclear waste program following the principles of the directive. Based on the first analysis of the Commission's report and the member states national programs for the management of spent nuclear fuel and radioactive waste, the most salient motivational factor identified is financial issues related to cost of nuclear decommissioning and management methods, including storage and disposal solutions. However, cost-related motivations appear in different ways. This section will bring forwards the most prominent motivations related to the overall cost of compliance.

Keeping in mind that management technologies for both storage and particularity disposal of radioactive waste have high operational costs (Augustiono Kurniawan et al, 2022). Still, arguments for lowering costs for management can be identified in the analyzed material. The Dutch national program and report imply that high costs for waste management are the most salient motivation which had caused the failure to adopt a national program compliant with the principles of the directive. They argue that disposal of radioactive waste is the costliest step in the management of radioactive waste, especially for a country with a small nuclear sector (Ministry of Infrastructure and the Environment, 2016). Throughout their national program, the dilemma of cost is highlighted, arguing how costly different disposal solutions are, weighing some of the cheaper options against more expensive ones. This trend is particularly striking as more affordable management methods often mean that safety standards are weakened (World Nuclear Waste Report, 2019). For example, the program does not consider DGR because of cost aspects, despite the many advantages of using the method for final disposal (Nős, 2020). DGR is further the recommended long-term solution, stated in the directive (Directive 2011/70/Euratom). Instead, the program considers the possibility to dispose waste in drums that can be retrieved over several hundred years because it is cheaper than other methods. However, the program expresses concerns about the high costs of using this alternative disposal solution

as well. The option will, according to the program, “engender additional costs”, arguing that over time the “costs will rise”, and cost of retrieval of the drums “could be very high” (Ministry of Infrastructure and the Environment, 2016, p. 29).

Following the same motivation for non-compliance, Slovenia argues that the management of radioactive waste should be done in a modern, but cost-effective way. The program further goes on to propose that long-term management, which is often considered more costly than any short-term solutions, should be managed cost-effective (Official Gazette of the Republic of Slovenia, 2023). It should be noted that Slovenia has a nuclear power program and plans to expand its use of nuclear energy with additional nuclear reactors. This plan would entail increasing volumes of spent nuclear fuel and other types of HLW in need of storage and disposal. Slovenia currently has a dry spent nuclear fuel storage facility under construction to relocate spent nuclear fuel from the pools in which spent fuel can be stored temporarily. The dry cask storage method has proven a safer method compared to the currently used wet storage. However, the Slovenian program states that fuel will be relocated to a dry storage facility in three campaigns only if it is shown to be more cost-effective (Official Gazette of the Republic of Slovenia, 2023, p. 19-20).

Similarly, the Greek national report on implementation states that financing of the national nuclear waste program is ”rigid” (Greek Atomic Energy Commission, 2021, p. 28), indicating that financial resources are fixed and unable to adapt. To avoid the costliest step of implementation for the national management program Greece has decided that spent fuels' final disposal is not considered part of their program (Greek Atomic Energy Commission, 2021). Only ILW and LLW are taken into consideration, violating the nuclear waste directive, which stipulated that all types of waste shall be included in the national program. The Greek's own classification of what type of waste that should be included not only violates the requirements of the directive but also enables Greece to adopt a national program that only includes long-term plans for the disposal of radioactive waste with low radioactivity, making management solutions more advantageous from a cost perspective, as they may only require interim storage without having to use permanent disposal. This is another way for the member states to avoid high costs for management, overlooking some of the safety concerns.

The Austrian program highlights another important factor, reoccurring in several member states national programs and reports. Austria expresses the importance of reducing the cost of disposal solutions. In order to lower the costs for treatment and disposal of radioactive waste, the Austrian program put forward a plan that aims to minimize the waste itself using volume reduction. Their national report expresses that "final disposal entails high costs" (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2021, p. 22). By reducing the volume of waste, costs for constructing and operating a disposal facility will decrease.

Furthermore, another key element related to cost minimization in the Austrian national program relates to the unwanted spent nuclear fuel. The program states that the most important step for long-term management is making sure that "no spent fuel arises for disposal in Austria" (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2022, p.10). The simplest way to achieve this goal would be to make sure not to have any nuclear reactors where spent nuclear fuel is generated. Instead, Austria argues that nuclear facilities for energy generation will not be constructed or operated. However, research reactors are allowed to operate as long as they can ensure that no spent fuel is left to be disposed of in Austrian territory. Any spent fuel from research reactors will be returned to the manufacturer or supplier (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2022). The reasons behind Austria's strict policy against spent nuclear fuel is once again having to manage large quantities of high-level waste and having to make long-term plans for its disposal which would entail high costs. The issue of costly management solutions is further highlighted in discussions on the construction of deep geological facilities (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2022, p. 59).

The waste-minimizing approach is addressed in Croatian, Maltese, and Romanian national reports. They all aim to minimize the volume of waste for cost-saving purposes, stating that"[…]must ensure that the radioactive waste, disused sources and spent nuclear fuel are generated in the lowest possible quantities" (Republic of Croatia ministry of the interior civil protection directorate, 2021, p.19). Further arguing that small amount of radioactive material poses challenges in setting up a cost-effective disposal solution (Maltese Report on the Implementation of Council Directive 2011/70/Euratom of 19 July 2011 establishing a

Community Framework for the Responsible and Safe Management of Spent Fuel and Radioactive Waste, n.d.).

The European Commission's report on implementation and staff working document suggests that countries with nuclear power program, tend to provide more comprehensive and detailed national programs for radioactive waste management. However, this analysis uncovers that even experienced nuclear power member states such as France, express cost-related concerns, motivating non-compliance (European Commission, 2019).

France is currently the largest user of nuclear energy in the European Union. Thusly, France produces the most spent nuclear fuel, and large amount of HLW and ILW from nuclear power plants and other industries (World Nuclear Waste Report, 2019). As expected, the French national management program outlines in detail, the national long-term plan for safe management. However, on several occasions, the program highlights the dilemma of" cost/benefit" when it comes to nuclear waste management, mainly in the case of disposal solutions and incineration (Ministère de l'Environnement, de l'Énergie et de la Mer & Autorité de sûreté nucléaire, 2016, p.153). The incineration has proven a sufficient and mature technology for low and intermediate-level waste, but the cost of using the method makes it "little used" for low and very low-level waste (Ministère de l'Environnement, de l'Énergie et de la Mer & Autorité de sûreté nucléaire, 2016, p, 121-122). The directive states that the national framework should use relevant technology and research, ensuring that management methods are improved when needed and appropriate (Directive 2011/70/Euratom). The French program indicates that certain solutions such as incineration technology, may be the most suitable for certain types of waste, but too costly to be used. The French program further refers to "reasonable cost", and having to "bear the cost" for improved technology, therefor the long-term plan aims to minimize the costs in certain management sectors even if there are better and safer options for management available (Ministère de l'Environnement, de l'Énergie et de la Mer & Autorité de sûreté nucléaire, 2016, p.194).

Why is the motivational factor of cost interesting? First of all, considering the increasing volume of radioactive waste produced in the member states, management has become increasingly complex and costly (Augustiono Kurniawan et al, 2022). It is unrealistic to think

that management technologies for both storage and particularly disposal can be realized without the element of high costs. The directive states that all member states should have adequate financial resources in place for the implementation of the national program so that all requirements in the directive are fulfilled. Motivating non-compliance by pointing to costly management solutions cannot justify the member state's failure to comply with the requirements of the directive. The member states are all responsible to make sure that they can take care of the SNF and radioactive waste they generate. Because the directive requires the member states to implement a national program that takes into account all types of waste and adopt a national framework that uses relevant technology and research, ensuring that management methods are improved to ensure a high level of safety, non-compliance is inevitably cheaper. The argument of cost, as expressed by the commission, is a recurring feature in the commission's report and staff working document, indicating that the cost of compliance motivates the member states to non-comply.

5.1.2. Multinational Management Solutions

The analysis further uncovers that in relation to cost, another motivation for not complying to the nuclear waste directive is revealed. The directive provided an incentive for the member states to place their development of nuclear waste management under the supranational authority of the EU because they most likely hoped to benefit from joint ventures. In the member states national reports and nuclear waste management programs, some address their interest in a multinational disposal solution. Such an alternative would entail placing a disposal facility in one of the member states or outside the EU, in which different types of radioactive waste (HLW, ILW, LLW), and spent nuclear fuel can be permanently disposed. Despite the directive specifically asking the member states to dispose radioactive waste in the country it was generated (Directive 2011/70/Euratom), some member states express particular interests in a multinational or regional option instead. The analysis uncovers that 14 member states (The Netherlands, Bulgaria, Croatia, Austria, Cyprus, Denmark, Greece, Hungary, Italy, Lithuania, Malta, Romania, and Slovenia) consider a multinational shared disposal solution the best option for SNF and HLW disposal. Nearly all member states are motivated by the economic advantages such a solution would have.

Some member states explicitly express their interest in a multinational disposal facility. The Netherlands come forward as the most driving member state, advocating for such a solution. They argue that a multinational disposal facility would have clear advantages over any national solution. They mention “lower costs”, “cost savings” and “more choice of possible suitable locations and combining technical capacity and supervision” (Ministry of Infrastructure and the Environment, 2016, p. 27). Furthermore, they consider multinational disposal facility the best option for Dutch radioactive waste in particular, due to the relatively small amount of radioactive waste produced in the Netherlands.

The amount of waste appears to be an important aspect for member states considering a shared regional or multinational disposal facility. Austria also argues that with consideration to the small quantities of long-lived waste generated in Austria, a common disposal facility is regarded as a suitable option (Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2022). Similarly, Slovenia suggests that in the long term, a search for solutions for the treatment and export of spent nuclear fuel and HLW for disposal, a regional or multinational repository is considered suitable (Official Gazette of the Republic of Slovenia, 2023). The aspect of lower volumes of waste in need of disposal is further expressed in the Italian, Cyprian, and Slovenian national reports and national programs, arguing that all EU member states should come together to promote the development of a shared disposal solution, taking into account the limited amount of HLW they generate (National Inspectorate for Nuclear Safety and Radiation Protection, 2021., Republic of Cyprus Ministry of labour, Welfare and social Insurance., Department of Labour Inspection & Radiation Inspection and Control Service, 2015). They argue that a deep geological repository could be national, regional, or multinational.

Cyprus also expresses incentives to use multinational facilitates for reprocessing. Some of the major nuclear member states operate reprocessing, conditioning and recycling of spent nuclear fuel and radioactive materials. Cyprus argues, in their national program, that such solutions will not be taken into consideration as they require specialized facilities which are not available in Cyprus. Again, based on the type and amount of waste produced in Cyprus, the cost of such facilities will be exceeding. Instead, Cyprus considers reprocessing facilities in foreign

countries a better option (Republic of Cyprus Ministry of labour, Welfare and social Insurance., Department of Labour Inspection & Radiation Inspection and Control Service, 2015)

Other member states are vaguer in their reasoning but consider international solutions more suitable and cost-effective than national disposal solutions. Multinational solutions should therefore continue to be explored for possible use in the future. For instance, the Danish program encourages the idea of finding an international solution for all radioactive waste in Denmark (Danish Health Authority, 2021). However, Denmark does not suggest that an international solution entails a shared disposal facility. Bulgaria argues that European countries should continue to explore the opportunities for disposal in international repositories for high-level waste in particular Austria argues that they will seek cooperation with other European countries to solve the issue of final disposal. Whilst the program does not explicitly express arguments for a multinational disposal facility, cooperation to solve the issue of disposal most likely aims at some form av multinational disposal facility (Second report of the republic of Bulgaria on the implementation of the requirements of the council's directive 2011/70/Euratom, 2018; Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology, 2022).

Although it might seem as if cross-national cooperation would benefit all the member states and address the common challenges of managing SNF and HLW, the solution is characterized by the member states endeavors to find alternative management strategies with economic advantages. The option of a multinational disposal solution for waste management is further characterized by the member states self-interest, and even more importantly, it leaves the member states without the responsibility of having to manage SNF and radioactive waste within their territory. The analysis shows that member states without nuclear programs favor the multinational disposal solution more than countries with nuclear power programs. Most likely because the cost of constructing a national disposal facility is extremely high. They argue national disposal solutions are not cost-effective considering the small amounts of waste. This is further acknowledged by the commission. The staff working document reveals that the export of radioactive waste for disposal in another member state or third country is considered by most MS without a nuclear program (Commission Staff working document, 2017).

The commission claim, in the commission's report on implementation, that member states that consider shared solutions should "cluster up and take practical measures, including site-specific matters" (European Commission, 2019). The analysis uncovers that none of the 14 member states who express support for the idea of a shared disposal facility mention any interest or offering in hosting such a facility, nor do they describe any practical measures for the shared facility. Nevertheless, the idea is intriguing because it displaces the problem of having to implement a national long-term plan for disposal. Only two member states have clearly stated that spent nuclear fuel and radioactive waste will only be managed within the country it was generated, further stating that no waste from other countries will be disposed of within their territory. The Estonia national report states that "The Estonian waste management policy is based on the principle that the radioactive waste generated in Estonia shall be managed and ensured final storage in Estonia. The national policy also states that radioactive waste should not be transported to Estonia for disposal" (Ministry of the Environment, 2019, p.14). The Finish nuclear management program also states that "Nuclear waste generated elsewhere shall not be handled, stored, or permanently disposed of in Finland" (Radiation and Nuclear Safety Authority, 2021, p. 1).

5.1.3. International Agreements to minimize costs

Another motivation related to the cost of compliance, is the member states' different international agreements with suppliers and manufacturers, as well as agreements between the member states and third countries regarding the management of SNF and radioactive waste, including the use of reprocessing, recycling, and disposal facilities. The directive states that "radioactive waste shall be disposed of in the member state in which it was generated unless at the time of shipment, an agreement taking into account the criteria established by the commission […] has entered into force between the member state convened and another member state or third country to use a disposal facility in one of them" (Directive 2011/70/Euratom). In this analysis, agreements include so-called take-back agreements with suppliers and manufacturers outside the EU, in which sealed sources of radioactive waste is exported back to the country of origin, and agreements for spent nuclear fuel when generated in research reactors.

The member states different international agreements are closely linked to the motivation of non-complying due to costly management solutions. However, agreements are more complicated from an analytical point of view because the directive has made it possible for the member states to use agreements for management outside the member state without violating the general principles of the directive. However, the directive also states that all member states must notify any agreement to the EC and are required to include any agreements in their national programs (Directive 2011/70/Euratom). There seems to be some ambiguity about whether all member states notify the commission of their international agreements. The commission states in the staff working document that "Only a few member states submitted their agreement(s) with other member states or a third country" (Commission Staff Working Document, 2017). The analysis of the member states national management programs and reports reveals that 15 member states (Belgium; Cyprus, France, Ireland, The Netherlands, Slovenia, Spain, Croatia, Bulgaria, Hungary, Italy, Latvia, Poland, Portugal, and Romania) have submitted some form of agreement for management solutions outside their territory in their program. In most cases, agreements are signed so that radioactive waste can be exported from the country in which waste was generated for reprocessing or recycling in the country of origin. Even though SNF and radioactive waste are exported, the member states are still responsible to make sure that the country of destination has a high level of safety, similar to those safety regulations established in the nuclear waste directive. The German, Czech, and Maltese national programs and reports do in no way mention any relevant type of agreement with other countries (State Office for Nuclear Safety, 2021; Maltese Report on the Implementation of Council Directive 2011/70/Euratom of 19 July 2011 establishing a Community Framework for the Responsible and Safe Management of Spent Fuel and Radioactive Waste, n.d; Federal Ministry for the Environment, Nature Conservation, building and Nuclear Safety, 2015). Having regard to the Commission's staff working document, is it possible that agreements for Germany, Czech Republic, and Malta exist, but they have not fulfilled the obligations of the directive by not including relevant agreements in their programs.

Using international agreements is just another way for the member states to procrastinate their legal obligations of the directive, meaning that all member states with international agreements are left without having to take care of their SNF and/or radioactive waste it has generated. To non-comply with the directive leaves the member states with less waste in need for storage and final disposal, which is not only a cheaper option, but it also makes questions on management

solutions less urgent. It is an indication of a lack of willingness to commit and take full responsibility for the management of SNF and radioactive waste.

Agreements on export signed before directive 2011/70/Euratom was adopted in 2011 are not covered by the directive. This is particularly concerning from a compliance perspective as it should not be a distinction between when an agreement has been signed. It contradicts the purpose of the directive because member states with agreements signed before 2011 are no longer responsible to make sure that the country of destination has a high level of safety, similar to those safety regulations established in the nuclear waste directive. Some member states export HLW to Russian reprocessing facilities, which are famous for causing significant environmental damage (Mraz & Lorenz, 2020). Similar to the multinational disposal solution, an international agreement is more often signed by member states without nuclear power programs, only generating small amounts of radioactive waste, to avoid having to dispose any radioactive waste and therefore avoid the costliest step in management.

5.1.4 Policy Preference

The enforcement approach suggests that the likelihood of compliance is expected to decrease if national policymakers disagree with the content of the directive (Zhelyazkova et al., 2016). SNF and HLW management issues are defined by political choices (Doan, 2019). Dealing with highly radioactive waste material is considered a problem that has followed national political administrations for decades (Cotton, 2009). Unsurprisingly, the analysis of the member states national programs and reports reveals that MS motivates non-compliance with inadequate political frameworks and other policy-related challenges. However, this motivation is not emphasized to the same extent as cost-related motivations for non-compliance.

The Cyprian program highlights that milestones and timeframes for management might be strongly influenced by or dependent on socio-political processes (Republic of Cyprus Ministry of labour, Welfare and social Insurance., Department of Labour Inspection & Radiation Inspection and Control Service, 2015). The European Commission acknowledges that member states compliance with the requirements of the directive is sometimes pushed back due to political constraints. The commission states in the 2019 implementation report that lack of concrete disposal concepts and plans for disposal of ILW, HLW and spent nuclear fuel is sometimes caused by policymakers insufficiency to make decisions on site selection that will

enable disposal plans to continue (European Commission, 2019). Despite several updates of the member states national nuclear waste programs, no significant progress has been made regarding long-term plans for disposal. Policymakers' insufficiency to make real decisions on site selection for final disposal is the same as procrastinating because sooner or later all member states will have to make long-term plans for final disposal. Only Sweden, Finland, and France have selected sites for final repository (European Commission, n.d. a). The remaining MS must tackle the issue of deciding on these management solutions because the nuclear waste directive requires them to do so.

Inadequate political frameworks slow down progress for compliance. For example, in the Belgian nuclear waste management program, the national policy appears to be in disagreement over some of the management methods necessary for long-term storage and permanent disposal. In relation to the use of fuel in one of the Belgian nuclear reactors (BR1), the program states that ”there is not yet a policy for its management” (Fernandez, 2015, p. 24). Whilst technical considerations and financial resources for management are in place, progress is undermined due to insufficient policymaking. This is further evident in the case of Belgian reprocessing of spent nuclear fuel. The program states that spent fuel from another reactor (BR2) has reprocessing solutions but fall under the subject of reprocessing policy in which there is no clear national policy. The issue of reprocessing is reported being a” subject of debate” in the Belgian parliament (Fernandez, 2015, p. 25).

Similarly, the Dutch nuclear waste management waste program argues how policy on radioactive waste ”will be tightened up in a number of respects” (Ministry of Infrastructure and the Environment, 2016, p. 9). Indicating the current national policy does not fit with the requirements of the nuclear waste directive, which has to be incorporated and implemented in the national nuclear waste management program. Furthermore, The Netherlands' national management policy applies a so-called”dual strategy” focusing on two policy lines. One for planning and creating a national disposal facility, and one for an international disposal facility. This means that national policy on nuclear waste management is considering international disposal solutions, already in the decision-making phases of the national framework.

5.2. Management

5.2.1 Financial capacity

The management approach suggests that member states non-comply due to lack of financial capacity or ability to comply with all the requirements of the nuclear waste directive (Börzel et al., 2010). In this analysis, financial capacity is closely related to cost of compliance. However, financial capacity for waste management addresses a member state's ability to manage the financial affairs related to waste management, from generation to disposal. In the enforcement section, cost of compliance stands out as the most salient motivational factor influencing non-compliant behavior. When analyzing the member states financial recourses for spent nuclear fuel and radioactive waste management, lack of financial capacity becomes evident in several member states.

Article 9 of the nuclear waste directive state that all member states shall ensure that adequate financial resources are available for the implementation of the national program (Directive 2011/70/Euratom). All national programs, regardless of nuclear status, must provide a financial scheme for spent nuclear fuel and radioactive waste management. The commission highlighted, in the 2019 commissions report on the implementation progress of the Councils Directive 2011/70/Euratom, that most of the member states have not sufficiently estimated the costs of their national nuclear waste programs (European Commission, 2019). The commission further states that" most of them have not adequately addressed the assessment of the national programmes costs (Article 12(1)(h)). The other main challenges identified are: the setting of financial mechanisms ensuring sufficient funding for the national programme implementation (article 12(1)(i) and 5 (1)(h))" (European Commission, 2019).

At present, most member states have calculated the long-term estimated costs for nuclear waste management based on international estimates and norms, without providing any figures based on national provisions, capacity, or data. The commission argues that MS are not confident in their cost estimates for nuclear waste management (European Commission, 2019), indicating that some of the numbers and figures are submitted to the commission without any connection to reality and the actual cost of management. Most likely, some member states have put together rough numbers for the cost of management so that non-compliance becomes less obvious.

This is illustrated in the Irish nuclear waste management program. After receiving critique from the commissions for their first assessment of costs for the program implementation and the underlying basis and hypothesis for that assessment, including profile over time and the financial schemes in force (European Commission, 2019; Directive 2011/70/Euratom), the Irish program argues that any unclarities about the financial assessment have been considered in their revised program which was submitted to the commission in 2018. It states that "The National Programme for Ireland has been compiled to comply with the requirements of Article 12 of Directive 2011/70/EC" (Department of Communications, Climate Action & Environment, 2018). However, the financial assessment and financial provision only cover so-called "orphan sources". Orphan sources are radiation sources whose ownership cannot be established. They can derive from closed-down industries or other activities involving radiation sources (Lanaro et al., 2015). The program does not include expenditure for any other type of waste or the underlying basis for the profiled expenditure submitted in their program. The directive requirements do not mention orphan sources in particular. Control for High activity sealed radioactive sources and orphan sources fall under the council's directive 2003/122/Euratom (Directive 2003/122/Euratom). However, the waste directive specifies that all types of waste shall be addressed in the national program, thus including orphan sources and institutional waste (Directive 2011/70/Euratom).

The variance of cost estimates depends on the member states financial resources. Management strategies are most often financially covered by private generators, the so-called "polluter pays principle," and state budget. The" polluter pays" principle forms an integral part of most nuclear waste management programs around the world. The producer of the radioactive waste must bear the cost of its management and disposal (Sanders & Sanders, 2006). In addition, all MS receive EU funding and, in some cases, international funding for nuclear waste management (Commission Staff working document, 2017). EU funds come forwards as another key element in the commission's report, made clearer in the staff working document. The funds are meant to supplement the national funding for waste management and MS should not rely on EU or other international funds for its program implementation and waste management. Half of the MS has not provided information about the status of the funds, making it difficult to track how the money has been used (Commission Staff working document, 2017). Furthermore, the commission mentions that some member states rely entirely on the EU fund, despite the fact that MS is "required to ensure that the national framework requires that adequate financial

resources be available when needed for the implementation of national programmes" (Councils directive 2011/70/Euratom). The commission writes that both Lithuania and Estonia have indicated their reliance on EU funds for radioactive waste and spent fuel management (Commission Staff working document, 2017). However, according to the Lithuanian and Estonian national programs and reports, they experience no significant challenges related to financial capacity (State Nuclear Power Safety Inspectorate, 2021; Ministry of the Environment, 2019). Other member states could possibly rely on EU funding as well but have not provided information about its status.

5.2.2. Directive requirements clear?

The management approach suggests that non-compliance is triggered when legislative acts use unclear language that allows for national interpretations of rules (Tallberg, 2002). In the case of directive 2011/70/Euratom, the scope of the directive includes all stages of SNF and radioactive waste management, from generation to disposal.

Congruent with the management approach, the directive's complexity may have caused involuntary non-compliance. The member states endeavor to minimize the cost of waste management by signing agreements with other EU member states or third countries for nuclear waste was discussed in the enforcement section. Ultimately, the MS is seeking to make compliance with all requirements of the directive less costly. However, this motivation is also characterized by the management approach. This analysis uncovers that there seems to be unclarity regarding some of the definitions in the directive itself. Making it difficult for the member states to properly comply with the directive. The Councils Directive 2011/70/Euratom om Article 2, stipulated that the directive requirements shall apply to "(a) spent fuel management when the spent fuel results from civilian activities; (b) radioactive waste management, from generation to disposal, when the radioactive waste results from civilian activities" (Directive 2011/70/Euratom). So far, the directive is clear. However, the general principles of the directive shall not apply to "shipment of spent fuel of research reactors to a country where research reactor fuels are supplied or manufactured" (Directive 2011/70/Euratom), or when a member state has "an undertaking to return radioactive waste after processing to its country of origin; where the radioactive waste is to be shipped to that Member State or undertaking for processing; or other material is to be shipped to that Member

state or undertaking with the purpose of recovering the radioactive waste" (Directive 2011/70/Euratom).

Arguably, the directive itself has made it possible for the member states to deviate from their obligations, as the directive allows for member states' own interpretations of what type is waste that can be exported, under an agreement. The directive makes a difference if SNF and HLW are generated in nuclear power reactors for electricity generation or if it comes from research reactors that generate the same radioactive waste but for the purpose of using them for research (Directive 2011/70/Euratom). Still, the waste is the same and should therefore fall under the scope of the directive. It further makes a distinction between if radioactive waste is exported for reprocessing, treatment, and recovery, or other management purposes, which further makes the directive difficult to interpret.

Another instance when the directive itself made it possible for the member states to deviate from the directive and interpret the requirements in a way that would benefit the member states was previously analyzed as multinational management solutions to lower costs. Interestingly, the directive states that member states should dispose waste in the country it was generated (Directive 2011/70/Euratom). At the same time, the commission seems to encourage the idea of a multinational disposal facility. The ambiguity of the requirements of the directive and the commission's encouragement to further explore the possibility of having a shared disposal facility speaks to the complexity of interpreting the directive in a correct way. Whilst the option of a shared disposal facility is considered by serval member states, no program provides details about cost estimates or possible sites for the facility/facilities. This is further problematic from a legal perspective as the member states have different legal frameworks for national management. A multinational or regional disposal also raises the question of who bears the responsibility and accountability for the common facility where radioactive waste generated in different member states would be kept. If anything, the multinational disposal solution serves as a loophole for the member states to formally fulfil the requirements of the nuclear waste directive without having to consider implantation of their national programs.

6. Concluding discussion

This thesis set out the goal of studying member states' motivations for not complying with the EU joint policy for SNF and radioactive waste management, as laid down in the Directive 2011/70/Euratom. The analysis is guided by the two theoretical approaches, enforcement, and management, which are recurrent in the non-compliance literature. By conducting a qualitative content analysis of the EU member states national nuclear waste management programs and implementation reports, this study found that member states most often motivate non-compliance with arguments of costly management solutions, resulting in failure to adopt a national program compliant with all requirements and general principles of the directive. As suggested by the enforcement approach, and previous research, the member states are encouraged to continue to non-comply and procrastinate their obligations under the nuclear waste directive because the cost of complying is greater than the cost of not complying.

The result of the analysis shows that nearly all member states aim to minimize the cost of management in different ways. Firstly, they argue that management solutions should be shared between the member states, using so-called multinational disposal solutions. The multinational solutions leave the member states without the responsibility of having to handle HLW and spent nuclear fuel within their territory, making compliance with the obligations of the directive less costly. Secondly, the member states use international agreements with other member states or third countries so that SNF and radioactive waste can be exported for management in another country. The directive allows exports under strict conditions, even if the main objective of the directive is that member states manage all radioactive waste it generates. Again, exporting SNF and radioactive waste leaves the member states without the responsibility of having to handle the waste within their territory, making compliance with the directive less costly. If all member states adopted a national program compliant with all requirements and general principles of the directive, they would have to take full responsibility for the SNF and radioactive waste it generates, and they would have to invest in larger storage facilities and make plans for final disposal, using costly methods such as DGR. To avoid these costly steps in SNF and radioactive waste management, member states are motivated to non-comply because it is simply cheaper.

The enforcement approach and previous research suggest that non-compliance can be prevented by increasing the cost of non-compliant behavior. Punishment for non-compliance would

motivate, or rather force the member states to comply to a larger extent. In the EU context, punishment includes infringement procedures and imposed sanctions by the ECJ. It is possible that more member states would be more motivated to comply if the cost of compliance outweighed the cost of non-compliance. So far, this has not been the case. The result of the infringement procure analysis shows that only in three cases has an infringement procure reached the ECJ. However, in neither case was any of the member states punished with sanctions (European Commission, n.d. c).

The result of the analysis, guided by the management approach, proved less relevant compared to the enforcement approach. The analysis shows that member states are motivated to non-comply because they lack the financial capacity to comply with all requirements of the directive, including the financial capacity for costly management solutions. Whilst some member states seem to have adequate financial recourses in place, others are relying on EU and other international funds to support financing for the management of SNF and radioactive waste. The analysis further showed that not all member states provided a financial scheme for spent nuclear fuel and radioactive waste management and were not able to provide details on the estimated the costs of their national nuclear waste program.

Congruent with previous literature, the nuclear waste directive has left the member states with some leeway on how to make sure the requirements of the directive are fulfilled (Haverland & Romeijin, 2007). This is further supported by the management approach, which suggests that non-compliance is triggered when legislative acts use unclear language that allows for national interpretations of rules (Tallberg, 2002). The analysis shows that the directive itself made it possible for the member states to deviate from the directive and interpret the requirements in a way that would benefit the member states. This is exemplified by the member states motivation to develop a shared multinational disposal facility and agreements that allow exports of SNF and radioactive waste outside of the country waste was generated.

Like all research, this study has various limitations. The begin with, the empirical material used to conduct this analysis provides in-depth detail on the member states management strategies and long-term plans for the future of SNF and HLW management, following the general principles and obligations of the directive. The material is highly relevant and does provide

some insight into what can be identified as motivations for not complying with the nuclear waste directive. However, the material is mostly focused on technical aspects of nuclear waste management, making it challenging to separate technical considerations from motivations. Furthermore, the operationalization of the theoretical framework is not without limits. In this deductive study, management and enforcement were used to guide the analytical process by providing a framework of key motivations for non-compliance. The theoretical approaches are shaped and developed over time to test how non-compliance with EU law can be explained by country-level explanatory factors in quantitative studies. The theoretical approaches are, therefore less suitable for qualitative research, making it difficult to capture the essence of motivations for member states' non-compliant behavior without taking into account country-level factors. The study was able to identify motivations for non-compliance, but the results of the analysis are rather generalizing.

Lastly, future compliance research should continue to explore motivations for non-compliance in other policy areas to gain a deeper understanding of the underlying factors for non-compliant behavior. Compliance research needs more qualitative research that can provide in-depth investigations in policy-specific cases. For future research on motivations for non-compliance with EUs joint policy for spent nuclear fuel and radioactive waste management, studies should take into consideration individual member states historical, scientific, and technological development in radioactive waste management. Because nuclear waste management is characterized by exceptional circumstances, making nuclear waste a particularly complex policy field, county-level factors should not be discarded.

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