From Nuclear Winters to Ocean Breezes: How nuclear energy legislation can influence the renewable energy

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Abstract

This paper explores the complex interplay between nuclear energy legislation and green energy policies across Germany, Norway, and the United Kingdom. Each country presents a unique legal and regulatory approach shaped by historical developments, societal attitudes, and technological advancements. Germany's aggressive phase-out of nuclear energy, influenced by public opposition and environmental advocacy, contrasts sharply with Norway's cautious and minimalistic nuclear approach due to its abundant renewable resources. The United Kingdom's pragmatic yet robust regulatory framework highlights the influence of international treaties and domestic safety concerns.

The thesis analyzes these diverse strategies through the lens of international regulatory bodies like the International Atomic Energy Agency (IAEA) and the European Atomic Energy Community (Euratom), emphasizing their role in shaping national policies and fostering international cooperation. The comparative analysis seeks to understand how historical nuclear legislation can inform and guide current and future green energy initiatives, proposing that lessons from nuclear policy can enhance the effectiveness and societal acceptance of green energy solutions.

The findings suggest that while nuclear energy laws have been pivotal in managing nuclear risks, they also offer valuable insights for developing comprehensive green energy laws that balance safety, sustainability, and public acceptance. The paper did not find any clear lessons of how nuclear legislation directly might pave the way for net-zero emission energy production. The transition from nuclear to renewable energy sources, especially under the frameworks set by international accords like the Paris Agreement, highlights the need for adaptable and forward-looking international organizations that can meet global sustainability goals.

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1. The necessity for clean energy

Modern history has been shaped in how mankind has used energy. The importance of energy does not only stem from its role as a fundamental driver of economic growth, but also from its impact on the geopolitical landscape. From coal-trade across the Atlantic Ocean to nuclear proliferation, the energy-market has been a major concern for countries worldwide. In the ever-evolving technological leap, the development and access to energy has had a profound impact on societies and economies globally.

A major watershed moment in energy was the Industrial Revolution[1]. The transition from manual labor, agrarian economy and decentralized economic development to mechanical production lines fueled by coal and steam, transformed societies both psychologically and economically. The cities turned from institutions of political power to hotspots for production and manufacturing[2]; and to power all of this development there was an ever-increasing need for energy[3].

In the twentieth century, the emergence and subsequent utilization of petroleum resources significantly transformed the worldwide economic and political arenas. Petroleum assumed a pivotal role in the foundation of contemporary economies and military strategies, impacting phenomena ranging from the resolutions of global conflicts to the emergence of petrostates. Yergin's authoritative text on the chronicle of petroleum describe the extent to which this commodity has influenced international diplomacy and remains a fundamental element in the discourse of global affairs, accentuating the notion of 'energy security' as a principal driver of national policy[4] .

The late 20th and early 21st centuries have been characterized by growing concerns over the environmental impacts of energy consumption, particularly fossil fuels. This has spurred another transition, this time towards sustainable energy sources such as wind, solar, and hydroelectric power [5]. The importance of this transition is not merely technological but also involves substantial cultural, economic, and political shifts, as societies seek to mitigate climate change while ensuring energy security. Sovacool's research provides an overview of how these shifts are influencing international energy strategies and the global energy policy landscape[6].

There was also a different type of energy that emerged as a counter to the fossil fuel. The discovery of nuclear energy marked as a pivotal moment in the 21st century emerged from

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[1] Wrigley, E. A. (2015). *Energy and the English Industrial Revolution*. Cambridge University Press.
[2] Wrigley, E. A. (2015). *Energy and the English Industrial Revolution*. Cambridge University Press.
[3] Wrigley, E. A. (2015). Energy and the English Industrial Revolution. Cambridge University Press.
[4] Yergin, D. (1991). *The Prize*. Simon & Schuster.
[5] Solomon, B., & Krishna, K. (2011). The coming sustainable energy transition: History, strategies, and outlook. *Energy Policy*, *39*(11), 7422-7431.
[6] Sovacool, B. (2011). The Political Economy of Energy Poverty: A Review of Key Challenges. *Energy for Sustainable Development*, *16*(1), 272–282.

scientific investigations during the 19th and 20th century. Under which period the world saw significant advancement in understanding atomic structure, radioactivity and ultimately learning of fission by Otto Hahn and Fritz Strassmann in 1938. This breakthrough, first adopted as a militaristic tool, shifted to the use as an energy source[7].

The nuclear power was initially lauded as a giant leap in energy economy with minimal consequences faced major setbacks due to safety concerns[8]. High-profile accidents like Chernobyl and Fukushima Daiichi highlighted the potential risk of the nuclear energy strategy leading to widespread public fear and opposition[9][10]. The fear of major accidents wasn't the only controversy nuclear power plants faced; the nuclear waste which remains hazardous for years, the high costs of construction and maintaining nuclear facilities, have further set back the production of nuclear energy[11]. These challenges made the technological sector look for safer and more sustainable alternatives, seeking less controversies and more environmentally friendly options.

At the turn of the 20th century the growing concern over environmental impacts of energy consumption and especially fossil fuels have been in the forefront of energy policy. The shift brought another transition towards self sustainable energy sources such as wind, solar and hydroelectric power[12]. Nuclear Power plants was also a state-backed hope to move away from the fossil fuel industry. The transition marks a shift in not only technological, but also cultural, economic and political focus; away from efficiency to energy security[13]. Sovacool in the paper "The political economy of energy poverty: A review of key challenges" highlights this shift and the necessity of adapting to a new energy policy.

Therefore the conclusion of this shift is that energy is not only a driver of industrialization and economic growth but also a central actor in the quest for geopolitical dominance and pursuing long-term solutions for an increasingly energy-reliant world. The current global energy landscape continues to reflect the change in priorities such, from the state-backed acceptance of risk regarding nuclear power plants, to grassroots opposition of green energy-policies of the 21st century.

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[7]Murray, R. (2020). The History of Nuclear Energy. Nuclear Energy.

[8] Solomon, B., & Krishna, K. (2011). The coming sustainable energy transition: History, strategies, and outlook. *Energy Policy*, *39*(11), 7422-7431.
[9] Drottz-Sjöberg, B.-M., & Sjöberg, L. (1990). Risk perception and worries after the Chernobyl accident. *Journal of Environmental Psychology*, *10*(2), 135-149.
[10] Iwai, N., & Shishido, K. (2015). The Impact of the Great East Japan Earthquake and Fukushima Daiichi Nuclear Accident on People`s Perception of Disaster Risks and Attitudes Toward Nuclear Energy Policy. *Asian Journal for Public Opinion Research*, *2*(3), 172-195.
[11] Zinkle, S.J., & Was, G.S. (2013). Materials challenges in nuclear energy. *Acta Materialia*, *61*(3), 735-758.
[12] Solomon, B., & Krishna, K. (2011). The coming sustainable energy transition: History, strategies, and outlook. *Energy Policy*, *39*(11), 7422-7431.
[13] Sovacool, B. (2011). The Political Economy of Energy Poverty: A Review of Key Challenges. *Energy for Sustainable Development*, *16*(1), 272–282.

A key challenge to this energy efficiency is the search for sustainable energy. What was once thought of as the black gold has in modern times been realized to be the largest contributor to a modern crisis[14]. The climate crisis. Earlier times might have thought that the fossil fuels was a sign of modernization, of great technological leaps where - in under a century - mankind went from discovering pacific islands to landing on the moon.

In this paper I am exploring what, if anything, can be learnt by the legislation of nuclear energy. The paper focuses on three countries' approach to nuclear energy: Germany, Norway and The United Kingdom. Three countries with three different legal systems, three different approaches to environmental protection and also three active participants in the United Nations Climate Accords. I will first present a general overview of these countries legal systems, then I will present the countries nuclear legislation.

In this paper I will analyse the merits of nuclear legislation as a tool for paving the way for green energy. The Paris Agreement of 2015, represents a significant international effort to tackle climate change. The accords aim to limit global warming to below 2°C, distinguishing from previous accords with the flexibility and inclusivity, enabling countries to set their own goals for reducing greenhouse gas emissions[15]. The approach is a shift where standard protocols intended to foster compliance and participation. The main criticism of the accords have been that there are few enforceable mechanisms to ensure countries meet the commitment[16]. The effectiveness is, according to Christoff, in his paper "The promissory note: COP 21 and the Paris Climate Agreement" argue it's essential is crucial for mitigating the effects of climate change and guiding the global energy market towards sustainable energy sources[17].

1.1 Thesis

Can the Green Economy learn from nuclear legislation?

1.2 Definitions and Delimination.

The scope of this paper is limited to legislation of the nuclear energy production. By *nuclear energy* it is used as the process of fission of radioactive materials used in nuclear reactors. *Radioactive waste* is used as the byproduct of nuclear energy production. *Green energy* in this

[14] Based on various UN sources. (N/A, N/A N/A). *Causes and Effects of Climate Change | United Nations*. the United Nations. Retrieved May 14, 2024, from https://www.un.org/en/climatechange/science/causes-effects-climate-change

[15] Rajamani, L. (2016). AMBITION AND DIFFERENTIATION IN THE 2015 PARIS AGREEMENT: INTERPRETATIVE POSSIBILITIES AND UNDERLYING POLITICS. *International and Comparative Law Quarterly*, *65*(2), 493-514.

[16] Manolas, E. (2016). The Paris climate change agreement. *International Journal of Environmental Studies*, *73*(2), 167–169.

[17] Christoff, P. (2016). The promissory note: COP 21 and the Paris Climate Agreement. Environmental Politics, 25(5), 765–787. https://doi.org/10.1080/09644016.2016.1191818

paper is meant as a catch-all term to describe the 21st century United Nations agreed upon net-zero emissions energy producers such as windmill-, waterfall- and hydro-energy. In this paper there is also no distinction between a green economy where the focus is on sustainable inland energy development, and blue economy where the focus is on coastal and water sustainable development.

The paper limits itself to a broad overview of general terms and systems. The reason for this more generalistic approach is that the discussion and the point of the paper is to see if there are possibilities to learn and adapt from Nuclear Energy. That means the paper will not discuss the nature of the energy-process of which the two sources are sourced, namely the radioactive material versus the raw material for producing electricity.

Another aspect outside the scope of this paper is discussing the eurocentric focus of this paper. Therefore there is a lack of non-eurocentric interests in the paper, such as the discussions of common but differentiated goals, reducing emissions with other means and carbon capture.

I will also make a concession about the OECD Nuclear Energy Agency(NEA), which regulates the Norwegian nuclear energy, I would argue has the same legislative power as the Euratom due to the similarity in scope, goal and legislative power they are meant as used interchangeably, see provided source (NEA Mandates and Structures, 1958: Annex 1, Article 16 paragraph b[18] and Article 18[19]).

Methodology used in this paper has taken inspiration from the Gerd Winter's paper "The Rise and Fall of Nuclear Energy Use in Germany" (Winter, 2013) where he presents the legal status of Germany, it's nuclear legislative history and discuss the legal aspects with a selected legal conflicts. The paper has collected data through relevant channels pertaining to the discussion, especially Journal of International Law (Cambridge) and sources with prominent international legal standing (such as the IAEA, IEA and the United Nations).

[18] Article 16 b) "b) Since the present Decision does not affect the exercise of competences granted to the European Atomic Energy Community (EURATOM) by the Treaty entered into at Rome on 25th March 1957, the Agency shall establish with the said Community a close collaboration, details of which shall be determined by common agreement." STEERING COMMITTEE FOR NUCLEAR ENERGY. (1956, 06 18). NEA Mandates and Structures. OECD-NEA.org. Retrieved May 14, 2024,
[19] Article 18"The provisions of Supplementary Protocol No. 1 to the Convention on the Organisation for Economic Co-operation and Development shall apply to the representation of the European Atomic Energy Community (Euratom) in the Agency and in its Steering Committee as well as to the participation of the Commission of the European Communities in the work of the Agency and of its Steering Committee." STEERING COMMITTEE FOR NUCLEAR ENERGY. (1956, 06 18). NEA Mandates and Structures. OECD-NEA.org. Retrieved May 14, 2024,

2. The Journey from Nuclear to Renewable

The paper will introduce the legislative background for a discussion of the thesis, divided into the different countries legal system, presenting the present green energy's international legislative status and nuclear history.

2.1. The German Legal System

The German civil law system, based on the tradition of Roman law, is one of the most influential and organized legal systems in the world [20]. At the core of this system is the German Civil Code (Bürgerliches Gesetzbuch, BGB) which came into effect in 1990[21]. The BGB is a comprehensive legal framework that regulates civil matters from contracts to family law to property. And relevant for this paper: nuclear energy laws. The system is known for its detailed codification and methodological rigor in legal interpretation[22].

2.1.1 Overview of the German Civil Law System

German Civil law is characterized by the feature of having all legal rulings codified into comprehensive statutes, a distinguishably systematic approach. The BGB is divided into 5 books: General Part, Law of Obligations, Law of Things, Family Law, and Law of Succession. The structure ensures accessibility, clarity and transparency through public application and interpretation of the law[23] .

German civil law is characterized by its systematic approach to law, where all legal rules are codified in comprehensive statutes. The BGB, for instance, is divided into five main books: General Part, Law of Obligations, Law of Things, Family Law, and Law of Succession. This structure ensures clarity and accessibility, facilitating the application and interpretation of law[24].

The codified system demands that legal professionals have a deep understanding of *de lege lata*. Law students undergo rigorous academic training which includes both practical training

[20] Rühl, G. (2005). Preparing Germany for the 21st Century: The Reform of the Code of Civil Procedure. *German Law Journal*, *6*(6), 909–942.
[21] Makarushkova, A., & Solovyova, I. (2019). Comparative legal analysis of modern sources of civil law in Russia, France and Germany. *Current problems of Russian law*, *1*(12), 149-161. doi:0.17803/1994-1471.2019.109.12.149-161

[22] Haferkamp, H.-P. (2016). On the German History of Method in Civil Law in Five Systems. German Law Journal, 17(4), 543–578. doi:10.1017/S2071832200021362
[23] Rühl, G. (2005). Preparing Germany for the 21st Century: The Reform of the Code of Civil Procedure. *German Law Journal*, *6*(6), 909–942.
[24] Rühl, G. (2005). Preparing Germany for the 21st Century: The Reform of the Code of Civil Procedure. German Law Journal, 6(6), 909–942.

and education[25]. The combined theoretical knowledge and practical skills are essential in practicing law in Germany[26] .

2.1.2 Distinctive Features of the German Civil Code (BGB)

Although the BGB has been in effect for over a century, it has continuously adapted to modern legal challenges through amendments and reforms[27]. This flexibility allows the German legal system to stay relevant and effective in addressing contemporary social and economic issues[28].

German judges are renowned for their detailed and methodological approach to interpreting the law[29]. The judiciary plays a crucial role in shaping the application of the BGB, ensuring that its provisions are applied in a way that reflects current societal values and legal principles.

The systematic nature and the thoroughness of the German Civil Code have made it a model for many other countries developing their own civil law systems[30]. Its influence is particularly notable in parts of Europe and East Asia, where the principles of the BGB have guided the development of national codes .

2.1.3 Conclusion

The German civil law system is a testament to the enduring value of comprehensive legal codification and systematic organization. It not only provides a robust framework for legal proceedings within Germany but also serves as a reference point for other jurisdictions aiming to refine their legal processes. Through continuous adaptation and a commitment to methodological rigor, the German civil law system remains a cornerstone of global legal practices.

The German civil law system produces a highly methodological approach to green energy. While other countries rely on legislators and courts to control de lege lata, the German civil law system has additional procedures to establish law. This has been proven useful in the green energy sector where german production of renewables in the electric supply to increase

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[25] Rühl, G. (2005). Preparing Germany for the 21st Century: The Reform of the Code of Civil Procedure. German Law Journal, 6(6), 909–942.
[26] Koch, S., & Sunde, J. Ø. (Eds.). (2020). *Comparing Legal Cultures*. Fagbokforlaget. 28
[27] Senn, P.R. Why has the German Civil Code Proven so Durable?. European Journal of Law and Economics 7, 65–92 (1999). doi:10.1023/A:1008636224982
[28] Senn, P.R. Why has the German Civil Code Proven so Durable?. European Journal of Law and Economics 7, 65–92 (1999). doi:10.1023/A:1008636224982
[29] Haferkamp, H.-P. (2016). On the German History of Method in Civil Law in Five Systems. *German Law Journal*, (17), 543–578. doi:10.1017/S2071832200021362
[30] Senn, P.R. Why has the German Civil Code Proven so Durable?. European Journal of Law and Economics 7, 65–92 (1999). doi:10.1023/A:1008636224982

to 80% of the energy market share by 2030[31]. While there are drawbacks from the efficiency of the sudden change, such as the Nuclear Power Plant shutdown court cases, the lesson, I would argue, is that with a wide net of legal sources, Germany is a the forefront of combining energy law with production.

2.2 The Norwegian legal system

The Norwegian legal system is a unique hybrid that incorporates elements of both civil law and common law traditions, influenced significantly by its associations with international law, particularly through the European Economic Area (EEA). This hybrid system is characterized by its integration of Norwegian statutory law with principles derived from international agreements and the influence of EU law, despite Norway not being an EU member state. This puts Norway in a unique position internationally, considering it maintains its sovereignty while still adhering to international laws and practices through adaptation.

2.2.1 Characteristics of the Norwegian Hybrid Legal System

Norway integrates both the system of Common Law and Civil Law. While it fundamentally relies on comprehensive statutes typical of a civil law system, it also incorporates procedural elements that are characteristic of common law systems[32]. Norway's legal system is in a unique situation adhering to both international law, while taking inspiration internationally from two different doctrines it also adheres to international law.

The EEA-membership significantly influences Norwegian private international law and domestic legal standards. Norwegian law incorporates elements such as the Lugano Convention and is influenced by EU regulations like Rome I and Rome II, which concern jurisdictional and procedural matters in civil and commercial cases [33].

Recent years have seen efforts towards the codification of certain areas of private international law in Norway[34]. These efforts aim to systematize rules concerning the law applicable to contractual and tort obligations, drawing from EU models to ensure coherence and consistency in the application of law across different cases [35].

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[31] ccelerated expansion of offshore wind energy | Federal Government. (2022, April 6). Bundesregierung.de. Retrieved May 15, 2024, from https://www.bundesregierung.de/breg-en/news/offshore-wind-energy-act-2024112

[32] Cordero-Moss,, G. (2020). Internasjonal privatretten på formuerettens område. AUC IURIDICA, 66(4), 31–43.doi: 10.14712/23366478.2020.30

[33] Cordero-Moss,, G. (2020). Internasjonal privatretten på formuerettens område. AUC IURIDICA, 66(4), 31–43.doi: 10.14712/23366478.2020.30

[34] Cordero-Moss,, G. (2020). Internasjonal privatretten på formuerettens område. AUC IURIDICA, 66(4), 31–43.doi: 10.14712/23366478.2020.30

[35]Cordero-Moss,, G. (2020). Internasjonal privatretten på formuerettens område. AUC IURIDICA, 66(4), 31–43.doi: 10.14712/23366478.2020.30

2.2.2 Impact on Judicial Practices

Norwegian courts have adapted to the hybrid legal system by employing a pragmatic approach to law, where judgments often reflect a combination of statutory interpretation and case-law principles[36]. This adaptability is crucial for addressing cases with international elements or those influenced by EU law, thereby ensuring that Norwegian legal practices remain aligned with broader European standards.

The Norwegian legal system is adept at balancing national statutes with obligations derived from international law. Courts often prioritize international agreements and EU regulations in areas covered by the EEA Agreement, which has led to a dynamic and responsive legal framework capable of addressing both domestic and international legal challenges.

2.2.3 Summation

The Norwegian hybrid system provides a unique example of how national legal traditions and international legal jurisprudence can create adaptive legal text. Norway is also in the unique position of blending the hybrid international system with a co-mingling of two traditions, the common law system and the civil law system. As a member of the EEA Norway maintains sovereignty while adapting international laws.

The Norwegian generalist approach is taking into consideration how the public would like to regulate. With a lot of power in the legislative branch's hand the countries renewable energy market share amounts for 98%[37]. Norway is an example that a generalist approach to law with a strong state-backed incentive.

2.3. The British Common Law system

The British legal system, known as the common law system, is a cornerstone of the legal framework in the UK and has significantly influenced legal systems across the world, especially in countries that were once part of the British Empire[38]. This system is characterized by its reliance on judicial decisions from courts and the principle of legal precedent.

2.3.1 Key Features of the British Common Law System

Judicial Decisions and Precedents: Unlike civil law systems which are based primarily on codified statutes, the British common law system is built around case law and legal precedents. Judges play a crucial role in shaping the law, as their rulings on cases can set

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[36] Koch, S., & Sunde, J. Ø. (Eds.). (2020). *Comparing Legal Cultures*. Fagbokforlaget. 172

[37] Executive summary – Norway 2022 – Analysis - IEA. (n.d.). International Energy Agency. Retrieved May 15, 2024, from https://www.iea.org/reports/norway-2022/executive-summary

[38] Simpson, A. W. B. (1987). A History of the Common Law of Contract: The Rise of the Action of Assumpsit. Clarendon. doi:10.1093/acprof:oso/9780198255734.001.0001

legal precedents that future courts must follow. This principle ensures consistency and predictability in the application of the law [39].

Development of Legal Principles: The common law system is dynamic, allowing for the gradual evolution of legal principles through judicial interpretation. This adaptability makes the common law particularly responsive to new challenges and changes in societal values[40].

While common law is primarily based on judicial decisions, statutory laws passed by Parliament also play a critical role. Statutes can override existing common law and introduce new legal frameworks where necessary, reflecting the supremacy of Parliament in the legal hierarchy[41].

2.3.2 Influence and Interaction with European Law

Prior to Brexit, EU law had a significant impact on British law, with European regulations and directives integrating into the national legal system under the European Communities Act 1972. This relationship has influenced areas such as employment rights, environmental regulations, and competition law, demonstrating the adaptability of the common law system to incorporate international legal standards[42].

The incorporation of the European Convention on Human Rights into British law via the Human Rights Act 1998 is a prime example of how the common law system has evolved to include more codified protections of individual rights. This Act allows British courts to hear human rights cases domestically, enhancing the protection of civil liberties within the common law framework[43].

2.3.3 Summation

The British common law system is a robust and flexible legal framework that has developed through centuries of judicial decisions and statutory interventions. Its ability to adapt and incorporate new legal concepts and international law has allowed it to remain relevant and effective in governing complex modern societies. The system's global influence continues to be profound, shaping legal traditions in many countries around the world.

The United Kingdom's Common Law system has traditions and history spanning back

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[39]Simpson, A. W. B. (1987). A History of the Common Law of Contract: The Rise of the Action of Assumpsit. Clarendon. doi:10.1093/acprof:oso/9780198255734.001.0001

[40] Brand, P. (1992). The Making of the Common Law. London: Bloomsbury Academic. Retrieved May 14, 2024, doi: 10.5040/9781474210041

[41] Gearey, A., Morrison, W., & Jago, R. (2013). *The Politics of the Common Law: Perspectives, Rights, Processes, Institutions*. Routledge. doi: 10.4324/9780203071991

[42] Hartley, T. C. (2005). The European Union and the Systematic Dismantling of the Common Law of Conflict of Laws. International and Comparative Law Quarterly, 54(4), 813–828. doi:10.1093/iclq/lei038

[43] Gearey, A., Morrison, W., & Jago, R. (2013). *The Politics of the Common Law: Perspectives, Rights, Processes, Institutions*. Routledge. doi: 10.4324/9780203071991

centuries. The renewable share amounts for 14% in 2022[44]. I do believe that might be a lesson that a country where the only challenge to the current law is either court cases, where a party has a vested interest, or the centralised legislative branch where they offer no expertise on the subject might be considered a faulty. Although a centralised state proved in Norway's example of being a path forward, it might be a different system when the state has to consider the common law system in the UK.

2.4 Quick comparative analysis of the Three Countries

The German legislative system is a transparent yet complex interwoven system of legal bindings. In comparison, Norway and The UK takes a more generalist approach to the legal system. A more generalist approach means there are less to be demanded of the legal scholar.

Another distinction is the use of precedence. While in Norway and The UK precedence has a strong standing, where the courts have a legislative power in the use of precedence. In Germany, in comparison, the precedence is an interpretation for scholars to analyse, refute and incorporate.

The court systems also differ in the structure. While Germany operates with specialised courts in different legal matters, both Norway and The UK have a generalist approach to the courts, where a legal dispute can be handled by every judge in a district.

3. Green Energy

The present international standing as for now of international climate accords are the Climate Accords. The Climate Accords is the lens I am discussing the validity of nuclear legislation history as a guide for green energy.

3.1.1 Current Climate Legal Standing

Climate accords represent a cornerstone in global efforts to address climate change. They are essential for setting international goals and facilitating coordinated actions to mitigate and adapt to environmental changes. This paper provides a focused analysis of the legality and goals of significant climate accords, notably the Lima Accord, the Paris Agreement, and the Copenhagen Accord, shedding light on their development, implementation challenges, and global impacts.

[44] nited Kingdom - Countries & Regions - IEA. (n.d.). United Kingdom - Countries & Regions - IEA. Retrieved May 15, 2024, from https://www.iea.org/countries/united-kingdom/renewables

3.2 Legal standing of Climate Accords

Not legally binding, the Lima Accord marked a pivotal shift by requiring all nations to plan domestic carbon emission reductions. However, it imposed no penalties for non-compliance, leading to criticisms about its effectiveness[45].

The Paris agreement on the other hand is legally binding, and aims to limit global warming to well below 2°C. It introduced mechanisms for oversight and compliance, setting a more stringent framework than its predecessors[46] .

While The Copenhagen Accord is a political response to climate change, it lacks legal force. Still, it was significant for enabling a high level of commitments from world leaders. Despite this, its future was uncertain due to the non-binding nature of the commitments[47].

3.3 The Paris agreement

The Paris Agreement, adopted in December 2015, represents a significant milestone in global efforts to combat climate change. It introduces a comprehensive legal framework aimed at reducing greenhouse gas emissions and limiting global warming[4849]. Going forward, I will explore the legal character of the Paris Agreement, its binding and non-binding provisions, in addition to the implications of its legal structure on international climate policy.

3.3.1 Legal Character of the Paris Agreement

The Paris Agreement is recognized as a treaty under the Vienna Convention on the Law of Treaties. As previously mentioned, It includes both legally binding and non-binding provisions. The agreement mandates countries to maintain national plans to limit temperature rise, but does not prescribe the specifics of these plans, allowing flexibility - but also creating challenges in enforcement [50].

The most binding elements of the Paris Agreement involve the reporting requirements and the continuous progression of climate actions. Countries are legally required to participate in a global stocktake every five years and submit updated plans that ideally should represent a progression beyond previous efforts [51].

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[45] Beckrich, A. (2015). A New International Climate Change Agreement. The Science Teacher, 82, 10.
[46] Goodier, J. (2018). The Paris Agreement on Climate Change: Analysis and Commentary. Reference Reviews, 32(4), 29-30.

[47] Bodansky, D. (2010). The Copenhagen Climate Change Conference: A Postmortem. American Journal of International Law, 104(2), 230–240. doi:10.5305/amerjintelaw.104.2.0230
[48] Bodansky, D. (2010). The Copenhagen Climate Change Conference: A Postmortem. American Journal of International Law, 104(2), 230–240. doi:10.5305/amerjintelaw.104.2.0230
[49] Horowitz, C. (2017). Paris Agreement. International Legal Materials, 55(4), 740–755.
[50] Bodansky, D. (2010). The Copenhagen Climate Change Conference: A Postmortem. American Journal of International Law, 104(2), 230–240. doi:10.5305/amerjintelaw.104.2.0230
[51] Oberthür, S., & Bodle, R. (2016). Legal Form and Nature of the Paris Outcome. Brill|Nijhoff, 6(1-2), 40–57.

The Paris agreement also holds states accountable with the term common but differentiated goals in Article 4 paragraph 1(Paris Agreement, 2015). The article states “In order to achieve the long-term temperature goal set out in Article 2, Parties aim to reach global peaking of greenhouse gas emissions as soon as possible, recognizing that peaking will take longer for developing country Parties…” meaning that countries that are defined as developing countries do have an obligation to target the same goal but do have less responsibility to the

The goals to limit global warming to well below 2°C and pursue efforts to limit it to 1.5°C are, as I mentioned earlier, aspirational and do not constitute legal obligations. This non-binding nature raises concerns about the effectiveness of the agreement in compelling states to achieve these targets without concrete legal obligations[52].

3.3.2 Implications of the Paris Agreement's Legal Framework

The flexible legal structure of the Paris Agreement allows countries to set their own nationally determined contributions (NDCs) according to their capabilities and circumstances[53]. However, this flexibility may undermine the enforcement and compliance mechanisms necessary for achieving global climate goals[54].

The Paris Agreement’s blend of legal and non-legal provisions aims to foster a cooperative international environment [55]. It seeks to balance the legal obligations that states are willing to accept, with political commitments that encourage broader participation and ambitious climate actions [56].

As the effects of climate change become more pronounced, the Paris Agreement is increasingly cited in climate litigation cases[57]. Its provisions, particularly those related to human rights and environmental integrity, are being used to hold governments and corporations accountable for climate-related commitments and actions[58].

3.3.3 Conclusion

The Paris Agreement establishes a legal framework that is both innovative and challenging. While it strategically incorporates legal bindingness to ensure serious commitment from parties, its reliance on non-binding goals to foster wider participation presents a complex

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[52] Horowitz, C. (2017). Paris Agreement. International Legal Materials, 55(4), 740–755

[53] Oberthür, S., & Bodle, R. (2016). Legal Form and Nature of the Paris Outcome. Brill|Nijhoff, 6(1-2), 40–57.

[54] inuales, J. (2015). The Paris Climate Agreement: An Initial Examination. C-EENRG Working Papers, 6(1), 16.

[55] Keenlyside, P., Streck, C., & von Unger, M. (2016). The Paris Agreement: A New Beginning. Journal for European Environmental & Planning Law, 13(1), 3-29.

[56]Keenlyside, P., Streck, C., & von Unger, M. (2016). The Paris Agreement: A New Beginning. Journal for European Environmental & Planning Law, 13(1), 3-29.

[57] Urgenda Foundation v. The State of the Netherlands (13-01-2020) Accessed may 14,2014. https://climatecasechart.com/wp-content/uploads/non-us-case-documents/2020/20200113_2015-HAZA-C0900456689_judgment.pdf

[58] Preston, B. (2021). The Influence of the Paris Agreement on Climate Litigation: Legal Obligations and Norms (Part I)∗. Journal of Environmental Law, 33, 1-32. https://doi.org/10.1093/jel/eqaa020.

dynamic that could influence the future effectiveness of international climate agreements. The success of the Paris Agreement ultimately depends on the willingness of states to adhere to and progress beyond their commitments, leveraging the agreement's legal tools to achieve global climate objectives.

4. History of Nuclear legislation

The main goal of this paper is to research the validity of how nuclear legislation can influence the goals of the Paris Agreement, the paper is presenting a short history of the nuclear legislation in the three countries.

4.1. Germany

The history of German nuclear legislation prior to the Fukushima-accident reflects a complex and shifting landscape influenced by technological optimism, public opposition, environmental concerns, and major nuclear incidents.The section will be divided into the decades in which the nuclear legislation evolved.

4.1.1 Establishment of the AEA (1960s-1970s)

Germany's Atomic Energy Act, passed in 1960, laid the foundation for using atomic energy for peaceful purposes and promoting nuclear research and development. During that time, significant progress was made in building a nuclear infrastructure with support from government backed research organizations, a growing nuclear construction industry and power companies focused on a future driven by nuclear energy. Leading companies like Siemens, AEG and ThyssenKrupp played key roles in advancing nuclear technology[59]. Initially, there was strong political and public support for nuclear power with little opposition.

The 1970s brought about significant changes due to two key factors. The issue of nuclear waste disposal gained prominence, particularly with contentious plans to establish a reprocessing and waste disposal facility in Gorleben[60]. The proposed Gorleben site faced intense opposition from local farmers and nationwide anti-nuclear groups, as it raised environmental concerns and doubts among the German public about the safety and sustainability of nuclear energy in the long run[61].

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[59] Jahn, D., & Korolczuk, S. (2012). German exceptionalism: the end of nuclear energy in Germany!. Environmental Politics, 21, 159 - 164. https://doi.org/10.1080/09644016.2011.643374.
[60] Hocke, P., & Renn, O. (2009). Concerned public and the paralysis of decision‐making: nuclear waste management policy in Germany. Journal of Risk Research, 12(7–8), 921–940. https://doi.org/10.1080/13669870903126382
[61] Rüdig, W. (2000). Phasing out nuclear energy in Germany. German Politics, 9(3), 43–80. https://doi.org/10.1080/09644000008404607

4.1.2 Public Opposition and Political Shifts (1970s-1980s)

The question of nuclear waste disposal, particularly plans for a nuclear reprocessing and waste disposal center in Gorleben, sparked widespread public opposition. Anti-nuclear protests gained momentum, especially after the Chernobyl disaster in 1986, leading to a significant re-evaluation of nuclear energy among the public and some political groups[62]. The nuclear power conflict contributed to the establishment of the Green Party, which challenged existing political narratives around nuclear energy[63] .

The key factor of the political shift was the Chernobyl disaster in 1986 retrospectively underscored the risks associated with nuclear energy and fueled the anti-nuclear movement in Germany. The disaster led to a significant re-evaluation of nuclear energy among certain political groups and the public, culminating in the establishment of the Green Party, which became a strong anti-nuclear voice in German politics[64] .

In response to these developments as well as the growing anti-nuclear sentiment, the legislative branch in Germany began to adjust its stance on nuclear energy. While the AEA laid the groundwork for nuclear energy's development, subsequent amendments reflected a more cautious and restrictive approach towards nuclear power. The German government's efforts to address public opposition and environmental concerns led to a gradual shift in policy, moving from an initial emphasis on nuclear energy as a cornerstone of the country's energy policy, to increasing considerations of safety, waste disposal, and eventually - the phasing out of nuclear power[65].

4.1.3 Legislative and Policy Responses (1990s-2000s)

Germany's nuclear policy experienced multiple shifts over the decades. The Red-Green government decided to phase out nuclear power, setting a timetable for shutting down nuclear power stations and ending the reprocessing of German nuclear fuel in Britain and France[66]. Despite challenges in implementing this policy, an agreement was reached between the government and nuclear utilities in 2000, marking a significant step towards phasing out nuclear energy[67].

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[62] Hocke, P., & Renn, O. (2009). Concerned public and the paralysis of decision-making: nuclear waste management policy in Germany. Journal of Risk Research, 12(7–8), 921–940. https://doi.org/10.1080/13669870903126382

[63] Rüdig, W. (2000). Phasing out nuclear energy in Germany. German Politics, 9(3), 43–80.

[64] Jahn, D., & Korolczuk, S. (2012). German exceptionalism: the end of nuclear energy in Germany!. Environmental Politics, 21, 159 - 164. https://doi.org/10.1080/09644016.2011.643374.

[65] Rüdig, W. (2000). Phasing out nuclear energy in Germany. German Politics, 9(3), 43–80.

[66]Chandler, S. D. (2011). Radioactive waste policy and legislation: 50 years on from the 1960 Act. Journal of Radiological Protection, 31(3), 309-317.

[67] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031

The Red-Green coalition government (comprising the SPD and the Greens) in 1998 marked a turning point in Germany's nuclear policy[68]. One of its first actions was to negotiate an agreement with the nuclear industry to phase out nuclear power, involving new legislation and a consensus with electricity utilities. This policy shift was a result of a combination of factors, including public opposition, environmental concerns, and the influence of the Green Party, which had a strong anti-nuclear stance[69].

4.1.4 Impact of Fukushima and Accelerated Phase-out (2011)

The Fukushima Daiichi nuclear accident in March 2011 prompted Germany to dramatically change its energy policy, accelerating the phase-out of nuclear energy[70]. This decision was grounded in historical and legal contexts, including previous phases of nuclear energy use and the role of law in phasing out nuclear power. Germany's shift away from nuclear energy is considered a pivotal moment in its energy policy, leading to a focus on renewable energies and energy efficiency[71].

Germany's nuclear phase-out was not only a political and environmental decision but also involved complex legal and economic considerations[72]. Legal challenges by nuclear operators seeking compensation for lost profits highlight the contentious nature of the phase-out process[73]. However, the overall economic impact of the phase-out, such as on electricity prices and the German economy, was relatively small and manageable within the broader context of transitioning to renewable energy sources[74].

4.1.5 Summation

The evolution of nuclear energy legislation in Germany proves a trajectory from strong initial support for nuclear power as a symbol of technological progress, to a cautious and critical stance influenced by environmental concerns, public opposition, and international incidents. The German experience underscores the complexity of nuclear energy policy as well as the potential for dramatic policy shifts in response to environmental concerns and public opinion.

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[68] Rüdig, W. (2000). Phasing out nuclear energy in Germany. German Politics, 9(3), 43–80
[69] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031
[70] Growitsch, Christian & Höffler, Felix, 2019. "Fukushima and German Energy Policy 2005 - 2015/2016," EWI Working Papers 2019-2, Energiewirtschaftliches Institut an der Universitaet zu Koeln (EWI).
[71] Mez, L. (2012). Germany's merger of energy and climate change policy. Bulletin of the Atomic Scientists, 68, 22 - 29. https://doi.org/10.1177/0096340212464358.
[72] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031
[73] Rossnagel, A., & Hentschel, A. (2012). The legalities of a nuclear shutdown. Bulletin of the Atomic Scientists, 68(6), 55-66. https://doi.org/10.1177/0096340212464361
[74] Matthes, F. (2012). Exit economics: The relatively low cost of Germany's nuclear phase-out. Bulletin of the Atomic Scientists, 68, 42 - 54. https://doi.org/10.1177/0096340212464360.

The German state-backed efficient and holistic approach to nuclear energy was a radical change from earlier. Even with opposition and shifting policies the nuclear power plants amounted for over a fifth of the energy sector until it shut down. The same approach, I would argue, is implemented regarding green energy-production. I do believe that the German state have included a system where grassroots opposition with the shift from centralised governing to backing of international organisations.

4.1.2 United Kingdom

The development of nuclear energy in the United Kingdom(UK) has been closely governed by a series of legislative measures designed to ensure the safe, responsible, and efficient use of nuclear technology. Since the mid-20th century, the UK has been at the forefront of nuclear technology, necessitating a robust legal framework to manage its risks and potentials[75]. in the interest in the scope of this paper will present a shallow overview of the key legislative milestones and the impact on UK's nuclear sector.

4.1.2.1. Foundations of Nuclear Legislation

The UK's journey into nuclear legislation began with the Atomic Energy Authority Act of 1954, which established the Atomic Energy Authority (AEA). This body was tasked with controlling the development and production of nuclear energy in the UK, marking the nation's formal entry into the nuclear age[76] . The AEA was responsible for pioneering research and development, overseeing the construction of nuclear power stations, and ensuring safety and security in operations[77].

Following the establishment of the AEA, the Radioactive Substances Act of 1960 was introduced to regulate the safe handling, use, and disposal of radioactive materials[78]. This Act set the groundwork for environmental protection and public health safety concerning radioactive waste, a concern that continues to be of paramount importance in nuclear regulation[79].

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[75] White Paper 'The Control of Radioactive Wastes, cmnd 884
[76] Chandler, S. D. (2011). Radioactive waste policy and legislation: 50 years on from the 1960 Act. Journal of Radiological Protection, 31(3), 309-317.
[77]Chandler, S. D. (2011). Radioactive waste policy and legislation: 50 years on from the 1960 Act. Journal of Radiological Protection, 31(3), 309-317.
[78] Chandler, S. D. (2011). Radioactive waste policy and legislation: 50 years on from the 1960 Act. Journal of Radiological Protection, 31(3), 309-317.
[79] Chandler, S. D. (2011). Radioactive waste policy and legislation: 50 years on from the 1960 Act. Journal of Radiological Protection, 31(3), 309-317.

4.1.2.2 Evolution and Expansion

As nuclear technology evolved and the number of facilities grew, the Nuclear Installations Act of 1965 was enacted [80]. This legislation introduced a licensing system for nuclear installations and established a framework for liability and compensation in the event of nuclear incidents. This Act was pivotal in ensuring that operators maintained high safety standards and were financially accountable for any accidents[81] (UK Nuclear Installations Act, 1965).

In 2010, significant regulatory changes were made when the Environmental Permitting Regulations were updated to include nuclear substances. This integration marked a shift towards a more holistic approach to environmental permitting, linking nuclear safety more closely with broader environmental protection efforts[82].

4.1.2.3 The Role of International Treaties

Furthermore, The UK's nuclear legislation has also been significantly shaped by international treaties. The Partial Test Ban Treaty of 1963, which the UK signed, prohibited nuclear explosions in the atmosphere, in outer space, and underwater[83]. This treaty influenced UK nuclear testing policies and showcased the country's commitment to reducing global nuclear threats[84].

The Nuclear Non-Proliferation Treaty (NPT), which the UK ratified in 1968(UN 1969: Article 4, paragraph 1). The NPT has been crucial in shaping the UK's nuclear export controls and non-proliferation policies, reinforcing the country's role as a responsible nuclear state[85].

4.1.2.4 Brexit and Euratom

The recent departure of the UK from the European Union brought on additional challenges, particularly the separation from the European Atomic Energy Community (Euratom). This

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[80]Chandler, S. D. (2011). Radioactive waste policy and legislation: 50 years on from the 1960 Act. Journal of Radiological Protection, 31(3), 309-317.
[81] UK Government Legislation. (1965). Nuclear Installations Act.arts. 1(2), 3(4) (with art. 40)
[82] Chandler, S. D. (2011). Radioactive waste policy and legislation: 50 years on from the 1960 Act. Journal of Radiological Protection, 31(3), 309-317.
[83] Walker, J. R. (2010). British Nuclear Weapons and the Test Ban 1954–1973: Britain, the United States, Weapons Policies and Nuclear Testing: Tensions and Contradictions. Diplomacy & Statecraft, 23(4), 419-421.
[84] Walker, J. R. (2010). British Nuclear Weapons and the Test Ban 1954–1973: Britain, the United States, Weapons Policies and Nuclear Testing: Tensions and Contradictions. Diplomacy & Statecraft, 23(4), 419-421. 419
[85] Walker, J. R. (2010). British Nuclear Weapons and the Test Ban 1954–1973: Britain, the United States, Weapons Policies and Nuclear Testing: Tensions and Contradictions. Diplomacy & Statecraft, 23(4), 419-421. 420

necessitated adjustments in the UK's nuclear safeguards and international obligations, prompting legislative updates to ensure continued compliance with international nuclear safety standards[86].

4.1.2.5 Summation

The history of British nuclear legislation is a testament to the fualts of a Common law system. In establishing a nuclear energy the UK Government has put themselves in a deadlock over how to regulate a public necessity such as energy with a public demand for change, such as Euratom. The question of sovereignty and the NPT are oxymoronic because the British government wants sovereignty in their own interests yet demands to be part of international treaties they have interests in. There is also the fact that UK do own nuclear warheads so the NPT did not exactly are in the interest of their own weaponry.

4.1.3 Norway

Norway, known for its abundant hydroelectric power and oil resources, has had a unique journey in developing its nuclear energy legislation[87]. While nuclear energy has never been a major focus in the country's energy mix, its policies and laws reflect a cautious approach to nuclear technology, driven by safety concerns, environmental considerations, and non-proliferation commitments.

In the post-World War II era, many countries began exploring nuclear energy for civilian use. Norway initiated its nuclear program in the 1950s, largely for research purposes. The Institute for Energy Technology (IFE) was established in 1948 to promote nuclear research and advancement of nuclear technology. Key facilities like the Halden Reactor and the JEEP II reactors were established to advance Norway's nuclear capabilities[88].

[86] Callen, J., Takamasa, A., & Toma, H. (2019). Insights to the UK's impending departure from Euratom: Case study of UK nuclear safeguards and radiation protection in light of Brexit. Energy Policy, 129(1), 1416-1422. doi.org/10.1016/j.enpol.2019.01.074.
[87] Norwegian Institute for Energy Technology. (n.d.). The Halden Reactor Project. IFE. Retrieved May 14, 2024, from https://ife.no/en/project/the-halden-reactor-project/
[88] ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. (2001). NORWAY. ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 21. https://www.oecd-nea.org/law/legislation/norway.pdf

4.1.3.1 Legislative Milestones

The Norwegian Atomic Energy Act of 1957 laid the groundwork for Norway's nuclear regulation. It focused on research, safe handling of radioactive substances, and the promotion of nuclear energy in alignment with international standards [89]. The Norwegian Atomic Energy Act of 1957 marked Norway's formal entry into the nuclear age, creating a legal framework to regulate nuclear energy research and applications. This law empowered the government to oversee nuclear activities, focusing on three key areas. Firstly, The Act sought to facilitate nuclear research for peaceful purposes. In addition it promoted the establishment and expansion of research reactors, like the Halden
and JEEP reactors, aiming to advance Norway's scientific expertise[90]. Secondly the act recognized and codified the potential hazards of nuclear technology, the law introduced stringent safety protocols for the handling and use of radioactive materials. Finally it also established regulatory mechanisms to monitor and enforce safety standards across all nuclear facilities[91]. The Act reflects Norway's commitment to international collaboration, emphasizing adherence to international safety standards and non-proliferation norms.

Growing environmental concerns and anti-nuclear sentiments influenced policy directions, leading to more stringent regulations and a pivot towards renewable energy sources[92] . Norway signed the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1969, further solidifying its commitment to nuclear non-proliferation (NOU, 1972). The 1970s witnessed a significant shift in public opinion and policy regarding nuclear energy, influenced by rising environmental awareness and safety concerns. These changes prompted the Norwegian government to reassess its nuclear energy stance, leading to notable policy adjustments. Growing concerns over nuclear accidents and radioactive waste led to a stronger emphasis on environmental safety in nuclear energy law.

The government prioritized renewable energy sources and adopted stricter controls on nuclear research and waste disposal[93] (NOU 1991:9, 6). Aligning with global trends, Norway solidified its commitment to nuclear non-proliferation. The country ratified the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) in 1969 and continued to strengthen its legislation to prevent the proliferation of nuclear weapons[94] (UN 1969: Article 1). The government introduced reforms to enhance regulatory oversight of nuclear activities, ensuring that Norway's nuclear energy policies aligned with evolving international standards.

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[89] Forland, A. (1997). Norway’s nuclear odyssey: From optimistic proponent to nonproliferator. *The Nonproliferation Review*, *4*(2), 1–16.
[90] ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. (2001). NORWAY. ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT, 21. https://www.oecd-nea.org/law/legislation/norway.pdf
[91] Forland, A. (1997). Norway’s nuclear odyssey: From optimistic proponent to nonproliferator. The Nonproliferation Review, 4(2), 1–16.
[92] Forland, A. (1997). Norway’s nuclear odyssey: From optimistic proponent to nonproliferator. The Nonproliferation Review, 4(2), 1–16.
[93] NOU. (1991). *Norwegian Official Report on Nuclear Energy Policy*.
[94] UN. (1970). *Treaty on the Non-Proliferation of Nuclear Weapons.*

Norway signed the Comprehensive nuclear Test Ban Treaty in the 1990s, reinforcing its stance against nuclear weapons and further emphasizing peaceful uses of nuclear technology[95](UN 1969: Article 4, paragraph 1).

The government enhanced regulatory frameworks for nuclear safety and began decommissioning aging reactors, emphasizing the safe handling of radioactive waste. This included the closure of the Halden Reactor in 2018, marking the end of an era for nuclear research in Norway [96].

4.1.3.2 Current Legal Framework and Policies

Norway's nuclear energy laws prioritize environmental safety, non-proliferation, and the peaceful use of nuclear technology. The Norwegian Radiation and Nuclear Safety Authority (DSA) oversees the implementation of these laws, focusing on ensuring high safety standards for the remaining nuclear research facilities and the management of nuclear waste.

The necessetiy of updating nuclear legislation has diminished due to the shutdown of hte last ractor, the Halden Reactor[97]. There are currently no plans of building nuclear power plants for energy consumption, but are built for research[98].

4.1.3.3 Summation

The early milestones of Norway's nuclear energy law reflect a nuanced approach to the adoption and regulation of nuclear technology. The 1957 Norwegian Atomic Energy Act laid the groundwork for nuclear research and safety protocols, while the policy shifts of the 1970s, influenced by anti-nuclear sentiments and environmental concerns, led to more stringent regulations and reinforced Norway's commitment to non-proliferation. These early legal frameworks have shaped Norway's cautious yet informed approach to nuclear energy policy. Norway's legal history in nuclear energy reflects a cautious yet progressive stance, prioritizing environmental safety, non-proliferation, and the peaceful use of nuclear technology. While the nation has not pursued commercial nuclear energy, its legal framework

[95] Norwegian Institute for Energy Technology. (n.d.). The Halden Reactor Project. IFE. Retrieved May 14, 2024, from https://ife.no/en/project/the-halden-reactor-project/
[96] Norwegian Institute for Energy Technology. (n.d.). The Halden Reactor Project. IFE. Retrieved May 14, 2024, from https://ife.no/en/project/the-halden-reactor-project/
[97] Nærings- og fiskeridepartementet. (2022, 10 Last updated: 11). Om nukleære anlegg i Norge. Regjeringen.no. Retrieved May 14, 2024, from https://www.regjeringen.no/no/tema/naringsliv/forskning-og-innovasjon/Norsk-atomavfall-og-atomanlegg/om-nukleare-anlegg-i-norge/id2484230/?expand=factbox2623
[98] Nærings- og fiskeridepartementet. (2022, 10 Last updated: 11). Om nukleære anlegg i Norge. Regjeringen.no. Retrieved May 14, 2024, from https://www.regjeringen.no/no/tema/naringsliv/forskning-og-innovasjon/Norsk-atomavfall-og-atomanlegg/om-nukleare-anlegg-i-norge/id2484230/?expand=factbox2623

has adapted to address evolving challenges in nuclear research, waste management, and global security. This same stance can be said Norway has taken with green energy.

4.2. International atomic legislation

Another key aspect shared by the three countries included in this paper are international regulators of nuclear energy. Going forward, I will highlight the two institutions regulating nuclear power, Euratom and the International Atomic Energy Agency (IAEA).

4.2.1. The IAEA

The International Atomic Energy Agency (IAEA) plays a pivotal role in the global nuclear regulatory landscape. Established in 1957 as an independent international organization under the United Nations, the IAEA is tasked with promoting the peaceful use of nuclear energy and preventing its use for military purposes[99]. Its unique supranational regulatory capabilities are grounded in its mandate to enforce safeguards, establish safety standards, and foster international collaboration.

4.2.1.1 Supranational Regulation Framework

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The legislative authority comes from the NPT signed by the member-states Article I-III (NPT, 1970). The member-states consent to have a supranational organisation inspect if the member-state is in possession of banned substances according to Article III paragraph 3. The IAEA's regulatory authority stems from its membership of over 178 countries[100] as well as its ability to enforce internationally agreed-upon norms and standards[101]. The regulatory framework is therefore controlled by the IAEA.

Parties in the agreement are under obligation to act in accordance of good faith (Article VI) in the non-proliferation of nuclear energy. Good faith in this context is interpreted as a presumption that every party is working towards the goal of achieving the stated goals of the treaty. It also means that in an inspection, the assumption is that countries are not acting against the intentions of the treaty.

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[99] Barkenbus, J. (1987). Nuclear power safety and the role of international organization. International Organization, 41(3), 475–490. doi:10.1017/S0020818300027557

[100] International Atomic Energy Agency. (n.d.). IAEA AT A GLANCE - atoms for peace & development. International Atomic Energy Agency. Retrieved May 14, 2024, from https://www.iaea.org/sites/default/files/23/09/iaea-at-a-glance.pdf

[101] Salminen, E., Izewska, J., & Andreo, P. (2005). IAEA's role in the global management of cancer-focus on upgrading radiotherapy services. Acta Oncologica, 44(8), 816–824. https://doi.org/10.1080/02841860500341355

4.2.1.2 Safeguards and Verification

The IAEA's Safeguards System is designed to ensure compliance with international agreements regarding the non-proliferation of nuclear weapons.[102] Through inspections, monitoring, and evaluation, the agency verifies that nuclear material and facilities are not diverted to military use. The Comprehensive Safeguards Agreement, which many member states have signed, gives the IAEA extensive rights to inspect nuclear activities, providing a robust framework for supranational regulation.[103]

4.1.2.3 Safety Standards and Guidelines

The IAEA codifies international standards of nuclear safety and provides recommendations and guidelines for their implementation. This includes a comprehensive suite of standards, such as the Basic Safety Standards (BSS), which govern radiation protection and safety measures. The agency's regulatory authority is further reinforced by its peer review services, which assess national regulatory infrastructures and their adherence to these standards[104] .

4.2.1.4 Nuclear Security

The IAEA plays a crucial role in enhancing global nuclear security by assisting member states in implementing effective protection measures against nuclear terrorism. Its advisory missions, training programs, and provision of technical guidance strengthen national capacities and align them with international best practices. The IAEA's International Physical Protection Advisory Service (IPPAS) missions assess and provide recommendations on national physical protection systems [105].

4.1.2.1.5 International Collaboration and Capacity Building

The IAEA fosters collaboration among member states by facilitating the exchange of information and best practices[106]. Its technical cooperation programs provide assistance to countries in developing nuclear energy infrastructure and enhancing regulatory frameworks.

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[102] Donohue, D. (1998). Strengthening IAEA safeguards through environmental sampling and analysis. Journal of Alloys and Compounds, 271, 11-18.doi: 10.1016/S0925-8388(98)00015-2.
[103] Treaty on the Non-Proliferation of Nuclear Weapons (NPT) | IAEA. (n.d.). International Atomic Energy Agency. Retrieved May 14, 2024, from https://www.iaea.org/topics/non-proliferation-treaty
[104] EUROPEAN COMMISSION, FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, INTERNATIONAL ATOMIC ENERGY AGENCY, INTERNATIONAL LABOUR ORGANIZATION, OECD NUCLEAR ENERGY AGENCY, PAN AMERICAN HEALTH ORGANIZATION, UNITED NATIONS ENVIRONMENT PROGRAMME, WORLD HEALTH ORGANIZATION, Radiation Protection and Safety of Radiation Sources: International Basic Safety Standards, IAEA Safety Standards Series No. GSR Part 3, IAEA, Vienna (2014), doi:10.61092/iaea.u2pu-60vm
[105] EXPERT GROUP REPORT TO THE DIRECTOR GENERAL OF THE INTERNATIONAL ATOMIC ENERGY AGENCY. (2005). Multilateral Approaches to the Nuclear Fuel Cycle. Scientific, technical publications in the nuclear field | IAEA. Retrieved May 14, 2024, from https://www-pub.iaea.org/MTCD/publications/PDF/mna-2005_web.pdf
[106] EXPERT GROUP REPORT TO THE DIRECTOR GENERAL OF THE INTERNATIONAL ATOMIC ENERGY AGENCY. (2005). Multilateral Approaches to the Nuclear Fuel Cycle. Scientific, technical publications in the nuclear field | IAEA. Retrieved May 14, 2024, from https://www-pub.iaea.org/MTCD/publications/PDF/mna-2005_web.pdf

Additionally, the IAEA promotes research and development through coordinated research projects, helping to establish a globally consistent approach to nuclear safety and security[107].

4.1.2.1.6 Summation

The IAEA embodies supranational regulation through its comprehensive safeguards system, safety standards, security measures, and capacity-building initiatives. Its ability to influence national nuclear policies and practices underscores the importance of international cooperation in managing nuclear energy's benefits and risks. The agency's work ensures that nuclear technology is used safely and securely, benefiting humanity while preventing the proliferation of nuclear weapons. The NPT does not regulate peaceful utilization of nuclear energy.

4.1.2 Euratom's Supranational Regulatory Role

The European Atomic Energy Community (Euratom) complements the International Atomic Energy Agency (IAEA) in the realm of supranational nuclear regulation, specifically within the European Union. Established in 195 Euratom's objective is to coordinate the member states' nuclear energy development for peaceful purposes, while ensuring the highest safety standards[108] (EURATOM, 2012/C 327/01 Title II section 3 article 25, paragraph 1). As a supranational entity, Euratom has significant regulatory authority over its member states(EURATOM, 2012/C 327/01 Title III, chapter 2, section 4 Article 144-145), including setting standards for radiation protection, overseeing nuclear safety, and managing the secure supply of nuclear materials. This regulatory power extends to harmonizing safety practices and ensuring compliance across member states through legally binding directives and regulations.

Euratom also plays a critical role in nuclear safeguards and verification, working closely with the IAEA to prevent nuclear proliferation within the EU. Through its safeguards system, Euratom ensures that nuclear materials are not diverted to unauthorized uses, providing additional oversight to that of the IAEA[109](EURATOM, 2012/C 327/01 Title I, article 2). This combination of standard-setting, verification, and collaborative research efforts solidifies

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[107] EXPERT GROUP REPORT TO THE DIRECTOR GENERAL OF THE INTERNATIONAL ATOMIC ENERGY AGENCY. (2005). Multilateral Approaches to the Nuclear Fuel Cycle. Scientific, technical publications in the nuclear field | IAEA. Retrieved May 14, 2024, from https://www-pub.iaea.org/MTCD/publications/PDF/mna-2005_web.pdf

[108] Official Journal of the European Union. (2012, 10 26). CONSOLIDATED VERSION OF THE TREATY ESTABLISHING THE EUROPEAN ATOMIC ENERGY COMMUNITY (2012/C 327/01). Lex Europa. Retrieved May 14, 2024, from https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/eu-stability-and-growth-pact/surveillance-framework/stability-and-convergence-programmes_en

[109] Implications for Nuclear Safeguards in the EU Countries. (2012). In E. Häckel & G. Stein (Eds.), *Tightening the Reins: Towards a Strengthened International Nuclear Safeguards System* (pp. 107-128). Springer Berlin Heidelberg. p 106

Euratom's position as a key player in the international nuclear regulatory framework, effectively enhancing the supranational regulation of nuclear activities within Europe.

Euratom proves that energy legislation can be addressed internationally. Another example of this is the ACER-agreement in which regulates gas export in Europe. The key point is that with common goals and frame-set, such as nuclear proliferation, there are instances of relieving national legislation of important issues up to international specialised organisations.

4.1.2.1 Comparing Euratom to IAEA

Euratom's strength as a legislative regulator lies in its regional focus within the European Union. This concentrated jurisdiction allows Euratom to legislate and enforce standards tailored specifically to the unique needs of EU member states. According to Gmelin (2000), Euratom's safeguards are designed to verify the use of all civil nuclear material within the region, providing a specialized and cohesive legislative framework that directly addresses local challenges[110]. Its ability to legislate region-specific regulations ensures member states are aligned on nuclear safety, waste management, and non-proliferation measures.

4.2.2.2 Efficiency in Legislative Implementation

Kilb (2016) highlights how Euratom's ability to work closely with national regulatory bodies allows for more efficient legislation and implementation[111]. This regional proximity ensures member states adopt and implement regulations efficiently and effectively, reflecting Euratom's legislative influence. The close collaboration within the EU allows,in my opinion, Euratom to craft legislation that considers member states' input, enabling a smoother implementation process compared to the IAEA's broader global mandate, which must consider the diverse political and legislative contexts of many countries.

4.2.2.3 Potential for Legislative Redundancies

Euratom's legislative framework can overlap with the IAEA's, leading to redundancy in nuclear regulations. Krige (2015) explains that the potential duplication of legislative efforts can increase compliance costs for EU member states, which need to adhere to both Euratom and IAEA frameworks[112]. This overlap in legislative mandates may complicate the regulatory landscape for member states, requiring careful coordination between Euratom and the IAEA to avoid unnecessary legislative conflicts and ensure a streamlined approach to nuclear safety and security.

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[110] Gmelin, W. (2000). Implications for Nuclear Safeguards in the EU Countries. In: Häckel, E., Stein, G. (eds) Tightening the Reins. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-57147-3_8

[111] Kilb, W. (2016). The Nuclear Safeguards Regime of EURATOM: A Regional Cornerstone of the Verification of Non-Proliferation Obligations in the European Union. In: Black-Branch, J., Fleck, D. (eds) Nuclear Non-Proliferation in International Law. T.M.C. Asser Press, The Hague. https://doi.org/10.1007/978-94-6265-075-6_7 . p. 159-160

[112] Krige, J. (2015). Euratom and the IAEA: the problem of self-inspection. Cold War History, 15(3), 341–352. https://doi.org/10.1080/14682745.2014.999046

These observations reflect how Euratom excels as a regional legislative regulator while acknowledging potential challenges compared to the IAEA's global mandate. IAEA has been used, according to the IAEA, is used for recommendations and key research is in halting and limiting damage. The scope is therefore outside of what is the goal of the Paris Agreement where the object is trying to find alternatives for energy consumption that does not increase global temperatures.

5. Discussing the pros and cons of using Nuclear energy legislation as a framework for Green Energy

This discussion of section of the paper is heavily inspired by Gerd Winter's paper "The Rise and Fall of Nuclear Energy Use in Germany" where Winter outlines a historical and legal analysis of German nuclear energy legislation. His hope was that other countries would learn from Germany's history and adapt their nuclear legislation with that in mind. This discussion is an attempt to accomplish that goal with green energy in mind.

5.1. History as a lesson.

One main takeaway from the history of nuclear legislation is, I would argue, the effectiveness of actionable legislation. I would argue based on presented earlier that state-backed energy policy creates an efficient environment for power production. For example the Halden Reactor, making Norway one of the six first countries to use nuclear energy, the British white paper and Germany's stated goal of being a nuclear superpower are all signs that the countries showed interest in rapidly adapting nuclear energy as mainstay of their energy economy. The political and legislative support for nuclear energy was a main factor for the rapid expansion and adaptation of nuclear energy.

The expansion of nuclear power plants in Germany amounted for 30,4% of the electric production in the 1980s, and steadily downgraded to 22,4% in 2010. As presented earlier, the shut-down of the nuclear reactors in Fukushima did not alter the energy-economy of Germany. This proves that efficient legislation can and will be a mainstay of the energy industry, and that with effective legislation, the energy market can easily adapt; which was the main point of the criticism levied against the Paris Agreement.

The downside of the effective legislation regarding this topic, is that expedited measures can overlook preventable negative outcomes. The Anti-Nuclear movement was disregarded in all three countries - and instead of finding common ground, legislative powers made them out to be a be a non-viable solution. In light of the Chernobyl disaster, the movement achieved a majority opinion in the populations due to the disregard of grassroot interests such as conservation, nuclear waste safety and the fears of catastrophic accidents.

The history has taught us that any state has the obligation of its citizens to adhere to their concerns. This is not necessarily learnt yet as I will discuss later in section 5.5.1. History should teach us that grassroots and special interests do have a vested interest in the success or failure of energy plans, and that with constitutional backing, they should be guaranteed the right to participation.

5.2. Lessons from the watershed moments.

The Fukushima Daiichi and the Chernobyl accidents are both watershed moments in nuclear energy history. With the Fukushima Daiichi accident being the lightning rod of costs relating to shutting down nuclear reactors[113]. Regarding green energy, several special interest groups stand opposed to investing more into green energy[114]. A common deflection is that these countries are producing small amounts of the global GHG emissions. I would argue that in the 21st century the states have learnt that the implementation of the practice of Environmental Impact Assessment, and especially Social Impact Assessment, has made the legislative branch be more cautious of disregarding interest groups.

5.3 A discussion of Nuclear legislation would be capable of achieving the goals of the Paris Agreement.

At present, the Paris Agreement is the legal source intended to establish a common foundation for what should be the international standard for . In this document, I will present a selection of various laws to assess whether nuclear power legislation could be a solution for the Paris Agreement. One premise for the discussion is that carbon emissions are dangerous and therefore need to be regulated the same way ionizing radiation is regulated.

5.3.1 Paris Agreement Article 4 “Mitigation”

Article 4 of the Paris Agreement paragraph 1 requires member states to “aim to reach global peaking of greenhouse gas emissions as soon as possible…” meaning that states have a deadline for reaching the maximum carbon emissions they need to produce energy. The paragraph state that developing countries might need longer than other states to reach their

[113] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031. p 101
[114] Lory, G. (2023, December 4). Opposition to EU climate laws grows as European elections approach. Euronews.com. https://www.euronews.com/my-europe/2023/12/04/opposition-to-eu-green-deal-grows-as-european-elections-approach

peak. The article has a proactive wording, in recognition that the global carbon emissions are already too high (Paris Agreement, 2015).

Related to this paper, if there would be a more efficient way nuclear legislation would be able to adapt this. The Euratom Directive 2013/59 Article paragraph 2 states “Member States shall consider a review of existing classes or types of practices with regard to their justification whenever there is new and important evidence about their efficacy or potential consequences..”. This legislative body requires states to have a justification for their continued use of nuclear energy. I do believe this would be a deep regulatory tool in the battle. An international membership controlling access to a State's carbon emission production which in turn requires justification for the emission would have larger hurdles to overcome than the local governing of today.

5.3.2 Paris Agreement Article 8 “Loss and Damage”

Article 8 encourage member states to “recognize the importance of averting, minimizing and addressing loss and damage associated with the adverse effects of climate change…” in paragraph 1(Paris Agreement, 2015). The article recommends, in paragraph 4, a list of “areas of cooperation and facilitation to enhance understanding”. The question is if there are grounds in nuclear energy legislation to turn those recommendations into actionable obligations.

The AtG chapter 3 - Administrative authorities (Atomic Energy Act, 1959) lists responsibility of the authorities to include the precautionary measures subject to Article 9 and inter-agency communications subject to Article 24a. There is however no German legislation that lists the exact same recommendations or enforces the same things. The same goes for norwegian and UK legislation.

The conclusion has to be that there are no national legislative branches that promote precautionary cooperation in climate disasters. Mostly due to the nature of the legislation. One thing to also note is that in the Euratom directive 2009/71 also do not enforce international cooperation. The remaining questions is therefore if Article 8 sets too high of a bar for the recommendations to be enforceable.

5.3.3 The Paris Agreement is too narrow and too broad

The nuclear legislation has been proven so far to not be applicable for it to enforce the goals of the Paris Agreement. The cause this paper has found is that they regulate from two completely different perspectives. The Paris Agreement has a set of goals listed in Article 1 of reducing emissions to limit the global temperature to rise 2℃ which is a really specific

target and recommendations to how different member states can achieve that goal. The regulation of nuclear energy has shifted dramatically from a new source of energy to proliferation and protection from radiation. Even though both are based in wide international agreement of political will, the findings in this paper is that there just aren't enough similarities in the legislation to apply local nuclear energy legislation to enforce the Paris Agreement.

There are however other lessons to learn from the history of nuclear energy.

5.4 The role of law

Winter presents legislative key learning points from the shut down of the nuclear energy program in Germany[115]. Going forward, I will extrapolate on those the points made in his paper to include Norwegian and British law.

5.4.1 Precaution

Nuclear energy has triggered the precautionary principle[116] as the wastes of nuclear energy have been discovered to have adverse effects of human health. Norwegian legislation has the Act on Radiation Protection and Use of Radiation Act (Act on Radiation Protection and Use of Radiation, 2000). In said legislation the purpose is, according to section 1, “to prevent harmful effects of radiation on human health and contribute to the protection of the environment”. The British Office of Nuclear Regulation do also have the same regulation in the Energy Act 2013 (Energy Act, 2013) [117]. These are all in compliance with the Euratom Directive 2009/71 article 4.

The precautionary principle serves as a foundational guideline in green energy law, advocating for preemptive measures to mitigate environmental risks in the absence of complete scientific certainty. Its implementation helps in shaping responsible environmental and energy policies worldwide[118].

5.4.2 Beyond safety

[115] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031. Chapter 3.
[116] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031. p 106
[117] Energy Act, c. 32 Part 3 chapter 1, §1 section 68 (2013)
[118] Kriebel, D., Tickner, J., Epstein, P., Lemons, J., Levins, R., Loechler, E., Quinn, M., Rudel, R., Schettler, T., & Stoto, M. (2001). The precautionary principle in environmental science.. Environmental Health Perspectives, 109, 871 - 876. https://doi.org/10.1289/EHP.01109871.

The Chernobyl disaster undoubtedly changed the view of nuclear energy. The lack of transparency internationally and the ecological damage it caused was a defining moment in nuclear energy. What Germany did do learn from it was focusing on beyond the precautionary principle[119]. Instead of focusing on precaution it built the framework to achieve balancing preventive and repressive regulation. And as Winters remarks, the German court in BVerwG, Decision of 9 July 1982, 7 C 54/97, DVBl. 1982, 960 (961), decided that the constitutional obligation of applying the precautionary principle of any suspicion of harmful effect is within the scope of legitimate interest of the legislative branch.

There are unfortunately not any court decisions regarding this issue in the other two countries. There is however, in my opinion, cause to believe that British and Norwegian courts would come to the same conclusion in the discussion of repressive versus preventative considerations.

For example, the British Nuclear Installations Act 1965 regulates granting development of nuclear power plants. In Section 4 subsection 3 (a) it allows for provisions such as " for securing that an efficient system is maintained for detecting and recording the presence and intensity of any ionising radiations from time to time emitted from anything on the site or from anything discharged on or from the site…". The paragraph is intentionally wide for the state being able to have safety measures being beyond normal safety measures[120].

I would argue that the beyond safety measure is implemented in British nuclear legislation. The British Nuclear Installations act 1965 regulates, among others, granting licenses to operate and develop nuclear power plants. Section 4 subsection 3 litra a allows for provisions to development "for securing that an efficient system is maintained for detecting and recording the presence and intensity of any ionising radiations from time to time emitted from anything on the site or from anything discharged on or from the site…" the law doesn't only take the precautions of ionising radiations. The legislation also include "anything from the site or from anything discharged on or from the site" language is intentionally wide where the operator of the nuclear power plant is responsible for tracing anything that can be related to the site. The paragraph in my opinion support the beyond safety measures.

In Norway there are similar legislation in nature; in Act no. 28 of 12 May 1972 concerning Nuclear Energy Activities in Norway, where section 15 outlines the same interests. Subsection 4 state "It shall be the duty of the operator and all other persons concerned with nuclear fuel or radioactive products to take all necessary measures to ensure that no damage is caused as a result of radioactivity or other hazardous properties of the material". One interesting note is that the Norwegian legislator does not in the said sources have the same wide language used in British legislation nor are there jurisprudence from the courts to establish the same wide legislative powers as in the two other countries.

[119] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031.
[120] Energy Act, c. 57 Nuclear site license, chapter 1, §4 litra a section 4(2013)

The key learning point green energy could take away Beyond Safety, is that a preventative measurement where the state has an obligation to err on the side of disallowing productions disallowing productions that might cause any type of harmful effects and allow the state to have a wide margin of being “too safe”. This proves to be a challenge for the issues presented earlier in the paper, where the problem is that there is not enough being done to develop more sustainable energy.

5.4.3 Stepwise licensing of installations

The building of a Nuclear Power Plant is a long and complex process[121]. Winters highlights the risks of a lack of a overview regarding the dangers of a nuclear power plant, but also calls attention to how legislators created provisional positive safety assessment to keep the holistic goal in mind while focusing on due cause. This implementation is, in my opinion, a safe remedy to the precautionary principle. Building energy development of any kind imposes risks, both environmental and human.

With a stepwise the system in place the legislators have the legal basis to deny certain developments in an energy plant without having to scrap the entire project. However, a system like this is implemented in Norwegian green energy legislation.

The negative aspect of this system involves adding immensely more resources to develop sustainable energy plants, as well as the aspect of time As mentioned earlier, the goal is to reduce pollution to the point that global temperature does not rise above 2℃ by 2030. A continuous impact assessment will undoubtedly hinder that goal when it comes to developing sustainable energy.

Another perspective of this is the interesting case of how Norway regulates installations. Norway regulates the different sources of energy[122]. This ensures that each installation is regulated and up to code in each sector. Even though the Energy Act (1990) takes precedence over the source-legislation, I would argue that the local regulations are more up to date and have more interest in the general population than each source’ protected field.

Another argument is that considering the Energy Act provides the legal basis they are stretched too thin for it to be possible for legislators to have interest in stepwise installations.

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[121] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031.
[122] The legal framework - Norwegian Energy. (2024, January 15). Energifakta Norge. Retrieved May 15, 2024, from https://energifaktanorge.no/en/regulation-of-the-energy-sector/det-juridiske-rammeverket/

In The Energy act (1990) Section 1-2 (purpose) paragraph 4 "The Act shall ensure that the generation, conversion, transmission, trading,distribution and use of energy are conducted in a way that efficiently promotes the interests of society, which includes taking into consideration any public and private interests that will be affected. " and is regulated by the Ministry of the Petroleum and Energy. In the Fosen-Case the said ministry miscalculated the viability of reindeer husbandry and therefore the Norwegian Supreme Court concluded their assessment was faulty[123].

A third critic of the Norwegian system is the inefficiency it provides. A power production company would have to own rights to the source energy, then have rights for the energy and own the rights of the power line. The system is cautious in its implementation, but as mentioned earlier, Norway's consumption of renewable energy amounts to 98% of the market, which is among the top in the world. Implementing a system to modify the permits for energy production in addition to the source-legislated would demand more resources.

Step-wise licensing of installations invites other challenges than an holistic approach and while not codified in law, the grants of permits in all three countries include a part relating to "public interests". The Euratom Directive 2013/59 have adapted into the legislation, in Article 24, the stepwise licensing of nuclear production. If this can be adapted into green energy legislation is a difficult discussion because the interests of establishing the stepwise installation was, as mentioned earlier, a reaction to fear of ionised particles. It would however, ensure that utilizing natural forces for energy production would be as safe as possible if adapted the way Winter argues.

5.4.4 Modification of permits and new safety requirements

A continuation of the stepwise implementing in my previous point is the logical consideration of control after the power plant has been granted building permits. In his paper, Winters presents the technological changes and new requirements as grounds for the state to alter the permit[124]. If a power plant has been found to be in violation of safety, there are grounds in AtG §17 (5) for the state to revoke the license to operate(Atomic Energy Act, 1959).

The step wise process allows the state to halt power plants in solidifying its production. Meaning that if there are shown signs that could worry the states' duty of "beyond safety" the state has a legislative power and opportunity to halt productions for determining if there are either a) technological advancements that can be implemented to heighten the safety of impacted areas or b) any cause for concern by the state. Due to the stepwise implementation being incorporated the permit to be allowed to halt, the private persons property does not have the same protections as it has with other private property and therefore would not be as much of a transgression of the person's rights as normal expropriations measures.

[123] HR-2021-1975-S (10)
[124]Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031.

The modification is already implemented in the Euratom Directive 2013/59 Article 8 (2)b, into the UK Energy act and the atomic energy act (AtG, 1959).

5.4.5 Long term harmful effects

The state has an obligation to secure its citizens right to health(UDHR 1948, art. 28). The result from nuclear waste has shown the energy industry faces several obstacles regarding the long-term harmful effects of nuclear energy production. In Winters paper the focus is on residue from nuclear waste and how flawed the AtG was in regulating this the long term harmful effect[125].

I would argue that under green energy economy there is still a need to direct our focus on the concerns.The building of windmills in the 21st century has already had lasting damages to indigigneous groups. The Norwegian landmark court case regarding windmills violating samii peoples indigenous rights, proved the Norwegian green economy did not anticipate the long term harmful effects. There is an argument, however, of the need to balance the rights of groups living off public land and the utilization of that land to achieve the goals set in the Paris agreement. This paper will not address that discussion, as it doesn't pertain to my thesis.

5.4.6 Participating in administrative procedures

Energy production can’t happen on a small scale. Considering this, the need to utilize public or private land to establish and build nuclear energy opened up a new scale of legislation. The need for public land opens up the process of energy production to have others affected by the power plant as being able to participate in the procedure. Winter presents that previous to nuclear power plants, participation meant having experts weigh in on the matter to provide insight[126]. With energy production happening on larger parts of public land the worries of grassroots defiance to the

I would argue a publicly accessible discussion regarding is a keystone in changing energy reliance to sustainable productions. The issue with this is that it is another hindrance in the road to achieve the climate goals. However, when these things are not properly considered, we face problems regarding constitutional issues which I will present next.

This is not a challenge in modern legislation. All three countries have included public participation in establishing new energy. Germany has included it in their energy act (AtG, 1959), Britain’s Energy Act of 1990 highlight the necessity of communal insight before granting licenses, and Norway’s Energy act of 1999 doesn’t allow for a concession to be

[125] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031.
[126] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031. (112).

made unless there has been a public hearing where every person has a legal right to participate in the process.

5.5 Considerations of constitutional rights

Energy legislation, as I have proven, permeates multiple facets of society, and therefore is multifaceted in it's legislative branches. In recent times there have been court rulings regarding constitutional rights. Recent rulings in Neuebauer v. Germany and the Fosen-Case proves this to be the case.

In Neuebauer v. Germany the federal constitutional court was deliberating if the Federal Climate Protection Act was insufficient in regards to basic law[127]. The complaints allege that the new law was not consistent with Basic Laws for the Republic of Germany 1949. The constitutional court concluded that the violation was in regards to Article 20 a "Mindful also of its responsibility toward future generations the state shall protect the natural foundations of life and animals by legislation…" that the Act had not gone far enough in it's protection of future generations fundamental rights.

On the other hand there is the Fosen-case. The rights of the Sàmi people, an indigenous population, of Norway allege that their indigenous rights were in jeopardy with the newly built windmills in Fosen. The Sàmi people have for generations been keeping reindeer husbandry and is acknowledged as an "indigenous way of living" (HR-2017-2428-A). This established the rights of the indigenous people to have supranational protections that go above the norwegian legislative branch and is therefore regulated by the The International Covenant on Civil and Political Rights, and in this case, Article 27[128]. The defendant, responded that their impact assessment would affect the rights of the

The two court cases are examples of the state having two different strategies to access the issues. The German ruling proved that the state can be too restrictive in their climate goals, the Norwegian ruling proved that the state was too ambitious in their climate goals. In the latter example the legal system has evolved since the establishment of the Halden reactor, when local groups protesting building the reactor due to risk of wildlife but was not seen as having a "vested interest" by the courts.

5.5.1 Right to property

A key turning point in the Fukushima Daiichi accident was shutting down the Vattenfall reactor in Germany. It became, according to Winter (2013), a discussion of expropriation in

[127] Climatecasechart.org. (2024). Neubauer, et al. v. Germany - Climate Change Litigation. Climate Change Litigation Databases. Retrieved May 15, 2024, from https://climatecasechart.com/non-us-case/neubauer-et-al-v-germany/

[128] Ravna, Ø. (2023). The Fosen Case and the Protection of Sámi Culture in Norway Pursuant to Article 27 ICCPR. n International Journal on Minority and Group Rights, 30(1), 156–175

the public interest[129]. It is a shame that Vattenfall et.al. filed a complaint with ICSID instead of going through a court system (Vattenfall AB and others v. Federal Republic of Germany, ICSID Case No. ARB/12/12), because the ICSID has no international binding legislative power. The legal dispute would have been key in the interest of how to regulate energy-actors who do not comply with public interests. There is in my opinion a need for court/legislative decisions in this problem.

With analogy to expropriation I will discuss the necessity of public interest in nuclear private property - to prove the same problem will be faced in the discussion of the green economy. The analogy is as follows: the necessity for private and public land either needs to be utilized to establish renewable energy productions, or the renewable energy production facility imposes a risk to the population due to unsafe environment. It has not been proven that either of these examples have been the case in the respective countries, mainly due to regulatory bodies not allowing access because of beyond safety measures.

Expropriation under British law serves as a critical legal tool where the state acquires private property for public use, ensuring that such actions adhere strictly to the principles of necessity and fairness(Acquisition of Land Act, 1981). Rooted deeply in the protection of private property rights, British legal traditions mandate that expropriation must meet public interest criteria and be accompanied by adequate compensation. This balance between individual rights and public needs is detailed in statutes that outline the proper procedural conduct for expropriation, emphasizing the role of Parliament in its governance. As there is no constitutional barrier against expropriation in Britain, the process is facilitated by legislative frameworks that are flexible yet carefully regulated to protect property owners[130].

The implementation of expropriation presents legal complexities, particularly in defining 'public use' and determining the 'necessity' that justifies the acquisition of private property. The legal safeguards in place are designed to prevent arbitrary property seizures, ensuring that any expropriation is justifiable, procedurally correct, and compensatory. This meticulous approach is crucial in maintaining the delicate balance between advancing public infrastructure projects and respecting private property rights, thus safeguarding against potential abuses of power[131].

The Town of Country Planning Act of 1990 regulates the British legislation of public acquisition of land(expropriation). In section 226 the local authorities have the authority to expropriate the land. In paragraph 1 b it is required for “a purpose which it is necessary to facilitate the land". The legislation is in line with my argument that the countries are aligned in tradition and values on a cohesive basis.

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[129] Winter, G. (2013). The Rise and Fall of Nuclear Energy Use in Germany: Processes, Explanations and the Role of Law. Journal of Environmental Law, 25(1), 95–124. doi:10.1093/jel/eqs031. (117)
[130] Buckingham, W. (1953). COMPENSATION AND PROFITS IN BRITISH NATIONALIZED INDUSTRIES. Journal of Finance, 8, 422-435. https://doi.org/10.1111/J.1540-6261.1953.TB01188.X.
[131] Mann, F. (1959). Expropriation in Public International Law. International and Comparative Law Quarterly, 8(3), 611–612. doi:10.1093/iclqaj/8.3.611

While Germany and Norway have a protection of public acquisition of land enshrined in constitutional legislation, while the British legal system protects it as a federal law. There can be an argument to be made that inefficiencies is that states are too respectful of individual rights for the rapid expansion of green energy the Climate Accords demands, but removing constitutional rights for the sake of establishing energy demands thorough processes.

5.6 Supranational organisations

The established international organisations to regulate nuclear energy, namely the IAEA and Euratom, have focused on safeguards and nuclear proliferation. The necessity to prevent nuclear weaponry and the proliferation of nuclear powers. The organisations, as introduced earlier, hold supranational legislative powers to regulate and enforce their mandate.

Euratom does not hold the same international prowess as the IAEA but it does hold a stronger legislative power. As presented earlier in the paper, the Euratom is nonetheless an efficient and influential organization. A smaller scale supranational organization with the same mandate as Euratom would be the next step in Green Energy As of writing, the European Commission has moved away from the The Energy Charter Treaty as it is no longer compatible with the European Green Deal, but there is not a given organizational position for the Green Energy[132]. One consideration is to hand the tasks of supranational regulation and implementation to Euratom, but as Norway is not a part of the legislative body, they would have to implement the rules, as they have done with Euratom.

One could, (and in my opinion, should) argue that the national security risks imposed by failing to reach climate goals necessitates organisations with as great legislative powers as nuclear energy. The projected environmental disasters amount to more displacement of populations and loss of life[133] than the respective countries lost in World War 2[134].

The risk of such an institution is the question of sovereignty. In this paper I have provided examples of how intricate and cross-disciplined nuclear energy spans, from administrative conditions to private interests to fundamental rights questioning property.

Another risk to this system is the question of fundamental rights being regulated by supranational organisations. As previously presented the question of expropriation is a constitutional question in Norway and Germany, but not in The United Kingdom. There are

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[132] Directorate-General for Energy. (2023, July 7). European Commission proposes a coordinated EU withdrawal from the Energy Charter Treaty. Energy - European Commission. Retrieved May 14, 2024, from https://energy.ec.europa.eu/news/european-commission-proposes-coordinated-eu-withdrawal-energy-charter-treaty-2023-07-07_en

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differing ways for the three countries to tackle subjects and based on previous case-law, namely the Nuclear shut-down in German[135] and the Fosen-Case in Norway[136]. The argument is therefore that there are no guarantees that fundamental rights are protected by the state and therefore a supranational expertise organisation would at least solve the main goal, of alternative energy sources, while being challenged the same way the states are being challenged.

6 Conclusion

From the establishment of nuclear energy to the Fukushima-accident, the ever evolving energy legislation has attempted to adapt and evolve with technology, time and interested parties. Both sectors have had both unprecedented grassroots opposition and institutional support. From being 30% of the energy trade in Germany to a single recently shut down reactor in Norway, the three countries journey with nuclear energy has been in a myriad of controversies.

This paper, I hope, has proven that the lessons legislative branch may not be applicable to adapting to 21st century renewable energy legislation. Partly due to the influential nature of the nuclear energy sector bleeding into different types of legislation, but also considering that the threat of climate change is a different threat. There is argued that the nuclear proliferation the IAEA is regulating remedies a threat as large or larger than the respective countries face when it comes to climate change, but as I have argued in this paper, the need for international supralesligative action can be a useful tool and even with three different forms of legislative systems the interests, goals and considerations are already aligned.

In my opinion, the commonality should be enough for the states to align behind a supranational organization with the legislative mandate to supersede the grassroots opposition and private interests. And finally, that with a common goal we can learn from each other's history.

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