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Legal Challenges of EU Energy System Digitalization from the EU Competition Law Perspective: Monopolies in the Energy Platforms

Master's thesis

Master of Arts in Law, specialisation Law and Technology

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Tallinn 2024

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Contents

ABSTRACT

The European Union (EU) envisions a comprehensive energy transition, pivoting towards renewable sources and fostering a fully digitalized energy market. This strategic shift is rooted in the EU's commitment to liberate itself from dependence on fossil fuels, particularly from Russia, and preemptively address potential future energy challenges. The EU has laid the foundation for this transformative journey by establishing specialized commissions and groups dedicated to realizing the ambitious goals outlined in the Green Deal.

Central to this transition is the integration of smart meters within the framework of smart cities. These devices serve as pivotal instruments, offering real-time data to both consumers and data holders. Their functionality extends beyond mere data provision; they facilitate effective management of energy resources, enabling users to save, reduce consumption, and even share excess energy. This integration aligns with the EU's broader objectives of sustainability and efficient resource utilization.

However, the incorporation of smart meters into the energy landscape is not without its share of challenges. Paramount among these concerns are data security and privacy issues. The deployment of smart meters necessitates a careful alignment with the General Data Protection Regulation (GDPR), ensuring that the collection, storage, and utilization of data adhere to stringent privacy standards. Concurrently, the integration of smart meters must navigate the complex terrain of existing competition laws. The data amassed by these devices holds immense value and can be leveraged by providers in various ways, potentially leading to monopolistic practices. Such monopolies could emerge if certain providers gain preferential access to data, whether due to political influence or governmental support.

In essence, the strategic deployment of smart meters as part of the broader energy transition initiative represents a multifaceted endeavor. It underscores the EU's commitment to sustainability, energy efficiency, and digitalization. However, meticulous attention must be given to legal frameworks, particularly GDPR and competition laws, to ensure that the deployment of smart meters aligns with the EU's commitment to fair competition, data privacy, and the overarching goals of the Green Deal.

Key words: Energy transition, Smart meters, Competition law, Data protection

1. INTRODUCTION

In order to end the EU's reliance on fossil fuels from Russia, combat the climate emergency, and guarantee affordable energy accessibility for everyone, the European green deal and RepowerEU necessitate a comprehensive sustainable and digital overhaul of our energy system. At the 25th session of the Conference of the Parties (COP25) in December 2019, Ursula von der Leyen, the President of the European Commission, introduced the European Green Deal.[1]This comprehensive initiative comprises a series of policy measures designed to achieve climate neutrality and foster sustainability within the EU economy. The overarching goal of the European Green Deal is to attain climate neutrality by 2050. Moreover, it seeks to assist businesses in becoming global pioneers in environmentally friendly products and technologies while concurrently promoting an equitable and inclusive transition.[2]

Later in February of 2022, the European Commission unveiled a strategic initiative titled "REPowerEU: Joint European action for more affordable, secure and sustainable energy" in response to Russia's invasion of its neighboring country, Ukraine.[3] Prompted by the urgency of the situation, the Commission is implementing sweeping measures aimed at diminishing the European Union's reliance on Russian energy resources. The primary objective outlined in the proposed plan is to achieve European independence from Russian fossil fuels well in advance of the year 2030, with immediate actions set in motion.

Formally communicated on March 8, 2022, the document titled "REPowerEU: Joint European Action for more affordable, secure and sustainable energy" (hereafter referred to as "REPowerEU") delineates the specific programmatic objectives and considerations inherent in this remarkably accelerated energy policy package. The unveiling of this initiative marks a significant step towards addressing the challenges posed by the geopolitical events and underscores the Commission's commitment to ensuring a more self-reliant, secure, and sustainable energy future for the European Union.[4]

Currently, urban areas are essential contributors to the EU's energy consumption and greenhouse gas (GHG) emissions and significantly impact efforts to reach the EU's climate targets. At the same time, it is imperative to swiftly digitize cities, as they are pivotal contributors to the EU's economy, to minimize avoidable expenses and financial resources. To fulfill these EU goals, they targeted on energy transition. The "energy transition" signifies a worldwide shift in the energy sector from traditional fossil fuel-based systems to cleaner, renewable energy sources. This transition is facilitated by technological advancements and a collective societal commitment to sustainability. It seeks to not only alter energy supply, demand, and pricing structures permanently but also reduce greenhouse gas emissions through decarbonization measures.[5]

According to forecasts by the International Energy Agency, global renewable energy capacity is expected to grow by 50% from 2019 to 2024[6]. Consequently, utility companies have initiated a rapid shift away from coal as an energy source[7]. While some market experts anticipate a gradual transition, there is increasing pressure on power providers to retire existing coal-dependent assets and develop alternative power generation methods[8]. In response to mounting concerns about climate change, numerous major oil companies are

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[1] Claeys, G., Tagliapietra, S., & Zachmann, G. (2019). How to make the European Green Deal work. Brussels, Belgium: Bruegel.

[2] European Commission. The European green deal. 2019. vol. Communicat. Brussels, Belgium. [4] European Commission. Regulation establishing the just transition fund. European Parliament and the Council; 2020. 2020.

[3] European Commission. REPowerEU: Joint European action for more affordable, secure and sustainable energy. (2022).

[4] Lonergan, K., Gabrielli, P., & Sansavini, G. (2022). Energy justice analysis of the European Commission REPowerEU plan.

[5] https://www.spglobal.com/en/research-insights/articles/what-is-energy-transition

[6] https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/electric-power/102119-global-renewables-capacity-to-grow-50-by-2024-on-spectacular-solar-iea

[7] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/50756130

[8] https://www.spglobal.com/marketintelligence/en/news-insights/latest-news-headlines/48939639

intensifying investments in and diversifying their portfolios to include renewable and low carbon energy sources.

The energy transition involves more than just generating power from renewable sources. It encompasses the widespread implementation of electric transportation infrastructure, the adoption of energy storage solutions, and the utilization of technologies aimed at enhancing energy efficiency. One significant driver of this transition is the substantial reduction in the average cost of lithium-ion batteries[9], a result of both economies of scale in manufacturing and technological advancements. Consequently, both businesses and consumers are increasingly embracing electrification as a means of powering transportation. This shift toward electric vehicles (EVs) is considered one of the most promising sectors for electrification, with the global adoption rate of EVs expected to reach 10%-12.5% by 2025[10].

Renewable energy storage is a pivotal element of the transition to renewable energy sources and electrification, addressing the intermittent nature of many renewable technologies. Previously regarded as the critical connection between sporadic renewable power generation and consistent reliability, energy storage is now assuming a more extensive role in the energy transition[11]. It holds the potential to facilitate the eventual decarbonization of energy systems. With decreasing costs, renewable energy storage has the capacity to find applications beyond its current niche markets. In fact, certain commercial applications of energy storage are already becoming more cost-effective.Globally, the EU promotes the twin transition through the Global Gateway Strategy. [12]

Energy transition stands on three pillars: Digitalization, Decarbonization, and Decentralization, called the 3D. Decarbonization aims at reducing fossil energy usage, whereas decentralization tries to generate energy off the main grid, including micro-renewables and heating and cooling systems. Additionally, digitalization will set the stage for smart cities, where prosumers can exchange their produced energy with others. One can realize that the three pillars should be developed hand-in-hand through the energy transition in the European Union. However key factor for exchanging energies and achieving prosumer's continuity is Digitalization.

For instance, a target has been set to equip the rooftops of all commercial and public buildings with solar photovoltaic (PV) panels by 2027 and to include them in the construction of all new residential buildings by 2029,[13] deploy 10 million heat pumps within the coming 5 years[14] and substitute 30 million cars with zero-emission vehicles on the streets by 2030[15]

Achieving a 55% reduction in greenhouse gas emissions and attaining a 45% renewable energy share in 2030 is contingent upon the energy system's preparedness for this transformation.

In order to attain these objectives, the European Union must establish an energy system that surpasses its current capabilities in terms of intelligence and interactivity. Enhancing energy and resource efficiency, reducing carbon emissions, promoting electrification, integrating various sectors, and decentralizing energy systems are all integral components of the digitalization process that necessitates careful planning and substantial commitment.

Digital, information and communication technologies, including smart grids and smart meters, are considered an integral part of the smart city concept. While decentralization and

[9] https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/electric-power/070518-electric-vehicles-cost-competitive-by-2024-25-oxford-summit

[10] https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/metals/102819-global-electric-vehicle-adoption-rate-around-10-125-by-2025-lme-seminar

[11] https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/coal/102219-coal-fired-opportunities-still-exist-long-duration-storage-a-play-in-us-power-markets-execs

[12] The Global Gateway JOIN(2021) 30 final

[13] EU Solar Energy Strategy COM(2022)221

[14] REPowerEU Communication COM(2022)230 final

[15] Sustainable and Smart Mobility Strategy COM(2020)789 final

decarbonization have been in the spotlight in recent years, mainly because of the environmental and geopolitical pressures of the Russian invasion to Ukraine, digitalization is vital for establishing the new energy system, especially in the long term and should not be neglected.

Digitalization as one of the three pillars mentioned in energy transition needs to be defined and distinguished from digitization. Digitization involves converting physical objects, like documents, into digital formats, such as pdfs, and storing them on a computer. It relies on encoding information as bits, which are the building blocks of digital data. This process is crucial for recording and working with data in digital technologies, as it transforms analog information into a format that computers can handle, store, and share.

Digitization involves storing physical objects or information in computers without changing how it's used. Digitalization, on the other hand, goes beyond that. It leverages digital technologies and digitized data to enhance or streamline processes. Digitization is about converting and recording data, while digitalization focuses on optimizing manual systems by using digitized data. For instance, it involves taking customer data from various sources and using it to automatically generate insights about their behavior, improving workflows.

Currently, some countries like Estonia have already reached the level of almost-full digitization of the database however some others have not fully achieved this goal which may also cause serious delays in achieving digitalization and smart energy transition.

On the other hand, digitalization has already taken place and being more equipped every day: usage of electric cars (EV), photovoltaic (PV)setups, heat pumps, and various other modern devices come equipped with intelligent technologies that produce data and allow for remote management.[16]

Over the past decade, digitalization has gained significant attention in various EU policy areas. In the field of energy, the European commission has initiated efforts to align its objectives including the Energy union. The adoption of directive 2018/844 (amending directive 2010/31/EU on the energy performance of buildings and directive 2012/27/EU on energy efficiency) urged alignment of the energy union goals, i.e. single energy market and decarbonization, with the Digital single market and provides the legal ground for smart meters promotion at the Union level. As a result, there has been a practical focus on promoting the implementation of smart meters and smart grids. However, the legal challenges associated with these technologies have not received as much attention.

According to the final action plan from October 2022, a substantial investment of 584 billion euros will be required between 2020 and 2030, with a primary focus on the electricity grid, particularly emphasizing the distribution aspect.

With the introduction of emerging digital technologies like advanced IoT (Internet of Things), Smart meters, 5G and 6G connectivity, and a Pan-European energy data platform supported by cloud-edge computing servers and digital twins for Energy systems, the shift towards cleaner energy, a key element of the European Green Deal, is becoming more seamless and rapid.For instance, now we can have real-time (almost live with a 30-minute delay[17]) consumption of energy in each household that is using smart meters and give the household the opportunity to monitor, manage, and reduce it. Digital devices like IoT devices can also make lives easier by charging electric cars remotely, changing and controlling room temperature, managing home appliances to benefit from the lowest energy prices, etc.

This bilateral approach aids governmental bodies and policymakers in gaining improved insight for overseeing and tackling energy deficits while enabling the energy industry to concentrate on its activities and give preference to the utilization of renewable sources. To ensure a fair and equitable transition to this era of intelligent digitalization, we must

[16] Digitalising the energy system - EU action plan ,COM/2022/552 final
[17] https://www.sseairtricity.com/ie/home/help-centre/smart-metering/what-does-30-minute-usage-data-mean/

proactively address potential challenges related to privacy and data protection, while also ensuring compliance with competition laws.[18]

Smart meters as the main focus of this study need to be described first with functioning and technical characteristics. They can connect two types of data: the quantity of power used and the time over which it was consumed[19].The term 'smart meter' can encompass both meters with and without bidirectional communication capabilities[20].These meters serve multiple purposes, allowing consumers to monitor their energy consumption in-depth, enabling them to identify potential savings.[21]

Additionally, they simplify the process of reading electrical usage, as it eliminates the need for a meter operator to physically read the meter, and consumers don't have to relay their readings to the supplier when remote reading is an option. On the other hand, for network operator expansion of smart meters enhance and secure network management, as they enable more accurate regulation of electricity supply and consumption through almost real-time tracking of usage and generation.[22]In practical terms, this is especially beneficial for monitoring power generation in smaller electricity facilities, as the power output of larger plants is already accurately ascertainable.[23]

One of the main and most useful features that are being offered is the ability to switch the devices off and back to on, based on the electricity tariffs at that specific time of the day[24]. Some meters include a remote-control feature, that provides the benefit of directly decreasing or increasing power generation and consumption for network control purposes.[25] Moreover, the new generation of smart meters shall have the ability to save and trade the exceeded energy that the consumer doesn’t wish to use in the market. This means that they have bidirectional communication with other consumers in the market.

Aside from enhancing electricity storage capacity, the combination of the gas and electricity industries offers a solution to deal with surplus renewable electricity during periods of low demand and high generation from renewable energy sources (RES) like wind and solar. This surplus electricity can be converted into green hydrogen, which is easily storable. When demand is high, this green hydrogen can be converted back into electricity. Investing in green power-to-gas technologies has the potential to significantly increase the share of renewable

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[18] Digitalising the energy system - EU action plan. (2022). Communication from the commission to the european parliament, the european council, the council, the european economic and social committee and the committee of the regions. European Commission: Strasbourg,, France

[19] Kuh, K. F. (2012). Personal environmental information: the promise and perils of the emerging capacity to identify individual environmental harms. Vand. L. Rev., 65, 1565

[20] Leal-Arcas, R., & Wouters, J. (Eds.). (2017). Research handbook on EU energy law and policy. Edward Elgar Publishing.

[21] Greveler, U., Glösekötterz, P., Justusy, B., & Loehr, D. (2012). Multimedia content identification through smart meter power usage profiles. In Proceedings of the International Conference on Information and Knowledge Engineering (IKE) (p. 1). The Steering Committee of The World Congress in Computer Science, Computer Engineering and Applied Computing (WorldComp)., https://www.nds.rub.de/media/nds/veroeffentlichungen/2012/07/24/ike2012.pdf (accessed 04 July 2017), 1; McKenna, E., Richardson, I., & Thomson, M. (2012). Smart meter data: Balancing consumer privacy concerns with legitimate applications. Energy Policy, 41, 807-814; see also King, N. J., & Jessen, P. W. (2014). For privacy's sake: Consumer “opt outs” for smart meters. Computer Law & Security Review, 30(5), 530-539; and Eisen, J. B. and others (2015) Energy, Economics and the Environment (4th edn, Foundation Press), 903

[22] McKenna, E., Richardson, I., & Thomson, M. (2012). Smart meter data: Balancing consumer privacy concerns with legitimate applications. Energy Policy, 41, 807-814); Dinter,J ,(2015) ‘Das Gesetz zur Digitalisierung der Energiewende – Startschuss für Smart Meter? Ein Überblick über den Referentenentwurf’ EnergieRecht Zeitschrift für die gesamte Energierechtspraxis (ER), 229, 229; Eisen, J. B. and others (2015) Energy, Economics and the Environment (4th edn, Foundation Press), 903; see also King, N. J., & Jessen, P. W. (2014). For privacy's sake: Consumer “opt outs” for smart meters. Computer Law & Security Review, 30(5), 530-539

[23] Dinter,J ,(2015) ‘Das Gesetz zur Digitalisierung der Energiewende – Startschuss für Smart Meter? Ein Überblick über den Referentenentwurf’ EnergieRecht Zeitschrift für die gesamte Energierechtspraxis (ER), 229, 229; Greveler, U., Glösekötterz, P., Justusy, B., & Loehr, D. (2012). Multimedia content identification through smart meter power usage profiles. In Proceedings of the International Conference on Information and Knowledge Engineering (IKE) (p. 1). The Steering Committee of The World Congress in Computer Science, Computer Engineering and Applied Computing (WorldComp).

[24] Dinter,J ,(2015) ‘Das Gesetz zur Digitalisierung der Energiewende – Startschuss für Smart Meter? Ein Überblick über den Referentenentwurf’ EnergieRecht Zeitschrift für die gesamte Energierechtspraxis (ER), 229, 229

[25] Ibid., 229ff. See also Eisen, J. B. and others (2015) Energy, Economics and the Environment (4th edn, Foundation Press), 921

energy sources in the EU's energy mix and facilitate the decarbonization of the gas sector in the medium and long term.[26]

Within the context of thesis objectives, it is imperative to examine the digitalization of smart measures for the energy market in the European Union (EU), a realm fraught with diverse challenges, particularly those pertaining to the legal domain. While issues of data and security rightfully command significant attention, there appears to be a relative paucity in the comprehensive consideration of legal challenges. Of particular concern are the implications for competition law, a facet that has yet to receive adequate scrutiny.

This thesis endeavors to underscore the critical importance of addressing all legal challenges associated with the digitalization of smart cities in the EU. While data and security concerns are undeniably pivotal, the focus here is on the nuanced complexities inherent in competition law. By delving into these legal intricacies, it becomes apparent that overlooking or underestimating the implications of competition law may yield outcomes that run counter to the primary objectives of the energy transition initiative. Thus, a thorough examination of competition law challenges is deemed essential to ensure the seamless integration of digitalization in smart cities without compromising the overarching goals of the energy transition.

The focal exploration of this study revolves around investigating potential loopholes within competition law stemming from the prolonged absence of updates in its regulatory framework. The inquiry is prompted by the prevalent scenario wherein smart meters, typically supplied and overseen by governmental entities or entities closely affiliated with the government, might inadvertently lead to the emergence of monopolistic practices. During this study we will assess two case laws in which government entities directly or indirectly helped one undertaking to have monopoly over the market and how state aid affects a fair internal market. The overarching objective is to discern the implications of these potential loopholes and devise strategies to prevent the inadvertent consolidation of monopolies within the context of smart city digitalization. This thesis aims to contribute valuable insights towards addressing these challenges and fostering an environment that upholds fair competition, thereby ensuring the efficacy and integrity of the evolving smart city landscape.

Challenges involved on implementing ad developing smart meters can have at least three different aspect: Firstly, technical aspect as the issues that might arise while changing from the old unit to new version of meters affect functionality, secondly the economic aspect as we need additional infrastructure for changing and installing new smart meters and most of EU countries has not yet reached to that level of self-sufficiency and improvement and thirdly legal challenges such as contradiction with competition law in case of monopoly, data protection issues and cybercrime concerns. All these challenges will be described and possibility of them affecting the usability of smart meters will be discussed in details.

Within this thesis, the author delves into the identification of legal voids and loopholes within the energy acquis, particularly focusing on fostering a digital single energy market, with a primary concentration on competition law and data protection. The author endeavors to explore preventative measures against potential monopolies instigated by governments or major service providers in these platforms. Ultimately, the focus will be on proposing legal frameworks that encourage widespread adoption of smart meters among energy users while upholding principles of civil liberties and data privacy. While acknowledging the pivotal role that various challenges play in shaping the trajectory of smart cities within EU member states, this thesis provides concise descriptions of these challenges and explores potential resolutions. However, the primary emphasis of the author centers on examining the likelihood

[26] Vasilakos, N. (2020). A no-regrets strategy towards 2030 Smart Sector Integration. Renewable Energy Law and Policy Review, 10(1), 16-20.

of monopoly occurrences within EU member states, aligning with the provisions of Article 108 TFEU concerning state aid.

The structure of this thesis is delineated as follows: Section 2 elucidates the chosen methodology, which is qualitative content analysis. This method was selected due to its appropriateness for the research objectives. Section 3 constitutes the main body and discussion of the thesis, delving into the legal prerequisites and current regulatory landscape within the European Union concerning smart metering. While acknowledging the significance of other challenges such as technical and economic considerations, the thesis concentrates on legal challenges. These encompass issues ranging from cybersecurity and data protection concerns to the central focus of the thesis, which is competition law and the potential for monopolistic scenarios. Finally, Section 4 provides a conclusive summary.

2. METHODOLOGY

This thesis employs a qualitative content analysis methodology to meticulously examine a diverse array of sources, including articles, reports, legal documents, newspapers, agendas, advertisements, program proposals, and scholarly literature. The analysis is conducted within the overarching context of European Union law and competition regulations, with a specific emphasis on the intersection of digitalization and decarbonization within the energy sector, particularly concerning smart meters. The reservoir of documents subjected to scrutiny spans across various repositories, encompassing libraries, newspaper archives, and files from organizations and institutions.

The process of document analysis has been strategically employed as a systematic procedure for the comprehensive review and evaluation of existing documents. These documents encompass a range of formats, including both printed materials and electronic sources, such as computer-based and Internet-transmitted content. [27]

The objective of this analytical approach is to attain a nuanced and detailed description of the smart meter phenomenon, events, organizations, and programs associated with it. This methodology draws upon established frameworks for document analysis as outlined by scholars like Stake [28]and Yin. [29]

The process of document analysis involved the author immersing into the existing literature concerning the steps involved in the implementation of smart meters. In this endeavor, these studies served as a valuable source of data. Departing from a sole reliance on raw data as the analytical foundation, the chosen approach placed emphasis on a comprehensive review, detailed description, and thoughtful interpretation of the gathered data. The overarching aim was to extract meaningful insights from the available information, illustrating a prioritization of the review, description, and interpretation of data, rather than relying solely on raw data for analysis.[30]Through the application of this method, the author was able to procure data in the form of excerpts, quotations, or complete passages. Subsequently, this data was systematically organized into major themes, categories, and case examples, employing a content analysis approach.[31]

The author further strengthened the analysis by cross-referencing and examining relevant case laws in Italy and Spain. This meticulous process allowed the author to draw connections between multiple sources of evidence and assess their relevance to potential competition issues. Additionally, the documents at hand served diverse purposes, ranging from prompting inquiries that necessitated exploration to outlining situations that warranted observation. These documents also furnished supplementary research data extracted from various sources, aiding the author in monitoring the evolution and progression of smart cities.

Despite being less time-consuming compared to other qualitative research methods, specifically due to the utilization of data selection instead of collection, document analysis faced certain limitations during the data collection process. These limitations included insufficient detail in some instances, occasional unavailability of retrievable data due to restricted access to governmental data, and biased selectivity. Biased selectivity refers to the incomplete collection of documents,[32] following corporate policies and procedures or

[27] Bowen, G. A. (2009). Document analysis as a qualitative research method. Qualitative research journal, 9(2), 27-40.).
[28] Stake, R. E. (1995). The art of case study research. Thousand Oaks, CA: Sage
[29] Yin, R. K. (1994). Case study research: Design and methods (2nd ed.). Thousand Oaks, CA: Sage.
[30] Supra note 28
[31] Labuschagne, A. (2003). Qualitative research: Airy fairy or fundamental? The Qualitative Report, 8(1), Article 7. Retrieved 5 January 2009, from http://www.nova.edu/ssss/QR/QR8-1/labuschagne.html.
[32] Yin, R. K. (1994). Case study research: Design and methods (2nd ed.). Thousand Oaks, CA: Sage.

organizational principles that result in the provision of selected documents rather than all relevant data

Utilizing methods within the textual analysis group, especially content analysis, is considered appropriate for the processing of the formative phase of strategic narrative constructs. Content analysis, which is a broad term encompassing various strategies for text analysis, proves to be effective in this context.[33] The objective of content analysis is to elucidate the characteristics of a document's content by scrutinizing elements such as who communicates, what is communicated, to whom, and the resultant impact.[34]

The analysis involves evaluating both the quantity of frames and the recurrence of specific ones and storylines over time, requiring a blend of quantitative and qualitative measurements. Furthermore, the outcome aims to identify a narrative that the researcher constructs about the data in connection with the research question or questions.[35]

The aim and focus of the data analysis employed were centered on addressing questions such as the concerns people have regarding smart meters, potential challenges in the expansion of smart meters, and the reasons people may have for either using or not using this service and its associated procedures.[36]

The application of content analysis encompasses two distinct approaches: inductive and deductive. While both approaches share common phases, including data collection and the selection of the unit of analysis, they diverge in the second phase. The inductive approach employs open coding, category creation, and abstraction.[37] Conversely, the deductive approach entails the development of a categorization matrix.[38]

Indeed, content analysis unfolds through a dual approach, employing both inductive and deductive methods. The inductive journey involves essential steps like open coding, category creation, and abstraction. On the other hand, the deductive route entails crafting a categorization matrix. This study opted for a holistic approach, amalgamating both inductive and deductive analyses, acknowledging the advantages inherent in this hybrid methodology, particularly within the context of integrated quantitative and qualitative research.[39]

Critical data for this research emanated from primary legal texts, specifically the EU energy acquis, which were accessed through EUR-Lex. The data collection period extends from 2017 to February 2023. The filtration of pertinent documents involved the use of keywords such as "smart meters" and "competition law."

The inclusion criteria have been meticulously designed to encompass only those sources that explicitly delve into the legal facets of EU energy system digitalization and competition law. By focusing on sources published in the last decade, this ensures a contextual alignment with contemporary developments. Periodic updates are scrutinized to incorporate the latest advancements in smart cities within the EU energy sector.

Nevertheless, in certain areas, such as detailing the progress of each country in implementing smart meters, systematic reporting of results proved to be challenging. Challenges in reporting results may stem from an analysis that did not yield successful outcomes[40] or difficulties in articulating the abstraction process. Given that the latter relies partly on the

[33] Powers, B. A., & Knapp, T. R. (2010). Dictionary of nursing theory and research. Springer publishing company.

[34] Bloor M,Wood F. (2006) Keywords in Qualitative Methods:AVocabulary of Research Concepts (1st edn). London: SAGE Publications

[35] Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. Nursing & health sciences, 15(3), 398-405.

[36] Ayres L. (2007) Qualitative research proposals – part II: conceptual models and methodological options. J. Wound Ostomy Continence Nurs. 2007b; 34: 131–133

[37] Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. Journal of advanced nursing, 62(1), 107-115.

[38] Polit, D. F., & Beck, C. T. (2004). Nursing research: Principles and methods. Lippincott Williams & Wilkins.

[39] Vaismoradi, M., Turunen, H., & Bondas, T. (2013). Content analysis and thematic analysis: Implications for conducting a qualitative descriptive study. Nursing & health sciences, 15(3), 398-405.

[40] Dey, I. (1993). Qualitative data analysis: A user-friendly guide for social scientists. London, England: Routledge

author's insight or intuitive actions, conveying it comprehensively to others posed inherent difficulties.[41]

The content analysis of articles and documents serves to uncover critical legal challenges and issues associated with the digitalization of the EU energy system, specifically within the framework of EU competition law. These themes may revolve around aspects like market dominance, data sharing, anticompetitive practices, and the evolution of the regulatory framework. Through providing a detailed account of the analysis process and elucidating the connection between the results and the original data, the author aims to empower readers to draw their own conclusions regarding the trustworthiness of the results.

In line with Schreier's perspective, content analysis is considered systematic due to its comprehensive consideration of all relevant material, adherence to a predefined sequence of analytical steps, and the requirement for the researcher to verify coding consistency.[42]

Following the guidance of Pyett and Thomas, this thesis incorporates self-criticism across various sections during the process of conducting qualitative content analysis. Emphasizing the importance of continuous reflection and self-critique from the initial stages, the analysis strives for a rigorous and introspective approach.[43]

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[41] Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. Journal of advanced nursing, 62(1), 107-115.

[42] Schreier, M. (2012). Qualitative content analysis in practice. Thousand Oaks, CA: Sage.

[43] Pyett, P. M. (2003). Validation of qualitative research in the "real world." Qualitative Health Research, 13, 1170-1179. ; Thomas, E., & Magilvy, J. K. (2011). Qualitative rigour or research validity in qualitative research. Journal for Specialists in Pediatric Nursing, 16, 151-155)

3. DISCUSSION

3.1 Legal prerequisites for the establishment of a digital single energy market

At present, the prevailing regulations in this sphere either exhibit obsolescence or lack a compelling imperative necessitating expeditious action. Several European nations, propelled by their technological advancement and innovative prowess, have successfully attained the prescribed objectives, while others have disregarded the significance of the energy transition and its ramifications for the environment.

Evidently, even in the aftermath of the Russian invasion, the imperative for this energy transition has become more pronounced. Nevertheless, substantive measures in this domain remain insufficient to redress the deficit, with certain countries languishing in this regard.

The digitalization of energy within the EU is already being directed by established digital and energy policies. Matters such as data interoperability, security of supply, cybersecurity, privacy, and consumer protection are deemed crucial, and their regulation cannot solely rely on market forces. The effective implementation of these policies is essential. Interoperability, in the context of smart meters, extends beyond technical capabilities. It encompasses the smart meter's ability to measure and connect to various appliances within a smart home. Moreover, interoperability aims to facilitate the seamless exchange of information, energy provision contracts, and pricing options across borders within the European Union.[44]

The European commission has set up goals by adopting The Digital Decade Policy Programme 2030 and proposal of Data Act 2022 for each sector which needs compelling factor to force member states to actually speed up and internally regulate existing loopholes in regard to moving towards green and resilient energy systems and smart cities all over the European Union.

Proposal of Data Act which is a proposal for a regulation on harmonized rules for fair access to and use of data, also known as the Data Act, is a legislative initiative of the European parliament and the council. This proposed regulation aims to establish a common framework for data sharing within the European Union. It focuses on promoting fair access to and utilization of data across various economic sectors.[45]

The Data Act addresses key principles such as data sovereignty, cybersecurity, data privacy, consumer acceptance, and interoperability. It seeks to ensure that data generated within the EU is made available to users while safeguarding their rights to access and use such data. This legislation encourages data sharing and enhances trust in data intermediaries.

The Act is part of broader EU efforts to harness the potential of data, facilitate data exchanges, and enable greater participation in energy markets, among other sectors. It builds on the existing European regulatory framework for energy and includes provisions that govern data generated in the EU, emphasizing the right of users to access and share data generated by their products.

The Data Act is a significant step toward creating a common European energy data space, which could potentially unlock the participation of flexible energy resources in wholesale markets and enhance the integration of various digital solutions. This regulation also seeks to address data challenges in the context of energy digitalization, aligning with the EU's commitment to a sustainable and competitive digital future.

[44] Vitiello, S., Andreadou, N., Ardelean, M., & Fulli, G. (2022). Smart metering roll-out in Europe: Where do we stand? cost benefit analyses in the clean energy package and research trends in the green deal. Energies, 15(7), 2340.
[45] COM/2022/68 final

Broadly relevant guidelines in the European Union must be rigorously maintained, encompassing EU data sovereignty, cybersecurity, data confidentiality, consumer approval, and compatibility. This is why a unified European energy data environment is necessary in the Europe.[46]

Establishing a suitable data sharing structure for the energy sector has the potential to enable over 580 GW of flexible energy resources, fully leveraging digital solutions, to participate in wholesale markets by 2050.[47]

The current regulatory framework for energy in Europe has laid the foundation, and the Fit-for-55 proposals have introduced particular regulations regarding data sharing. Fit for 55 is an extensive legislative program with rules on the climate, transport and energy sector, that enables EU to reduce emissions by at least 55% by 2030 and helps us become climate-neutral by 2050.[48]

In a broader context, the proposed Data Act[49]establishes fresh guidelines on data utilization and accessibility for data generated within the EU, encompassing all economic sectors. It also elucidates users' entitlement to unrestricted access and use of data produced by their products, along with the right to share this data with external parties. Furthermore, the Data Governance Act,[50] strives to promote data availability by enhancing data-sharing mechanisms and bolstering confidence in data intermediaries.

In accordance with the Euro Action Plan for 2022, the European Commission established the "Smart Energy Expert Group" in March 2023, which falls under the purview of the "Data for Energy Working Group" (D4E). This collective endeavor will serve as a forum for fostering collaboration between the European Commission, Member States, and pertinent stakeholders from both the public and private sectors. Their collective aim is to contribute to the formulation of a comprehensive European framework for the exchange of data related to the energy sector.

The primary role of D4E is to enhance the coordination of data sharing at the European Union level, with a focus on various aspects of data exchange relevant to the energy domain. This encompasses delineating the foundational principles and ensuring a harmonized approach to diverse data-sharing priorities and undertakings. Additionally, D4E is poised to provide its support to the European Commission in crafting and implementing a unified European data space dedicated to energy. Consequently, the governance structure and fundamental components of this forthcoming data space will be collaboratively designed and overseen by these stakeholders.

D4E's primary focus will revolve around the creation of a collection of overarching European use cases for data exchanges within the energy sector. These use cases are pivotal in achieving the objectives outlined in the Green Deal and the Digital Decade. Initially, the high-level use cases to be tackled encompass flexibility services that cater to the energy markets and grids, the intelligent and bi-directional charging of electric vehicles, and the development of smart and energy-efficient buildings. This effort includes the enhancement of both private and public investments, as well as the implementation of the proposed solar rooftop initiative. Moreover, further high-level use cases may be considered as the process unfolds and the need arises.[51]

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[46] The European Data Strategy (COM(2020) 66 final) announced the creation of Common European data spaces in nine sectors, including energy

[47] Digitalisation of energy flexibility', report by the Energy Transition Expertise Centre (EnTEC), https://op.europa.eu/en/publication-detail/-/publication/c230dd32-a5a2-11ec-83e1-01aa75ed71a1/language-en

[48] COM/2022/552 final

[49] COM(2022) 68 final.

[50] COM(2020) 767 final

[51] COM/2022/552 final

D4E will also aid the European Commission in establishing the governance structure for the shared European data space dedicated to energy. This collaborative effort will be closely coordinated with the European Data Innovation Board and the evolving governance systems of other European data spaces to ensure consistent approaches and the integration of interoperable procedures right from the beginning. The unhindered flow of data within the energy data space, as well as between energy and other data spaces, is essential for creating additional value throughout European value chains. Additionally, the Data Spaces Support Centre will offer guidance to the emerging sectoral data spaces and assist in their establishment by providing relevant technologies, processes, and tools. These endeavors will adhere to the guiding principles and recommendations outlined in the European Interoperability Framework, in alignment with the forthcoming Commission proposal for enhanced interoperability cooperation.[52]

3.1.1 Estonia's position

Estonia as one of the leading countries towards green energy has implemented outstanding steps in both the Water and Electricity sector.

For instance, In the water energy sector,AS Tallinna Vesi,[53] the water utility company, has embarked on a smart meter installation project since this summer. Their ambitious plan is to replace all water meters in their service area with smart meters by 2026, eliminating the need for customers to manually report their readings. These smart meters will be offered to private individuals and businesses with direct contracts with this enitity. By contracting with Telia as a network provider, Tallinna Vesi will deploy these smart meters and transmit data via Telia's network, covering their 23,900 contracted customers.

The selection of smart meters was based on the results of a 2021 pilot project, with a focus on an NB-IoT[54] solution, known for its energy efficiency and broad coverage, negating the need for additional network infrastructure investments. These smart meters are equipped with SIM cards and are capable of independently collecting consumption data and transmitting it automatically to the water company, a significant convenience for customers.

This result of this transition can be enhancing user experience and data accuracy. It aligns with Estonia's wider adoption of IoT technology for remote data reading in various sectors. Notably, these smart meters can provide rapid and secure data transmission while also alerting the water company to any issues, including failures or water misuse. This project is part of a broader trend in Estonia, with several utility companies adopting similar NBIoT-based meters, including Haapsalu Veevärk and Pärnu Vesi. For users of smart water meters, monitoring their water consumption will become much more convenient in the future.

Estonia as one of the leading countries moving towards energy transition in electricity sector has managed to reach 100% implementation of smart meters.[55]Elektrilevi's infrastructure comprises 24,500 substations, around 61,000 kilometers of power lines, and roughly 650,000 intelligent meters. In 2016, Estonia became one of the early adopters in Europe to transition entirely to smart meters, a move that not only facilitated smart services but also improved overall utility management.

Based on confirmation from one of the board members at Elektrilevi, they have decided to explore more effective solutions to address failures and the associated costs, as well as customer dissatisfaction. Collaborating with Eesti Energia's IT department, they embarked on

[52] Digitalising the energy system - EU action plan. (2022). Communication from the commission to the european parliament, the european council, the council, the european economic and social committee and the committee of the regions. European Commission: Strasbourg, France

[53] https://tallinnavesi.ee/en/tallinna-vesi-starting-to-install-smart-water-meters-for-its-customers/

[54] NB-IoT is optimised for low data connectivity with maximum reach, energy efficiency and cost effectiveness.

[55] https://www.smart-energy.com/industry-sectors/energy-grid-management/estonias-unique-technology-prevents-nearly-1000-power-outages-a-year/

the development of predictive technology to anticipate and prevent failures before they result in damage.They have prioritized investments in building a weather-resistant grid and remote-controlled substations. The company's primary mission was to ensure a reliable power supply and competitive network pricing in a dynamic environment, marked by a tenfold increase in distributed generation within the past four years. In this rapidly changing landscape, effective data-driven investments are crucial for service provider, its customers, and the entire country of Estonia. To keep pace with these changes, maximizing the utility of existing data is key.

As a result of their development team's projects, they created NetFix, a tool designed to monitor the power grid's health and identify issues. Leveraging machine learning and drawing from a database of defect samples collected over two years, this solution can detect data patterns that signal defects by analyzing information from smart meters. It also offers an initial assessment of the underlying causes of these issues.parallel to this success they have used the NetFix technology as a preventative tool to speed up development and achieve maximum value from this technology.

The anomalies identified by this solution offer an extra layer of insight into the network's condition. Early detection presents an opportunity to prevent an anomaly from evolving into a critical failure and enhances the efficiency of investment planning by pinpointing where investments would have the most substantial positive effect on network reliability.

With this technology, they can proactively predict and resolve approximately 65% of all low voltage failures. This innovative technology has already enabled Estonia to save roughly half a million per year.

3.1.2. EU level

As of the present day, the advancement in executing concrete measures with regard to the digitalization of the energy sector, particularly the deployment of smart meters, exhibits a disparity among European nations.

Based on the latest information available to the JRC (The Joint Research Centre of the European Commission), as of the year 2014, Finland, Italy, and Sweden had already completed the smart meter roll-out for almost all electricity customers. However, Bulgaria and Hungary had not completed or communicated their Cost-Benefit Analysis (CBA) at that time.

For most countries that performed a CBA, including Austria, Denmark, Estonia, France, Greece, Ireland, Luxembourg, Malta, the Netherlands, Poland, Romania, Spain, and the UK, the analysis yielded positive results. In contrast, seven countries, namely Belgium, the Czech Republic, Germany, Latvia, Lithuania, Portugal, and Slovakia, either had negative or inconclusive CBAs, signaling a cautionary approach to a smart meter roll-out by the year 2020. [56]Germany, Latvia, and Slovakia, while not universally positive, did find positive results for specific segments.

In summary, European countries committed to a smart meter roll-out of approximately 200 million electricity metering points by the year 2020, with an estimated investment of around 35 million euros.[57]

Sweden, Denmark, Finland, Estonia, Spain, Norway, Luxembourg, Latvia, Italy, France, Malta, Slovenia, and the Netherlands are countries that have successfully achieved an impressive 80% penetration rate in their smart meter deployments.

Moreover, another four countries, namely Portugal, Austria, Great Britain, and Ireland, are actively advancing their smart meter rollouts, while others are still in their preliminary stages of implementation.

[56] Vitiello, S., Andreadou, N., Ardelean, M., & Fulli, G. (2022). Smart metering roll-out in europe: Where do we stand? cost benefit analyses in the clean energy package and research trends in the green deal. Energies, 15(7), 2340.

[57] Gangale, F., Vasiljevska, J., Covrig, C. F., Mengolini, A., & Fulli, G. (2017). Smart grid projects outlook 2017. Joint Research Centre of the European Commission: Petten, The Netherlands.

Nonetheless, it is crucial to note that six countries, namely Belgium, Croatia, Poland, Slovakia, Lithuania, and Hungary, are only in the initial stages of implementing their smart meter programs. In contrast, five countries, specifically Bulgaria, Cyprus, Czechia, Germany, and Greece, have made limited progress or have yet to adopt smart metering systems.
This initial status poses challenges in achieving the desired level of acceptance and integration. Consequently, the significance of fostering solidarity among European nations becomes increasingly paramount in addressing this situation.
A new legislation, the "Clean Energy for all Europeans" [58] which was accessed on 12 January 2022, was approved in June 2019 will influence the smart metering roll-out in the upcoming years, particularly in countries that have not completed the roll-out.
The EU's resolute and collective response, coupled with favorable conditions such as a mild winter and reduced energy demand in Asia, contributed to mitigating the effects of the energy crisis. Following the peak in energy prices in August 2022, natural gas prices declined to an average of EUR 44/MWh, while electricity prices dropped to an average of EUR 107/MWh from January to June 2023.[59]

3.2 Challenges of Smart Meter's development

3.2.1 Introduction to Smart meters and necessity of them

Smart meters as one of the main factors towards smart cities and achieving energy transition policies need to be defined and challenges regarding implementing them have to be addressed accordingly. Smart meters are measurement devices capable of recording energy consumption every half-hour and establishing communication with energy suppliers and network companies. Given that traditional meters lack this capability, the replacement of traditional meters with smart meters is an essential measure in facilitating the development of a future 'smart energy system.' A system that leverages information and communications technology to manage electricity generation and consumption in nearly real-time, with the goal of delivering a more dependable and economical electricity system.[60]
Apart from facilitating the implementation of a smart energy system, the government views smart meters as a means to lower energy suppliers' expenses and motivate consumers to be more mindful of their energy usage. This, in turn, can lead to reduced energy consumption and heightened competition within the market.
Here are the prospects and constraints of integrating Smart meters into energy (specifically electricity) systems and how they are going to help us achieve the green deal goals and smart cities.[61]

Several remarkable benefits arise from the implementation of smart meters, which can be encapsulated as follows:

- No meter reading: Not many people appreciate unexpected visits from meter readers or the responsibility of regularly recording their own readings. With a smart meter, the consumer is no longer supposed to go and search in a dark closet with a flashlight to check the numbers, as these convenient devices calculate their energy consumption and transmit the data to main supplier automatically which saves time and energy for both parties.

[58] https://energy.ec.europa.eu/topics/energy-strategy/clean-energy-all-europeans-package_en
[59] EU fossil generation hits record low as demand falls | Ember (ember-climate.org)
[60] Rolling out smart meters, National Audit office ,https://www.nao.org.uk/reports/rolling-out-smart-meters/
[61] https://theweek.com/news/world-news/957811/pros-and-cons-of-smart-meters

- Realtime monitoring: The "in-home display" (IHD) unit that accompanies a smart meter provides consumers with real-time insights into their energy usage. This allows households to track precisely how much energy different appliances are consuming, whether it's boiling water for tea or running a washing machine cycle.[62] This information empowers consumers to identify energy-hungry appliances and those that are more energy-efficient. Loop, an energy monitoring app, pointed out that even well-informed individuals and those who are mindful of savings may not be aware of which appliances are driving up their energy costs.[63]
- No estimated billing: Traditional meters often rely on estimated readings when consumers forget to submit their usage data. These estimates can be notoriously unreliable, resulting in unexpectedly high bills when the tariff period ends. In contrast, smart meters provide accurate, real-time readings of consumer's energy consumption to the energy supplier, whether on a half-hourly, daily, or monthly basis. This ensures that they will be billed only for the actual energy they use, offering greater certainty for budgeting and avoiding surprises.
- No cost for installation: Providers are not allowed to charge anything extra for changing old meters to smart meters or in case that a user is changing their smart meter to an updated version of it. Later we will discuss briefly about different types of meters and their specific details.
- Wider range of tariffs: Smart meters enable the creation of variable tariffs that can respond to changing market conditions. For example, during periods of high demand or low supply, tariffs can be adjusted to reflect the current energy landscape. Also, they enable dynamic pricing models that can adapt to market conditions, encouraging consumers to be more aware of their energy consumption and make informed choices based on pricing variations. With usage of newly evolved application that can turn devices on and off, this will be helpful for the households to run devices during the time that tariffs suit them the most.

On the other hand, certain concerns and challenges might emerge including:

- Data protection concerns: Privacy advocates are worried and advise consumers to be vigilant and exercise prudence in their data as 'energy usage collected by smart meters might be shared with third parties without customers' consent. While there are regulations preventing energy companies from sharing this data without explicit permission, the rules governing how tech companies can utilize such information are more intricate and may pose additional privacy concerns. On early stages of implementing smart meters, it was raised (yet not proven) that some might have the potential ability to hack the data and know when people are inside or out due to their energy consumption which may result in burglary.
- Obsessive checking: while enjoying the perks of having IHD on the other hand, there is a down track to the In-Home Display (IHD) Unit as some users find themselves constantly checking the monitor to see their household's energy usage. This frequent monitoring can lead to family conflicts, with tensions arising every time someone uses an appliance. In some cases, it may even cause family

[62] Krishnamurti, T., Davis, A. L., Wong-Parodi, G., Wang, J., & Canfield, C. (2013). Creating an in-home display: Experimental evidence and guidelines for design. Applied Energy, 108, 448-458.
[63] https://loop.homes/turn-down-and-save/

members to view the household's energy consumption obsessively and lead to strained relationships.

- Issues switching suppliers: Changing from the old unit (SMETS1 to SMETS2) will make the smart functionality become dumb. To be clear, currently, there are two types of smart meters available: SMETS1 and SMETS2. If you have a first-generation SMETS1 smart meter, switching suppliers could result in it losing its smart capabilities. In such cases, you would need to revert to manually reading your meter because the automatic readings would no longer be available. However, second-generation SMETS2 smart meters are designed to retain their smart features when you switch suppliers, thanks to their connection to a central wireless network accessible by all energy providers. Regrettably, it's estimated that more than 12 million of these meters were installed prior to the introduction of SMETS2, which offers better interoperability.[64]

To gain a more comprehensive understanding of these two prevailing and accessible metering systems, it is imperative to dissect the technical attributes of each.

SMETS 1 and SMETS 2 : SMETS stands for Smart Metering Equipment Technical Specifications. SMETS1, the initial generation of smart meters, was deployed starting in 2013. The problem with these meters was that they might lose their functionality if you switched to a different energy supplier, essentially becoming ordinary meters.

In contrast, SMETS2, the second generation of smart meters introduced in 2017, doesn't have this issue and can be used seamlessly with any energy supplier.

All being said, Still advantages of having smart meters are much more than the potential or existing concerns and considering the fact that already most of the European countries have reached the level of changing all meters the new Smart meters, we need to take practical steps to address possible issues and closely monitor the bottlenecks.

Despite the potential or existing concerns, the benefits of having smart meters outweigh the drawbacks. Since many European countries are already in the process of replacing old meters with new smart meters, it's essential to take practical steps to address any possible issues and carefully monitor any bottlenecks in this sphere.

The other technical challenge that was brough up is that based on latest report on clean energy technology development focused on clean energy technology observatory in 2023[65] , the most recent challenged is about fundamental enabling technologies: High Voltage Direct-Current (HVDC) connections and Smart Metering Infrastructure.

HVDC is scrutinized for its crucial role in facilitating the integration of renewable sources and ensuring efficient operations in a decarbonized grid. Simultaneously, Smart Metering Infrastructure is emphasized for its significance in upgrading the energy grid, given the proliferation of smart meter rollout initiatives globally.

3.2.2 Legal Challenges

3.2.2.1 Smart cities and possibility of forcing users

In UK The installation of smart meters is not compulsory, and individuals responsible for bill payment have the right to decline the installation of these devices, which can be done indefinitely. Nonetheless, energy companies have the authority to compel customers to replace their existing meters if they are considered safety risks or are malfunctioning. Customers who already possess smart meters have the option to request the removal of the

[64] https://www.nao.org.uk/wp-content/uploads/2018/11/Rolling-out-smart-meters.pdf

[65] De Paola, A., Andreadou, N. and Kotsakis, E.(2023), Clean Energy Technology Observatory: Smart Grids in the European Union - Status Report on Technology Development Trends, Value Chains and Markets, Publications Office of the European Union, Luxembourg, 2023, doi:10.2760/237911, JRC134988. https://ses.jrc.ec.europa.eu/smart-metering-deployment-european-union

device at any time. However, suppliers are permitted to impose charges on customers to cover the associated costs.[66]

Doctrine have pointed out their discussions in US divided into two groups: consent and third-party doctrine. One can argue that this might be also applicable in EU level. In the realm of US legal aspects related to the privacy business, a significant focal point lies within the Fourth Amendment of the US Constitution. This amendment articulates the following principle: "The people have the entitlement to be safeguarded in their individuals, residences, documents, and belongings, and such safeguard shall not be infringed through unjustified examinations and confiscations. Warrants will only be granted based on credible grounds, substantiated by a sworn statement, and they must distinctly specify the location to be examined and the individuals or objects to be seized."

The Fourth Amendment, as explicitly laid out in the constitution, serves to shield the populace from unwarranted intrusions by the government. Consequently, scholarly deliberations in the United States primarily revolve around assessing the likelihood of government excesses, where law enforcement agencies could uncover information about illicit activities or employ data as evidence. The US Supreme court has established a precedent: if individuals voluntarily disclose their data to third parties, they forfeit their right to data protection under the Fourth Amendment.[67]This significant ruling is commonly referred to as the 'third-party doctrine.'[68]

As a result, this doctrine raises the issue of whether consumers willingly disclose their smart meter data. Therefore, according to the third-party doctrine, consumers may not have a reasonable expectation of privacy regarding the data stored in electric utility records.[69]

The third-party doctrine has come under significant criticism, leading to questions about whether it should be substituted with a "doctrine of consent."[70]

This predicament arises from two fundamental assumptions of the third-party doctrine: Firstly, the presumption that individuals have a choice in disclosing information to a third party, and secondly, the belief that consent to share information with a third party remains valid even if that third party allows government access to the data without obtaining separate consent.[71]

There is an ongoing debate about whether such consent also implies consent for third-party actions, such as a home search. Additionally, the notion of consumers having a genuine "choice" in this context is questionable. For instance, when the decision is whether to install a smart meter or forgo retail electric service,[72]the legal validity of the consent may be less clear compared to other situations.

The argument posits that, instead of regulating the installation of smart meters, the focus should shift toward regulating the distribution of data.[73] The primary concern lies not in government intrusion but rather in the potential misuse of data by third parties after it has been collected. Therefore, it is strongly advisable to establish regulatory measures regarding installation, including the provision of opt-out options for consumers. It's worth noting that,

[66] https://www.telegraph.co.uk/money/consumer-affairs/smart-meter-why-say-no-get-one/#:~:text=The%20chief%20concern%20of%20smart,name%2C%20address%20or%20bank%20details .

[67] Smith v. Maryland, Decision of 20 June 1979, 442 U.S., 735 (743ff); see McLean, M. (2015). How Smart Is Too Smart: How Privacy Concerns Threaten Modern Energy Infrastructure. Vand. J. Ent. & Tech. L., 18, 879.

[68] McLean, M. (2015). How Smart Is Too Smart: How Privacy Concerns Threaten Modern Energy Infrastructure. Vand. J. Ent. & Tech. L., 18, 879.

[69] Ibid, 890.

[70] Ibid, 890.

[71] Ibid, 890

[72] Ibid, 893

[73] Ibid, 879, 901ff.

given the drawbacks and associated expenses, these opt-out mechanisms need not necessarily be provided free of charge.[74]

In Europe it was not mandatory to get a smart meter However based on the latest update from February 2023 seems that its becoming mandatory for all users: The statutory rollout schedule will be adjusted so that the old rollout deadlines, which are difficult to achieve for some consumer and producer groups (rollout by 2025 for a large proportion of metering points), will be extended. The law provides for mandatory rollout from 2025 for consumers below 100,000 kWh p.a. and generators below 100 kW. By the end of 2030, 95% of the metering points to be equipped must be fitted with smart metering systems. For consumers above 100,000 kWh p.a. and generators above 100 kW, the mandatory rollout will begin in 2028. Of the metering points to be equipped in this consumer or generator class, 95% must be equipped with smart metering systems by the end of 2032.

3.2.2.2. Security of data being assessed

The EU Charter of Fundamental Rights, article 7 states: 'Respect for private and family life. Everyone has the right to respect for his or her private and family life, home and communications[75], The EU Charter of Fundamental Rights, in article 7, safeguards the private life and homes of all natural persons.[76]Private life encompasses one's personal affairs,[77] and, notably, the right to privacy. While the protection of the home is separately mentioned in the Charter, it is also encompassed within the broader concept of private life,[78] it refers to the geographical area that exclusively pertains to the individual, as it is secluded from general access.[79]This also includes basements. In contrast, Article 8 of the EU Charter of Fundamental Rights pertains to safeguarding personal data, encompassing any data related to a natural person[80]. Nevertheless, the protections established under Article 8 solely extend to operations related to data processing.[81]

Because both articles are rooted in the European Convention on Human Rights (ECHR), specifically Article 8,[82] it must be acknowledged that when presenting this legal argument, distinguishing between Articles 7 and 8 of the EU Charter of Fundamental Rights can be challenging;[83] It can also be observed that the issues under consideration should be founded on a right derived from both Articles 7 and 8 of the EU Charter of Fundamental Rights. However, it should be noted that these articles are strictly interconnected. If EU legal standards do not explicitly encompass data processing, including permission for data collection, the only relevant consideration in relation to these standards would be the application of Article 7 of the EU Charter of Fundamental Rights.

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74 King, N. J., & Jessen, P. W. (2014). For privacy's sake: Consumer "opt outs" for smart meters. Computer Law & Security Review, 30(5), 530-539.

75 EU Charter of Fundamental Rights, Article 7 states: 'Respect for private and family life. Everyone has the right to respect for his or her private and family life, home and communications', Charter of Fundamental Rights of the European Union, OJ C 364, December 18th 2000, p. 1, 10.

76 Augsberg,I, (2015) in Von der Groeben,H/ Schwarze,J/ Hatje,A (eds), Art. 7 GRC marginal reference number 10 ,Europäisches Unionsrecht ,7th edn),

77 Bernsdorff,N(2014) in Jürgen Meyer (ed), Charta der Grundrechte der Europäischen Union (4th edn, Nomos 2014), Art. 7 marginal reference number 19;

78 Weber,A (2016) Kommentar Art. 7 marginal reference number 10, in Stern,K/ Sachs,M (eds), Europäische Grundrechte-Charta. (CH Beck)

79 Kingreen,T (2016) in Calliess,C/Ruffert,M(eds), Art. 7 GRCh marginal reference number 9, EUV/AEUV. Das Verfassungsrecht der Europäischen Union mit Europäischer Grundrechtecharta. Kommentar (5th edn, CH Beck 2016),

80 Bernsdorff,N(2014), in Jürgen Meyer (ed), Charta der Grundrechte der Europäischen Union (4th edn, Nomos 2014), Art. 8 marginal reference number 15; Augsberg,I, (2015) in Von der Groeben,H/ Schwarze,J/ Hatje,A (eds), Art. 8 GRC marginal reference number 7 ,Europäisches Unionsrecht ,7th edn)

81 Bock, K., & Engeler, M. (2016). Die verfassungsrechtliche Wesensgehaltsgarantie als absolute Schranke im Datenschutzrecht. Deutsches Verwaltungsblatt, 131(10), 593-599.

82 Bonnici, J. P. M. (2014). Exploring the non-absolute nature of the right to data protection. International Review of Law, Computers & Technology, 28(2), 131- 137

83 Lynskey, O. (2014). Deconstructing data protection: the 'added-value'of a right to data protection in the EU legal order. International & Comparative Law Quarterly, 63(3), 569-597.

One group of doctrine argue that article 8 of the EU charter of fundament rights applies here instead of article 7 of the charter, Due to the Energy Efficiency Directive, Article 9, Paragraph 2, Character (b), referencing the general data protection directive and the directive on privacy and electronic communications regarding the implementation of smart meters influenced by the Energy Market Directive, the later one regulates the acceptability of data processing.

However, the particular risk associated with the widespread introduction of smart meters lies not solely in the data processing itself, but in the ubiquity of meter installation. Consequently, legal issues arise even before the commencement of data processing, making EU Charter of Fundamental Rights, Article 7, applicable in this context.

The primary apprehension voiced by critics of smart meters, apart from cost considerations, pertains to potential privacy issues associated with the transmission of household data to energy suppliers. While smart meters transmit meter readings to energy suppliers, they do not retain personal information such as names, addresses, or banking details. Energy companies assert that only they have access to customer data, and this information cannot be disclosed to third parties without explicit customer consent.

According to Octopus Energy, even network operators are unable to access a customer's electricity data since it is encrypted before reaching them.[84] A privacy charter established by the Energy UK trade body suggests that organizations with contractual ties to a supplier may gain access to data collected from customers' meters. Moreover, under certain circumstances, the police or other entities, including industry bodies engaged in the prevention and detection of theft or fraud, may be granted access to customer data in accordance with data protection laws.

Customers using direct debit and encountering energy debt may face the prospect of having their smart meters remotely switched to prepayment mode, effectively discontinuing their energy supply without requiring a provider to enter the premises. Previously, energy providers seeking payment from customers who had failed to meet their bills could obtain a warrant to enter a residence and install a prepayment meter that necessitated topping up before using any energy.

However, smart meters can be remotely adjusted to the prepayment mode, enabling energy companies to bypass the legal system. Ofgem[85] emphasizes that it anticipates suppliers to utilize the remote switching feature in an equitable and appropriate manner and is actively overseeing supplier practices

3.2.2.3. Implication of General Data Protection Regulation (GDPR)

EU legislation is firmly dedicated to safeguarding personal data, as evident in Article 8(1) of the Charter of Fundamental Rights of the EU. The General Data Protection Regulation (GDPR), outlining the conditions and methods for processing personal data, carries extensive implications for the accessibility, trading, and sharing of such data. It establishes a legal structure for the digital economy, influencing the dynamics of markets and competition across personal data-related domains. Nevertheless, the GDPR, although rooted in prior EU legislation,[86] remains relatively recent and has not undergone thorough judicial examination. Despite the issuance of numerous guidelines by the Article 29 working party and its successor, the European data protection board, essential guidance concerning the commercial utilization of personal data is still pending. Considering legal data regimes in a more comprehensive manner, the GDPR's interpretation and application should factor in the

[84] See Octopus energy Website https://octopus.energy/policies/privacy-policy/

[85] OFGEM, stands for the Office of Gas and Electricity Markets, is Great Britain's independent energy regulator. They work to protect energy consumers, especially vulnerable people, by ensuring they are treated fairly and benefit from a cleaner, greener environment.

[86] Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 on the protection of individuals with regard to the processing of personal data and on the free movement of such data, Official Journal L 281 , 23/11/1995, p. 31.

ramifications for competition. Adopting a risk-based approach,[87] it could assess the presence of market power. Additionally, it could be beneficial for the European legislator to explore institutional models that can simultaneously address these concerns.

Furthermore, it could be valuable for the European legislator to contemplate institutional models that facilitate effective exercise of data sovereignty by data subjects while fostering competition, such as legislation pertaining to data intermediaries. Concurrently, competition law has the potential to safeguard and enhance individuals' choices, including considerations related to privacy policies.

Data plays a crucial role in various aspects of the modern economy, including online services, production, logistics, smart products, and artificial intelligence. The competitiveness of companies is increasingly reliant on their ability to access relevant data in a timely manner.

While it may seem desirable to promote the widespread use of data by as many firms as possible, this approach must be carefully balanced with other policy considerations. These considerations include the need to provide incentives for companies to invest in data collection and processing, the importance of safeguarding privacy, especially in the case of personal data, the protection of business secrets, and the potential anticompetitive effects of data sharing.

Given this complex landscape, it is essential to explore how the economics of data intersect with competition policy. It’s important to note that when discussing data and access to it, we must consider the wide variety of data types and their diverse applications across multiple dimensions:

Data can be classified into three categories: volunteered, observed, and inferred data. The category to which data belongs can impact a competitor's ability to independently collect or acquire the same information. Data can be collected and utilized in various forms, including individual-level data (such as data from a specific user or machine), bundled individual-level data used anonymously (like movie preferences used for collaborative filtering), aggregated-level data (e.g., profit and loss information), and contextual data (such as map information). Additionally, data can be generated at different frequencies, and data access may involve either historical or real-time data. It can also be classified as personal or non-personal. The General Data Protection Regulation (GDPR)[88] which is our main focus on this section, establishes a distinct framework for personal data, providing individuals with significant rights of control over it. Consequently, access to personal data and non-personal data should be considered separately due to the differing regulations and implications.

Finally, Data can be requested and employed for various purposes, such as offering complementary services to a product or service offered by a dominant company or for training algorithms, even in contexts unrelated to the data controller's primary business activities.

The importance of data and data access in terms of competition will always hinge on an evaluation of the particular market, the nature of the data, and its use within a specific case. While it's not feasible to discuss all scenarios in this summary, we find it crucial to emphasize the following points:

- Access to personal data: The GDPR has the potential to make it easier for users to transition between data-driven services by enabling data portability. Nevertheless, the effectiveness of the right to data portability depends on its interpretation and

[87] Maldoff, G., & Tene, O. (2018). Born in the USA: The GDPR and the Case for Transatlantic Privacy Convergence. *Colo. Tech. LJ*, *17*, 295.

[88] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC (General Data Protection Regulation) (Text with EEA relevance)

execution. We contend that, in accordance with the risk-based approach embraced by the GDPR, a more rigorous data portability framework can be mandated for dominant firms to address significant lock-in effects that may arise. The GDPR's data portability provision is not intended to establish an ongoing right to access data continuously or to request data interoperability across multiple services used by the data subject. Instead, it primarily offers the right to receive a copy of previously collected data. While it can facilitate users switching between services, it wasn't specifically designed to facilitate multi-homing or the provision of complementary services that often require continuous and possibly real-time data access. More stringent data access regulations, including data interoperability, may be imposed (i) through sector-specific regulations, particularly when data access aims to open up secondary markets for complementary services, or (ii) under Article 102 TFEU, but in such cases, the focus would be on dominant firms.

- Data sharing: Data sharing and pooling data can be good for competition because it can help companies access more data, create better products, and improve their services. However, in some cases, it can harm competition. For example, when companies don't let others access data or share sensitive information. It can also stop companies from improving their own data. The impact on competition depends on the type of data, how it's shared, and the companies involved. Right now, this is a new and not well-studied topic in competition law. We need to figure out the different types of data pooling and how they affect competition. This could be done through guidelines, decisions, or new rules in the future.
- Data Access under Article 102 TFEU:[89] When competitors ask for access to a dominant firm's data, it's essential to analyze if such access is absolutely necessary. We need to consider the legitimate interests of both parties and be cautious because not all data access requests are crucial for competition. In some cases, data access won't be necessary to compete, and authorities should avoid intervening. Article 102 TFEU might not be the best way to handle data requests if they are unrelated to the dominant firm's market. In such cases, market-based solutions or regulatory regimes could be better. However, in some situations, like when data is needed for complementary markets, duties to ensure data access may be imposed. Competition authorities or courts would need to set the access conditions, especially when requests are standard and conditions stable. When dealing with continuous data access (data interoperability), there might be a need for sector-specific regulation. Still, competition law can establish general requirements and guide potential regulatory approaches.
- Data and aftermarket doctrine: There are concerns that when machine producers restrict users' access to data generated by the machines, it might block off secondary markets. We suggest some ways to adapt the traditional competition law analysis of aftermarkets, which currently doesn't consider the unique aspects of data.

Before starting the discussion about GDPR in the data economy we have to know that based on World economic forums classification[90]on how individual-level, data is collected from a specific individual or machine data. Data is also acquired through three primary channels. Data can be volunteered, observed, or inferred. The first channel involves volunteered data,

[89] Official Journal 115, 09/05/2008 P. 0089 - 0089
[90] See World Economic Forum, Personal Data: The Emergence of a New Asset Class, January 2011

which is information intentionally contributed by a product user. This can include data like names, email addresses, images or videos, calendar information, reviews, and posts on social media. It also encompasses structured data generated directly by individuals, such as movie ratings or liking a song or post.

The second channel through which data is acquired is by observation. In the modern digital age, many activities leave a digital trace, and observed data pertains to behavioral information obtained automatically from the activities of a user or a machine. For instance, mobile phones track the movements of individuals, telematic data records the routes taken by a vehicle and the actions of its driver, websites log every click made by visitors, and third-party software monitors visitor behavior. Good example for this can be Instagram and TikTok feeds. In manufacturing, the Internet of Things has led to machines generating vast amounts of data on their operations, sensor readings, and current activities or production.

Lastly, there is inferred data, which is acquired through a non-trivial transformation of volunteered and/or observed data, while still pertaining to a specific individual or machine. This category includes profiles of shoppers or music enthusiasts, such as categories generated by clustering algorithms or predictions about a person's likelihood to purchase a product, as well as credit ratings. It should be noted that there is no distinct and clear line between volunteered, observed and inferred data

Another way of classifying the data is to take into account how they are being used, which based on this classification they will fall into four categories: non-anonymous use of individual-level data, anonymous use of individual level data, aggregated data, and contextual data.

The first category is the non-anonymous use of individual-level data. This includes any individual-level data, whether it's volunteered, observed, or inferred, that is used to provide a service to the individual. For example, a music app uses data about the songs a user has listened to in order to offer recommendations for new artists they might enjoy. Likewise, a farming app uses data from farm equipment to monitor soil conditions. Access to individual-level data is often crucial for switching services or offering complementary services.

The second category is the anonymous use of individual-level data. This includes cases where individual-level data is used in an anonymous manner. The primary purpose is not to provide a service directly to the individuals who generated the data. Examples of this category include using skin image data to train a deep learning algorithm for recognizing skin lesions[91] or using location data for trading purposes. In some cases, the insights or algorithms generated from this data may be used to provide improved services to some of the individuals who contributed data, such as collaborative filtering for better film recommendations. Access to a large dataset may be crucial for competing in this context.

The third category is aggregated data, which involves more standardized data that has been irreversibly aggregated. Examples include sales data, national statistics, and profit and loss statements of companies. Unlike the anonymous use of individual-level data, this aggregated data is standardized enough that access to the individual-level data is not required.

Lastly, contextual data refers to data that doesn't originate from individual-level data. This category typically includes data like road network information, satellite data, and mapping data.[92]

From a privacy perspective, individual-level data, especially when it relates to a specific person, is considered personal data. This data can either directly identify the person or be linked to them through a pseudonym. That being said If the system or mechanism effectively safeguards individual information, then the anonymous use of individual-level data would

[91] Esteva, A., Kuprel, B., Novoa, R.A., Ko, J., Swetter, S.M., Blau, H.M. and Thrun, S., (2017), "Dermatologist-level classification of skin cancer with deep neural networks", Nature, 542(7639), p. 115.

[92] Crémer, J., de Montjoye, Y. A., & Schweitzer, H. (2019). Competition policy.

likely be perceived as anonymous data by the users of the system. Consequently, it might not be subject to the provisions of the General Data Protection Regulation(GDPR)[93].When we are talking about the protection of personal data by GDPR we are referring to non-anonymous use of individual-level data which fall under the scope. Aggregated data is mostly anonymous and contextual data is nonpersonal, hence none of them are related to this protection and considered to be out of scope of the General Data Protection Regulation (GDPR).

3.2.2.4. Cyber security concerns

Implementing smart meters introduces several cybersecurity challenges and risks. Some of the key cybersecurity issues associated with smart meters include:

- Data privacy: Smart meters collect detailed data on energy consumption, and this information can be sensitive. Protecting consumer privacy is essential. Unauthorized access to this data could lead to privacy breaches.
- Data tampering and unauthorized access to data: Smart meters rely on data to generate accurate bills and monitor energy usage. They might face potential threats from attackers manipulating meter data. Such tampering could disrupt the energy supply and introduce bias into smart devices' decision-making processes, impacting users' smart living experiences.[94] Imagine a malicious actor gaining unauthorized access to a smart meter's database. This will enable malicious actors to alter consumption data, manipulating billing information and potentially causing financial losses for utility companies by reducing recorded energy usage. Additionally, this tampering poses risks to the reliability of the smart grid. If the utility company relies on accurate consumption data to balance and manage grid efficiently, manipulated information could lead to inefficiencies and disruptions. Inaccurate energy consumption data may hinder the development of energy-saving initiatives, affecting decision-makers' ability to implement effective measures for conservation and efficiency. The example underscores the necessity for robust cybersecurity measures to safeguard smart meter data and maintain the integrity of energy systems.
- Data transmission: Data transmitted between smart meters and data centers can be intercepted if not properly secured. This can expose customer data or allow attackers to inject malicious data. Providing a secure channel that can guarantee the safety of the data from end-user (consumer) to data analyzers is the best way to tackle this issue.as a good example of such platform we have pointed out NXM company in upcoming section.
- Denial of Service (DoS) attacks: Attackers might target smart metering infrastructure with DoS attacks to disrupt services. This could affect energy billing, grid management, or customer communications. For example, to prohibit administrators from accessing equipment, an attacker can modify network routes in network infrastructure or, more covertly, turn off remote process control equipment and subsequently harm the firmware.[95]
- Meter firmware vulnerabilities: Vulnerabilities in the firmware of smart meters can be exploited to gain control of the device, potentially enabling unauthorized access to the network.

[93] Regulation (EU) 2016/679 of the European Parliament and of the Council of 27 April 2016 on the protection of natural persons with regard to the processing of personal data and on the free movement of such data, and repealing Directive 95/46/EC, OJ L 119, 4.5.2016

[94] Shrivastava, R. K., Mishra, S., Archana, V. E., & Hota, C. (2019, December). Preventing data tampering in IoT networks. In 2019 IEEE International Conference on Advanced Networks and Telecommunications Systems (ANTS) (pp. 1-6). IEEE.

[95] https://www.ncsc.gov.uk/collection/denial-service-dos-guidance-collection

- Insider threats: Insider threats, such as rogue employees within utility companies, can pose a significant risk. These people are usually ambitious, resourceful and independent individual and driven to get a job done, even if it's illegal. They'll stay up all hours to find a way to circumvent legal rules that they perceive are obstacles to slow them down. Insiders with access to the network infrastructure can abuse their privileges easily.[96]
- Lack of encryption: Inadequate or weak encryption can expose data to eavesdropping. Secure encryption protocols are essential to protect data during transmission. One of real life examples that lack of encryption caused problem as data breach in Strathmore College data in 2018. It seems that over 300 student records were inadvertently posted on the Strathmore Secondary College intranet by an employee. Medical and mental health records of the students were included, including information about Asperger's syndrome, autism, and ADHD. The Guardian claims that they included a list of the exposed pupils' drugs in addition to any behavioral or learning issues.[97] Encryption could make it difficult for anyone who doesn't have proper credentials to access them and cause further issues.
- Phishing and social engineering: Utility employees, as well as customers, can be targeted through phishing and social engineering attacks to gain access to the network or sensitive information.
- Legacy systems: Legacy systems within utility companies may not have the robust security measures required for smart meter deployments. Integration with older systems. can slow down your rate of production significantly.
- Supply chain risks: Hardware or software components in smart meters may come from a global supply chain. Any compromise in the supply chain can introduce vulnerabilities.
- Regulatory compliance: Failure to comply with relevant cybersecurity regulations and standards can result in legal and financial consequences.

Utility companies and government agencies need to address these cybersecurity issues by implementing strong security measures, conducting regular security audits, and educating employees and customers about best practices. Smart meters should be designed and maintained with a focus on security to protect critical energy infrastructure and customer data.

Regarding the ways we can tackle cyber security issues related to smart meters and smart cities on a bigger scale, by investing and supporting cyber security protecting platforms we can help this evolution happens faster and more secure. For instance, NXM [98]serves as a prime example of autonomous security, demonstrating the feasibility of establishing secure platforms.

This security platform claims to design and use autonomous security technologies in order to make all the phases from collecting data to using data again, to a blockchain based system and guarantee the security. It can be applied from autonomous vehicles to smart cities, homes, and offices, it is imperative to have unwavering confidence in the safety and security of the devices we rely on. These kinds of secure platforms specialize in developing autonomous security software, enabling devices to seamlessly collaborate without requiring human intervention. Their system is designed to be compatible with a wide array of

[96] https://www.pnjtechpartners.com/rogue-employees-and-how-to-stop-them

[97] https://www.theguardian.com/australia-news/2018/aug/22/melbourne-student-health-records-posted-online-in-appalling-privacy-breach

[98] https://www.nxmlabs.com/how-we-work

microchips. One of its key advantages is facilitating brand manufacturers in automatic compliance with data privacy regulations by isolating device data from personally identifiable information right at the chip level. As a result, all data is rendered trustworthy through anonymization and segmentation at the source, significantly reducing the expenses associated with developing artificial intelligence systems and other critical applications.
For instance, we know that for each homeowner, security and trust are inseparable and having such platforms with ability of autonomous security can offer unparalleled protection against cyber threats. Home locks, automated doors ,IoTs ,temperature control and home alarm system are some of the examples that this system can apply and used daily. Take the example of a smart home lock, if we have a platform that empowers devices to generate their unique machine identities upon activation, these identities are securely stored in memory and shared on a private ledger, visible to all other devices. The homeowner's smart lock app establishes its unique identity, creating a trusted communication link between the devices, and eliminating the need for passwords or security certificates.

The result they want to obtain is to have all data encrypted, anonymized, and securely stored in the cloud. As a homeowner approaches, the lock verifies their identity and unlocks automatically. Importantly, hackers face daunting challenges in gaining unauthorized access. This is because each device functions as an intelligent node within a fully distributed peer-to-peer network, operating based on machine consensus. As a result, there is no single point of failure that could lead to a network-wide breach.

Implementing such data-protecting technologies can assure both data holders to share their personal information safely and makes users and third parties able to access all necessary data without concern about cyber-attacks using trustworthy AI.

3.2.2.5. Competition law

To delve deeper into the implications of data for competition, we need to explore the economics of information. Within this context, we should consider two key facets of information.

The first important aspect of information is its value to the parties that own or control it,[99]whether directly or indirectly. From a legal perspective, there are no recognized general property rights in data at the national level within EU Member States or at the EU level. Instead, the ability to control data de facto grants the possessor of data the authority to exclude others from its use or to provide (potentially conditional) access to it.

This information about owning or controlling the data, can empower economic agents to make more informed decisions. From the perspective of an agent, the value of this information is determined by the agent's willingness to pay for the improved quality of decision-making it provides, which is always positive since information can be discarded if not needed. However, it's worth noting that from a societal standpoint, the acquisition of information by malicious agents can have harmful consequences.

Secondly, the value of information lies in its ability to be duplicated at a very low cost. This leads to various market imperfections that have been extensively studied in economic literature. One significant imperfection is the inherent conflict between the ease of low-cost reproduction and distribution of information, which often leads to the idea that information "wants to be free," and the necessity to provide incentives to those who collect (volunteered and observed) or produce (inferred) the information.

The desire to monopolize data comes primarily from the fact that the Incumbent offers a certain technology to users and records their feedback as data. This feedback is an "asset".

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99 Stiglitz, J. E. (2000). The contributions of the economics of information to twentieth century economics. The quarterly journal of economics, 115(4), 1441-1478

which no longer have competitors and Incumbent tries to have only themselves as a power over the market which causes the high possibility for monopoly.

Governments have established intellectual property rights to encourage the creation and sharing of certain types of information. However, there are no comparable Intellectual property rights for data in its raw form.

Incentives for monopolizing data also apply to information related to individuals, companies, or data from machines. Meaning that offers given by third parties can be personalized better if they have monopoly over the individual –level data. However, in these cases, the information might be accessible to others through the data subject, either directly or through the right to data portability. For instance, a music platform can enhance the user experience by providing personalized recommendations based on the user's past behavior and the behavior of many other users. Indeed, smart meters and the data they provide can enable third parties or energy providers to offer highly tailored and personalized energy plans to consumers. This could result in consumers receiving numerous recommendations and advertisements based on their electricity usage patterns, family size, preferred payment methods, and more. The data collected by smart meters allows for a more customized and efficient approach to energy products, services, and offerings.

Furthermore, Access to anonymous individual-level data can be valuable for various purposes, such as gaining insights into systems through statistical analysis, creating aggregated data, or training machine-learning algorithms. These trained models can then be applied to provide improved services to the individuals who initially contributed their data or for entirely different uses. Anonymous data access can have broad and versatile applications. Access to individual-level data offers clear benefits and is generally uncontroversial. However, the advantages of anonymous access to individual-level data require more in-depth analysis. Some people believe that data is just one component in developing an AI algorithm. Other factors like computing power, software, and skilled engineers also play a role.

From the perspective of competition policy, it's crucial to assess whether any of these factors act as barriers to entry in markets. Fortunately, the cost of computing power has significantly decreased, and the availability of cloud computing allows for flexible and affordable access to the resources needed for AI development. As a result, computing power is not a significant bottleneck that hinders entry into these markets. The majority of AI software tools are either open source or have open-source versions accessible to the public. Prominent examples of such software include TensorFlow, Keras, Scikit-learn, and Torch. Given their widespread use by major corporations and academic researchers, software availability does not pose a significant barrier to entry.

As one of key challenges mentioned earlier, we need to highlight the need for a comprehensive assessment of competition law in the context of new digital platforms. To emphasize the diversity of these platforms, we should know that it can be embedded within larger ecosystems, and the necessity of analyzing their competitive dynamics on a case-by-case basis. here we outline a two-step approach for addressing this issue.

First, it discusses the varying roles of network externalities in different platform types. Then, it delves into the distinct functions of data within these platforms.

The first category of platforms are content providers offering freely accessible content to users and generates revenue by selling user attention to advertisers. Examples include search engines, gaming platforms, and news sites. These platforms rely on the quality of their content to attract users, and in turn, advertisers are drawn to these platforms due to their user base. Consequently, these platforms are motivated to keep their user’s content, although the quality and competition may not always be optimal.

i) Single sided platforms: Social media platforms operate differently. Users are drawn to these platforms primarily because of the presence of other users. Advertisers, in turn, are attracted to these platforms due to their large user bases. In this context, the key challenge in competing with social media platforms lies in dealing with network externalities**,** particularly the single-sided type. These network effects make it challenging to displace social media platforms from their dominant market positions.

ii) "Matching" sites for reservations or marketplaces are genuine two-sided platforms. Users on one side are attracted by the presence of users on the other side. These platforms usually generate revenue by charging fees to one or both sides. Their market positions are once more reinforced by network externalities, with the quality of their matching algorithms and the interactions between users being critical factors.

Access to individual data, which is not anonymous, including historical and ongoing observed data, is often required to provide a valuable service to an individual or significantly enhance its quality. Within platform contexts, data can create a positive feedback loop, where having control over some of an individual's data enables the platform to gather even more data. This feedback loop can be established through data interoperability reciprocity agreements, where all interconnected companies are required to share the collected data with the platform. This allows the platform to accumulate data on the user's activities beyond the platform and centralize this information.

Within energy systems, the use of private data Application Programming Interfaces (API) between services that are part of the same system can provide a significant advantage, particularly in large and diverse systems with numerous services. This advantage is especially beneficial for services that are part of the system.[100]

Big platforms tend to diversify and furnish their products and encourage others to use their platforms which gradually reduces the number of platforms and leads to monopoly. The distinction between traditional industries and the digital world becomes apparent when we consider that price and product innovations are two critical dimensions of competition that typically lead to reduced prices. However, in the digital realm, these dimensions often have less impact on pricing.

When we take a deeper look into competition among energy platforms, we can see that both sides of a two-sided platform are not charged the same. The reason is that the value of keeping each player in this platform is not the same for the platform owner. For instance, this also applies even to newspapers and magazines, that historically charged readers less than the actual cost because a larger readership attracts more advertising revenue. In some cases, this approach extends to providing free services to one side of the market, similar to how TV stations have traditionally operated.

Each platform, along with other interconnected components, constitutes an ecosystem. These ecosystem services are linked to one another through private APIs that offer services to their respective platforms. However, these APIs exclusively cater to services within their own platform. Consequently, some services gain an advantage by utilizing APIs that provide them with data, while others are left at a disadvantage. This situation can stifle competition.

If we compare innovations that might happen in different types of platforms, we should say that digital industries have very different innovation habitude:

First, it is more fluid and combines new features, processes, and technologies in a unique and innovative manner to support a business concept. Second, it is an ongoing process with

[100] Andrei Hagiu, Bruno Jullien and Julian Wright, "Creating platforms by hosting rivals" which present many examples and an interesting analysis of this strategy

products constantly evolving and undergoing revisions. Third, it is less structured, often developing features concurrently with the innovation's implementation and testing. Finally, it places less emphasis on formal intellectual property protection like patents or copyrights. Instead, the focus is on being the first to introduce a service or product to the market and building a user base to reap the benefits of innovation.

As part of energy system digitization, network externalities make entry for the early-stage competitors difficult. They analogize this to the “chicken and egg problem”[101] as part of contestable market theory that was first introduced by William Baumol.[102] Platforms require a significant amount of data to operate effectively. However, acquiring more data also necessitates attracting more users to the platform, which can be challenging. The platform desires both data and users, but users are often reluctant to switch to a new platform. Some platforms attempt to incentivize early adopters to join by offering subsidies. Nonetheless, this may not fully resolve the problem, and existing platforms may continue to dominate the market.

The other issue that might arise is when the service provider as data holder is the only provider that is supported by the government of that specific member state or they get some state aid for this service of collecting data and analyzing this. Apart from the fact that will directly discriminate other providers to offer same system, will also lead to potential possibility of breach in article 106 TFEU. Article 106 of the Treaty on the Functioning of the European Union (TFEU) pertains to the energy sector and competition. It outlines the principles that should be followed regarding public undertakings, namely, that they should not be favored over other companies in a manner that distorts competition. It also sets guidelines for determining when public service obligations may be imposed and how compensation should be calculated when such obligations are imposed.

Article 106 TFEU[103] states that:

"1. In the case of public undertakings and undertakings to which member states grant special or exclusive rights, member states shall neither enact nor maintain in force any measure contrary to the rules contained in the Treaties, in particular to those rules provided for in Article 18 and Articles 101 to 109.

2. Undertakings entrusted with the operation of services of general economic interest or having the character of a revenue-producing monopoly shall be subject to the rules contained in the treaties, in particular to the rules on competition, insofar as the application of such rules does not obstruct the performance, in law or in fact, of the particular tasks assigned to them. The development of trade must not be affected to such an extent as would be contrary to the interests of the union.

3. The commission shall ensure the application of the provisions of this article and shall, where necessary, address appropriate directives or decisions to member states."[104]

In essence, Article 106 TFEU establishes the framework for ensuring that state-owned enterprises and those with special rights do not impede competition and that they comply with EU rules while still fulfilling their designated public service obligations.

In light of the aforementioned considerations, should a member state grant an exclusive monopoly to a particular service provider or take actions that facilitate the establishment of such a monopoly by impeding the entry of other competitors into the market, it may potentially run afoul of the provisions laid out in Article 106 of the treaty on the functioning

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[101] Caillaud, B., & Jullien, B. (2003). Chicken & egg: Competition among intermediation service providers. RAND journal of Economics, 309-328.

[102] Baumol, William J. (March 1982) "Contestable Markets: an Uprising in the Theory of Industry Structure", American Economic Review, vol 72 (1), pp. 1-15

[103] Official Journal 115 , 09/05/2008 P. 0093 - 0091

[104] Official Journal C 115, 9.5.2008. P. 0093 - 0091

of the European union (TFEU). Such actions would contravene the principles of fair competition within the European union's market.
As a result, it becomes evident that in certain EU member states, energy transition stages remain inadequately developed. This circumstance could be a significant contributing factor, as the absence of competitive pressures hinders the expeditious and necessary evaluation and evolution of these systems to meet the demands of the market, which is contrary to the ethos of robust competition enshrined in EU law.
In essence, any undue favoritism or restrictive practices that undermine a level playing field in the market and hinder the participation of other potential entrants not only risk violating the stipulations of article 106 TFEU but also impede the timely adaptation and advancement of services in certain EU countries. This ultimately jeopardizes the overarching goal of fostering a competitive and innovative landscape in the European union.
The objective of competition policy, as articulated in protocol no. 27 concerning the internal market and competition, which is attached to the treaty on the functioning of the EU ("TFEU"),[105] remains applicable in the digital age. This objective persists in its aim to create and safeguard "a system that prevents the distortion of competition."
Within the European union, competition rules are fundamentally designed to safeguard and promote the interests and well-being of consumers (Sot. Lélos kai Sia case[106]) The European Court of Justice (ECJ) has consistently held that article 102 TFEU is directed not only at practices that can harm consumers directly but also at those that can be detrimental to consumers by affecting the integrity of effective competition within the market structure. The question here is whether, in the current digital landscape where prices tend to approach zero, is there any contradiction with the primary goal of EU competition law, which aims to reduce harm to consumers.
First of all, we need to define what can be considered as harm to consumers. In the context of EU competition law, the concept of harm to consumers encompasses both end consumers (final consumers) and consumers at intermediate levels. This includes manufacturers who use products as inputs or distributors of goods or services. That being said customer welfare includes all users in a general context
Consumer harm theories can encompass a variety of adverse consequences, whether they affect pricing, production, options, quality, or innovation. In essence, the consumer welfare standard simply emphasizes that the preservation of competition is warranted when it can be shown to protect actual individuals from genuine harm. harm can be anything not only the price for the final user and In the digital economy, the impact on quality and, particularly, on innovation holds greater significance. Smart meters that are usually being offered for free are one of these platforms that fall under Platform to Consumer P2C category and are so dependent on innovation and quality rather than price.
However, This holds true for other segments of the digital economy as well, such as platform-to-business ("P2B") and business-to-business ("B2B") platforms, where the extent of innovation plays a pivotal role in shaping the productivity of the European economy.
Yet another potential obstacle that has the potential to culminate in a monopoly arises when government authorities provide state aid to entities responsible for the implementation, upkeep, and expansion of smart meters and the associated infrastructure integral to smart cities. Given that a substantial portion of these substantial projects necessitates significant financial resources and capabilities, it is common for the entities undertaking these responsibilities to have affiliations with the governing member state.
While Article 107(1) of the Treaty on the Functioning of the European Union (TFEU) does allow member states to assist entities in securing the necessary funds for the execution and

[105] Official Journal C 115, 9.5.2008.
[106] Case C-468/06, Sot. Lélos Kai Sia, EU:C:2008:504, at para. 68

enlargement of their services, it is imperative that such assistance aligns with the specific provisions outlined in the article. Consequently, any deviation from these stipulated criteria may raise concerns regarding the potential emergence of a monopoly, underscoring the importance of adherence to the delineated points within the article to ensure compatibility with regulatory frameworks.

State aid, as defined by Article 107(1) of the Treaty on the Functioning of the European Union (TFEU), is contingent upon several conditions. Firstly, it necessitates an intervention by the State or through state resources. Secondly, it must bestow a selective economic advantage upon the recipient. Thirdly, there should be an element of distorting or threatening to distort competition. Lastly, the intervention must be capable of influencing trade between Member States. The failure of any of these conditions implies that a particular undertaking enjoys privileges granted by the government of the member state, potentially leading to a monopoly within the market.

This principle extends to the realm of smart meters. If a specific undertaking secures preferential treatment from the member state government, whether by being designated as the primary entity responsible for the majority of smart meter infrastructures, receiving public subsidies to provide services, or exerting indirect control over tenders during their participation in bidding processes alongside potential suppliers, there exists a considerable risk of that undertaking establishing a monopoly. Such scenarios underscore the significance of ensuring adherence to the outlined conditions to prevent the emergence of monopolistic practices.

In the legal case denoted as Astra vs Spain (2014/489/EU), SES Astra S.A (hereinafter referred to as Astra), holding the esteemed position of being the pioneering satellite platform operator in Europe, filed a formal complaint addressing the issue of state aid provided by the Spanish authorities. Astra's assertion in their complaint revolved around the contention that the Spanish government engaged in the provision of unlawful state aid, specifically in the context of transitioning from analogue television to digital television in Kess urbanized and remote areas of Spain. Astra articulated the argument that the structured scheme amounted to aid that was neither notified nor in compliance with legal requirements, thereby leading to a discernible distortion of competition dynamics between satellite-based and terrestrial broadcasting platforms.

In the filed grievance, they explicitly state that Spain violates the principle of technological neutrality by favoring terrestrial transmission as the exclusive pathway for the digitization process. During the nascent stages of the television industry, the sole available platform was the analogue terrestrial one. However, with technological advancements, an array of alternatives has surfaced in the market, encompassing the satellite platform, cable platform, and the relatively recent addition of IPTV. The latter leverages broadband connections for the transmission of TV signals.

In the context of terrestrial broadcasting, the television signal is transmitted from a TV studio to a transmission center (head-end), typically owned and managed by a network operator. Conversely, in satellite broadcasting, the signal is dispatched to a transmission center (head-end) and subsequently conveyed to the satellite, from where it is broadcast to households. An alternative approach involves sending the signal directly from a TV studio to the satellite, provided that the TV studio is equipped with the necessary devices.

For the viewer to access satellite broadcasting, it necessitates the installation of a satellite dish and a decoder. Expanding satellite coverage in a particular region requires the deployment of ground equipment within the customer's residence. From a geographic perspective, the satellite platform has the capability to cover nearly 100% of the Spanish territory. In contrast, the terrestrial platform provides coverage for approximately 98%. At that time, Spain was divided into three distinct areas. Area I encompassed the vast majority of the Spanish population, with broadcasters bearing the costs of the switchover—96% of the territory for private broadcasters and 98% for public broadcasters.

As broadcasters bore the cost there was no need for state aid in this area. Area II: which were less urbanized and remote areas.2.5% of population were living there and switch to digital technology required upgrading the existing transmission centers and building new ones. Significant investments were necessary.

In Area II, private broadcasters lacked sufficient commercial interest to offer services and declined to cover the costs of digitization. Consequently, Spanish authorities implemented a state aid scheme to upgrade existing transmission centers and construct new ones. This initiative aimed to ensure that residents, who had previously accessed private and public channels via analog terrestrial TV, could continue receiving all channels through Digital Terrestrial Technology (DTT). Meanwhile, in Area III, the topography posed challenges for terrestrial TV service, leading to its provision via satellite by Hispasat, another prominent satellite platform.

Throughout the implementation and maintenance process, autonomous communities and town councils directed funds to the beneficiaries, drawing primarily from the central budget and, to a lesser extent, from regional and local budgets. Spain did not contest the predominant origin of funds from the central budget. It's essential to note that the measure went beyond a simple fund transfer between administrations, as the funds were ultimately utilized for the development of the Digital Terrestrial Television (DTT) network by entities engaged in economic activities.

In the course of the commission's investigation, it was determined that the financial assistance in question originated directly from the State budget as well as from the budgets of specific autonomous communities and local entities. Notably, the continuous aid was sourced not from the central State budget but directly from the budgets of the Autonomous Communities. As a result, it is attributable to the State and entails the utilization of state resources.

The court affirmed that specific beneficiaries directly received financial support for the enhancement and expansion of their network, coupled with ongoing assistance for the operation and maintenance of said networks. However, autonomous communities adopted diverse measures to accomplish this. Primarily, some opted to entrust public undertakings with the responsibility of extending coverage. These undertakings would either conduct tenders for the extension of coverage, entrusting the task to the winning tenderer, or personally execute the extension after procuring the necessary hardware. Consequently, these public undertakings were positioned to operate the DTT network in those areas due to the public subsidy, thereby enabling them to utilize the novel infrastructure to provide additional services, such as WiMax (wireless broadband standards that can furnish fixed or mobile broadband), digital radio, and mobile television. Owing to these economies of scope, the DTT network operators are presented with opportunities to generate income from the publicly financed infrastructure. This scenario underscores the complex legal landscape involving public subsidies, infrastructure deployment, and the provision of diverse services within the framework of autonomous communities and their respective legal frameworks.

Another avenue pursued by the Autonomous Communities involved the initiation of tenders at the regional level for the expansion of the DTT. Contrary to Spain's assertions, the Commission contends that Abertis, the principal operator of the terrestrial network, along with other companies, engaged in these tenders not solely for the procurement of equipment but also for the extension of coverage. Consequently, the victors in these tenders gained a competitive edge over other network operators who were precluded from participating in the selection process. Additionally, certain autonomous communities allocated funds to town councils for DTT coverage. Throughout the investigation, it came to light that local corporations functioned as network operators, with many of them being listed under CMT (Comision del Mercado de Telecomunicaciones), the Spanish regulatory authority, as network operators, thereby enabling them to effectively execute network extensions through the tendering process. This multifaceted approach adopted by Autonomous Communities underscores the nuanced complexities of regulatory procedures, competitive advantages, and the intricate interplay between public and private entities within the framework of DTT expansion initiatives.

The preferential treatment conferred by the measure, encompassing the continued state aid, distinctly benefits network operators within the broadcasting sector, specifically those engaged in the terrestrial platform market. The regulatory framework establishes technical eligibility criteria that exclusively align with the capabilities of terrestrial technology. Furthermore, solely those undertakings operating within the terrestrial platform market are recipients of the ongoing aid designated for network maintenance and operation. Consequently, network operators involved in alternative platforms, such as satellite, cable, and IPTV, find themselves excluded from the purview of this measure. This delineation emphasizes the sector-specific and technology-driven nature of the advantage, accentuating the regulatory selectivity inherent in the legislative framework.

In accordance with the jurisprudence of the European Courts, if financial assistance or aid derived from state resources serves to enhance the competitive standing of an undertaking in contrast to other undertakings engaged in intra-Community trade, the latter must be deemed impacted by said aid.[107]

Network Operators are active in a sector where trade occurs among Member States. Both Abertis and the complainant, Astra, are components of international corporate groups. Consequently, the initiative involving the deployment, operation, and maintenance of DTT in Area II influences trade between Member States. Member States have the authority to employ aid to address a particular market deficiency or to uphold social and regional cohesion.[108]

Nonetheless, it is imperative to establish, in each distinct circumstance, that the aid in question is a fitting instrument to tackle the issue, is restricted to the minimum necessary, and does not unduly distort competition. Public intervention is warranted in two scenarios: when overarching public interests are in jeopardy and when market inadequacies hinder the delivery of collective welfare. Furthermore, public interest should be substantiated by a comprehensive market analysis.

Finally, the court reached the determination that the financial assistance extended by Spain, including aid provided by the Spanish Autonomous Communities and local corporations, to terrestrial network operators for the enhancement and digitization of their network aimed at offering free-to-air TV channels in Area II, qualifies as aid within the purview of Article 107(1) of the Treaty on the Functioning of the European Union (TFEU). Significantly, this aid was deemed incompatible with the common market, primarily due to the non-compliance with the criteria of technological neutrality. Furthermore, the court underscored that the aid in question had not been duly notified to the European Commission, as mandated by Article 108(3) of the TFEU. Consequently, the implementation of the aid lacked the requisite authorization from the Commission, rendering it unlawfully put into effect. In light of these findings, the court ruled that the aid must be recovered from the terrestrial network operators involved in the undertaking. This legal pronouncement emphasizes the imperative of

[107] T-55/99, Confederación Espanola de Transporte de Mercancias (CETM) v Commission of the European Communities, [2000] ECR II-3207

[108] Less and better target state aid: a roadmap for state aid reform 2005-2009, COM(2005)107 final.

adherence to regulatory procedures, including notification requirements and compliance with technological neutrality, to ensure the compatibility of state aid with the common market.

Another illustrative instance substantiating the potential for a monopoly to ensue is evident in a legal case heard by the European Commission Court of Justice concerning digital broadcasting in Italy. Specifically, the case in question is denoted as Case T-177/07 and its subsequent appeal, C-403/10P. The focal point of these legal proceedings pertains to the state aid extended by Italian authorities to Mediaset SpA, a prominent Italian-based media company and one of the largest broadcasting entities in the nation.

In this legal dispute, Mediaset assumed the role of the appellant, contesting the European Commission's determination that a subsidy measure, implemented by Italy for the benefit of Mediaset, was incompatible with the common market. Mediaset's contentions centered on the assertion that the General Court erred in its classification of the measure as state aid, and the analysis of the measure's objectives was purportedly flawed. However, the Court of Justice of the European Union (CJEU) rejected both of these contentions.

Furthermore, Mediaset contended that no distortion of competition had transpired. Nevertheless, the CJEU upheld the General Court's conclusion, affirming the presence of a distortion of competition, and ultimately dismissed the appeal case. This legal precedent underscores the regulatory scrutiny applied to instances of state aid, emphasizing the potential implications for competition in the common market.The same principle can be applied in the context of smart meters, as demonstrated by the commission. Any illicit state support can lead to a monopoly, and even competitive tenders may be susceptible to corruption. If a member state chooses to grant a particular company a privilege, either directly or indirectly through state aid, there is a significant likelihood of establishing a monopoly in the market.

It can be argued that such market control might enable the company to disregard end users' preferences regarding sharing data with third parties. This could result in numerous threats of data breaches, with unauthorized and malicious cyber attackers gaining access to the data. For example, if the entity responsible for implementing and overseeing smart meters decides to share user data exclusively with a home appliance manufacturer, two primary challenges may arise. Firstly, there is the risk of a data breach, where consumers might be inundated by the manufacturer with additional appliances tailored to their energy usage patterns. Secondly, if the entity refuses to share legitimate data with other data processors or companies in the same market, it could lead to a secondary level of monopoly, granting Company A the privilege to offer products based on consumer data.

4 CONCLUSION

Presently, the energy transition and the EU Green Deal represent ongoing initiatives subject to continuous regulation. However, individual EU member states are adopting varied approaches to achieve the decarbonization goal, exhibiting divergent paces of implementation. To effectively realize this objective, a unified course of action is imperative. Firstly, enhancing consumer comprehension of the plan's nature and specific features is crucial. Convincing consumers to willingly share information and collaborate with regulators to expeditiously transition to the new generation of meters constitutes a primary step. This, in turn, facilitates data collection, providing enhanced insights into energy shortages and potential capacities within each member state, thereby contributing to fulfilling the requirements of Action Plan 2022.

Secondly, establishing a fair and non-discriminatory market within member states is vital. This involves allowing multiple suppliers to enter the market, thereby accelerating digitization and digitalization. Currently, a prevalent practice in many countries involves a single service provider managing smart meters, acting as the data holder and distributing data to third parties, resulting in a monopolistic scenario. Encouraging multiple providers, ensuring data safety, and aligning with regulations fosters internal market competitiveness, ultimately enabling the delivery of services in a more cost-effective and efficient manner.

Thirdly, the potential implications of sharing data with third parties need comprehensive consideration. Instances, where third parties utilize consumer data to tailor products and services based on household consumption data, pose challenges to GDPR and household privacy. Addressing these concerns is imperative to ensure compliance with privacy regulations and uphold the rights of households.

Finally, allowing consumers to trade excess energy in the market necessitates appropriate regulation. When consumers choose to sell excess energy rather than storing it for future use, regulatory frameworks must govern this process. Determining which organization should address arising issues and establishing the extent of support for each party is essential in this context.

In March 2023, the Commission introduced a targeted reform addressing the design of the electricity market [109]and the Wholesale Energy Market Integrity and Transparency Regulation.[110] The overarching objective is to enhance the cleanliness and competitiveness of the EU's industry, incorporating structural measures to both empower and safeguard consumers. Additionally, the reform seeks to diminish the prevailing influence of gas on electricity prices. This proposed initiative aims to foster competitive markets and ensure transparent price setting. Through the reinforced role of the EU Agency for the Cooperation of Energy Regulators (ACER), consumers and industries within the EU will enjoy heightened protection against market manipulation and abuse. The co-legislators are working towards concluding negotiations by the conclusion of 2023. Prior to the energy crisis, the Commission had already set forth numerous measures to secure widespread participation in the green transition. Notably, a significant initiative in this regard was the introduction of the Just Transition Mechanism.[111]

The progression from the conceptualization of energy transition to its tangible implementation involves various strategies, the efficacy of which is contingent upon the European Commission's influence over each member state. Beyond the Commission's action

[109] COM(2023) 148 final, SWD(2023) 58 final.

[110] COM(2023) 147 final.

[111] The Just Transition Mechanism consist of three pillars: the Just Transition Fund (Regulation (EU) 2021/1056), a public sector loan facility, and a scheme under InvestEU

plans, the establishment and alignment of internal regulations play a pivotal role in realizing the ambitious 2050 green energy objectives.

Thus far, the EU has advanced in achieving energy autonomy, bolstering security and safety measures, and positioning itself for an equitable and economically viable global transition to clean energy. However, the current landscape is further complicated by inflationary trends and the repercussions of the climate crisis. The forthcoming final updates of Member State National Energy and Climate Plans (NECPs) in 2024 will mark a crucial milestone in addressing identified challenges and adapting to the altered circumstances since the initial plans were adopted in 2019. It is imperative for the EU to persist in its forward trajectory, proactively anticipate and tackle future challenges, and expedite the implementation of a diverse array of policy initiatives set forth under the European Green Deal. Policies and investments must already factor in the post-2030 perspective.[112]

This thesis delves into the intricacies of data security concerns and privacy compliance within the framework of the General Data Protection Regulation (GDPR), juxtaposed with potential conflicts with competition law. Upon scrutinizing recent legislation, numerous loopholes are discernible, particularly in the monopolization of system providers' access, assessment, and sharing of data with third-party entities. Such practices may give rise to privacy concerns among consumers who prefer exclusive monitoring by the government, the entity supplying electricity and gas.

The mandated transition to new smart meters in smart cities and across countries has inadvertently necessitated this change, transforming what was initially an option for consumers into a mandatory transition during Smart-meter repairs or replacements. Presently, there exists no specific regulation addressing the scenario wherein consumers seek to sell excess energy in the market. This limitation extends to monitoring and managing the process. Concerns about data security, coupled with insufficient funds in certain countries like Malta and the Czech Republic, have potentially impeded or made this change non-mandatory.[113]

The question of whether the implementation of smart meters in energy platforms may lead to a digital market monopoly and contravene competition law remains inconclusive. The majority of these implementations have garnered government support, with data holders being either governmental entities or entities backed by the government. Consequently, other competitors perceive limited opportunities to enter this domain. However, if a competitor were to present a case to the EU Court of Justice asserting the impracticability of market entry, this could prompt the European Union to formulate new regulations specifically addressing competition issues and preventing monopolies.

On a smaller scale, regarding data shared with third parties, the study posits that exclusive sharing with select entities could lead to the concentration of significant market power, making it challenging for other companies to access or acquire such data. Proposing a solution, the anonymization of data by isolating device data from personally identifiable information at the chip level, fortified by autonomous security software encryption, could represent a significant stride toward mitigating monopolistic tendencies. This approach would enable the provision of data to a broader array of third parties, facilitating the formulation of consumption policies for enhanced data utilization, spanning from households to smart city scales.

In the realm of competition law considerations and potential challenges stemming from limited access to statistics, scrutinizing the procedures of tenders, and evaluating whether local authorities extend state aid to specific undertakings directly or indirectly linked to the government, a meticulous case-by-case assessment becomes imperative to ascertain if such

[112] COM(2023) 650 final

[113] Bularca, O., Florea, M., & Dumitrescu, A. M. (2018, November). Smart metering deployment status across EU-28. In *2018 International Symposium on Fundamentals of Electrical Engineering (ISFEE)* (pp. 1-6). IEEE.

scenarios fall within the purview of Article 108 TFEU. Given the inherent prospect of wielding influence over the market and impacting other member states, there arises a discernible need to modernize our competition law framework, addressing emerging concepts. Formulating comprehensive enactments, surpassing the mere stage of proposal, becomes imperative. This strategic legislative evolution not only instills greater confidence in end users by enhancing transparency but also expedites the timeline of energy transition. Simultaneously, it engenders trust among other member states, facilitating the seamless proliferation of smart meters.

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