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ARTICLE

The Right to Energy and the Data Protection and Privacy Rights: Towards a Coherent Enforcement under EU Law within the Energy Transition

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Abstract

Energy has been a fundamental precondition for human survival, economic development, and preserving dignity throughout history. At the same time, the increasing digitalisation of energy systems, especially in the EU's energy transition, creates new challenges, especially concerning rights such as data protection and privacy. Although European Law restricts the right to energy as a consumer right, it expressly recognises data protection and privacy as fundamental rights. This article outlines the theoretical, historical and legal foundations of the right to energy and analyses the implications of digitalisation for its realisation while also addressing emerging concerns about data protection and privacy rights. Furthermore, it identifies the tension points between the Recast Electricity Directive (RED) and the General Data Protection Regulation (GDPR) and provides recommendations for a legal framework that harmonises the abovementioned rights.

Keywords: EU Law; The Right to Data Protection; The Right to Energy; The Right to Privacy; Twin Transitions

I. Introduction: a brief analysis of the theoretical, historical and legal foundations of the right to energy

Incorporating the right to energy into the legal dimension is still progressive. The maturity of the theoretical and normative framework has shaped this process, driving the evolution of the right to energy over time. A review of the state of the art revealed the existence of numerous analogous denominations that limit or expand the scope of the right to energy. These denominations include the right to energy,[1] the right of

[1] Gordon Walker, "The Right to Energy: Meaning, Specification and the Politics of Definition" (2016) 378 L'Europe en Formation 26 available at <https://www.cairn.info/revue-l-europe-en-formation-2015-4-page-26.htm?ref=doi> (last accessed 20 November 2021); Marlies Hesselman and Others, "Energy Poverty in the COVID-19 Era: Mapping Global Responses in Light of Momentum for the Right to Energy" (2021) 81 Energy Research & Social Science 102246 <https://doi.org/10.1016/j.erss.2021.102246>; Rohit Azad and Shouvik Chakraborty, "Green Growth and the Right to Energy in India" (2020) 141 Energy Policy 111456 available at <https://linkinghub.elsevier.com/retrieve/pii/S030142152030207X> (last accessed 11 December 2021); Chian-Woei Shyu, "A Framework for 'Right to Energy' to Meet UN SDG7: Policy Implications to Meet Basic Human Energy Needs, Eradicate Energy Poverty, Enhance Energy Justice, and Uphold Energy Democracy" (2021) 79 Energy Research & Social Science 102199 available at <https://linkinghub.elsevier.com/retrieve/pii/S2214629621002929>; Ilona

access to energy,[2] the human right to electricity,[3] the right to electricity,[4] the right of access to electricity,[5] the right of access to clean energy,[6] the right of access to energy services[7] and the right to universal access to modern energy services.[8]

The right to energy encompasses multiple faculties and does not limit itself to a single one, such as accessibility or a specific type of energy, like electricity or clean energy. Prioritising specific faculties or types of energy would restrict the content of the right to energy and negatively impact human dignity. Within the scope of this research, the right to energy encompasses energy availability, accessibility, affordability and reliability. The first of these faculties ensures energy sufficiency in meeting the energy demand.[9] Once availability is ensured, energy accessibility enables right-holders to benefit from energy

Przybojewska, "Right to Energy? The Protection of Vulnerable Recipients on National and International Level" (2017) 4 Law and Administration in Post-Soviet Europe 31 available at <https://www.sciendo.com/article/10.1515/lape-2017-0003> (last accessed 11 December 2021); Jenny Sin-Hang Ngai, "Energy as a Human Right in Armed Conflict: A Question of Universal Need, Survival, and Human Dignity" (2012) 37 Brooklyn Journal of International Law 579 available at <https://core.ac.uk/download/pdf/228597477.pdf> (last accessed 20 November 2021).

[2] Yanelys Delgado Triana and Ernesto Yoel Fariñas Wong, "Derecho de Acceso a La Energía. Protección Constitucional En Cuba" (2016) Caribeña de Ciencias Sociales available at <https://www.eumed.net/rev/caribe/2016/04/energia.html>; R Durán and M Condorí, "El Acceso a La Energía Desde La Óptica de Los Derechos Humanos. Su Medición y Relación Con El Acceso a Otros Derechos Elementales En Salta, Argentina" (2015) 19 Avances en Energías Renovables y Medio Ambiente 57 available at <http://portalderevistas.unsa.edu.ar/ojs/index.php/averma/article/download/1872/1811>.

[3] Luis Anibal Aviles, "Electric Energy Access in European Law: A Human Right?" (2012) 217 SSRN Electronic Journal 1 available at <http://www.ssrn.com/abstract=2008887>; Lars Löfquist, "Is There a Universal Human Right to Electricity?" (2020) 24 The International Journal of Human Rights 711 available at <https://www.tandfonline.com/action/journalInformation?journalCode=fjhr20> (last accessed 20 November 2021).

[4] Comité de Desarrollo Campesino, *La Privatización Del Derecho a La Energía Eléctrica. Impactos Socioeconómicos y Convulsión Social Creciente* (1era edn, 2014) available at <https://es.readkong.com/page/la-privatizaci-n-del-derecho-a-la-energ-a-el-ctrica-6691900>.

[5] Cf. Stephen R Tully, "The Contribution of Human Rights to Universal Energy Access" (2006) 4 Northwestern Journal of International Human Rights 530 available at <http://scholarlycommons.law.northwestern.edu/njihr/vol4/iss3/3>.

[6] Stephen Tully, "The Human Right to Access Clean Energy" (2009) 2 Journal of Green Building 140 available at <https://www.scienceopen.com/document_file/c3efa42a-b169-4440-bf3b-42335b42ee2f/API/i1943-4618-3-2-140.pdf>.

[7] Giovanni Frigo, Manuel Baumann and Rafaela Hillerbrand, "Energy and the Good Life: Capabilities as the Foundation of the Right to Access Energy Services" (2021) 22 Journal of Human Development and Capabilities 218 available at <https://www.tandfonline.com/action/journalInformation?journalCode=cjhd20> (last accessed 11 December 2021).

[8] Manuel Peter Samonte Solis, *From Right to Light: A Human Rights- Based Approach to Universal Access to Modern Energy Services* (Adelaide University 2014) available at <https://digital.library.adelaide.edu.au/dspace/bitstream/2440/92548/3/02whole.pdf>.

[9] Organización de Naciones Unidas, *Report of the World Commission on Environment and Development* (1987) available at <http://digitallibrary.un.org/record/139811>; Ugur Soytas and Ramazan Sari, *Routledge Handbook of Energy Economics*, Uğur Soytaş and Ramazan Sarı (eds) (Routledge 2019) available at <https://www.taylorfrancis.com/books/9781315459646>; Ibrahim Fatehi Ibrahim Marei, *The Law and Policy for Electricity Generated by Renewable Energy: Greening the Power in Three Middle Eastern Jurisdictions* (Queensland University of Technology 2015) available at <https://www.researchgate.net/profile/Ibrahim-Marei/publication/314518793_The_Law_and_Policy_for_Electricity_Generated_by_Renewable_Energy_Greening_the_Power_in_Three_Middle_Eastern_Jurisdictions/links/58dddba0aca27206a8a1c3b9/The-Law-and-Policy-for-Electr>; Dejan Ostojic and Others, *One Goal, Two Paths. Achieving Universal Access to Modern Energy in East Asia and the Pacific* (The International Bank for Reconstruction and Development/The World Bank 2011) available at <http://documents1.worldbank.org/curated/en/281841468245390286/pdf/646690PUB0one000Box361543B00PUBLIC0.pdf>; Raya Salter, Carmen G Gonzalez and Elizabeth Ann Kronk Warne, *Energy Justice: Frameworks for Energy Law and Policy* (Edward Elgar Publishing, Inc 2018) available at <https://www.amazon.com/Energy-Justice-International-Perspectives-Environmental/dp/1786431750>.

through access to the grid.[10] Additionally, as the third faculty, affordability enables right holders to afford the cost of satisfying their energy needs.[11] Last but not least, once energy is available, accessible, and affordable, it must be reliable to ensure continuity and quality of supply while guaranteeing access to information.[12]

[10] Felipe Gutiérrez, *Soberanía Energética. Propuestas y Debates Desde El Campo Popular* (Ediciones Jinete Insomne 2018) available at <https://opsur.org.ar/wp-content/uploads/2018/12/Libro-Soberania-energetica-WEB.pdf> (last accessed 21 May 2022); Leonardo Nemer Caldeira Brant, *Desarrollo Sostenible y Matriz Energética En América Latina. La Universalización Del Acceso a La Energía Limpia* (Konrad-Adenauer-Stiftung 2016) available at <https://www.kas.de/c/document_library/get_file?uuid=7953d15d-8f4f-4dea-5ced-6c8e6930eaff&groupId=252038>; Enrique Velo García, "Desafíos Del Sector de La Energía Como Impulsor Del Desarrollo Humano Enrique Velo García Cuadernos Internacionales de Tecnología Para El Desarrollo Humano 01_ Desafíos Del Sector de La Energía Como Impulsor Del Desarrollo Humano" (2005) available at <https://core.ac.uk/download/pdf/41777398.pdf> (last accessed 9 August 2021); Jorge Rivera Staff, *Análisis Jurídico Del Sector Eléctrico En Panamá Para Su Evolución Hacia Las Energías Renovables: Una Aproximación Desde El Derecho Español* (Universidad Complutense de Madrid 2014) available at <https://eprints.ucm.es/id/eprint/28143/1/T35659.pdf>; Victoria Pellicer-sifres, *Reconceptualizando La Pobreza Energética Desde El Desarrollo Humano : Hacia Una Definición Más Inclusiva y Transformadora* (Universitat Politècnica de València 2017) available at <https://www.researchgate.net/profile/Victoria-Pellicer-Sifres/publication/313846905_Reconceptualizando_la_pobreza_energetica_desde_el_Desarrollo_Humano_hacia_una_definicion_mas_inclusiva_y_transformadora/links/58aad9b492851cf0e3c75cfb/Reconceptualizando-l>; Benjamin K Sovacool and Michael H Dworkin, *Global Energy Justice. Problems, Principles, and Practices* (Cambridge University Press 2014) available at <https://www-cambridge-org.bham-ezproxy.idm.oclc.org/core/services/aop-cambridge-core/content/view/BF7171BB9BD663FA31AB07B4F12AE67E/9781107323605c5_p157-190_CBO.pdf/energy_and_human_rights.pdf> (last accessed 25 July 2021); Alex O Acheampong, Janet Dzator and Muhammad Shahbaz, "Empowering the Powerless: Does Access to Energy Improve Income Inequality?" (2021) 99 Energy Economics 105288 available at <https://linkinghub.elsevier.com/retrieve/pii/S0140988321001936> (last accessed 11 December 2021); AA Refaat and IM Ismail, "Water Food and Energy Sustainability Nexus" (2017) *International Conference on Sustainable Futures* available at <https://www.researchgate.net/profile/Ibrahim-Ismail-13/publication/321579870_Water_Food_and_Energy_Sustainability_Nexus/links/5a3a8393458515889d2de6f2/Water-Food-and-Energy-Sustainability-Nexus.pdf>; Silvia Hostettler and Ashok Gadgil, *Sustainable Access to Energy in the Global South* (Springer International Publishing Switzerland 2015) available at <https://link.springer.com/book/10.1007/978-3-319-20209-9>.

[11] Julio Eisman, *Acceso Universal a La Energía y Energías Renovables* (Consorcio de Investigación Económica y Social 2016) available at <https://www.researchgate.net/profile/Julio-Eisman/publication/303947040_Acceso_Universal_a_la_Energia_y_Energias_Renovables/links/575ff04308aec91374b6262f/Acceso-Universal-a-la-Energia-y-Energias-Renovables.pdf>; Organismo Internacional de Energía Atómica, Departamento de Asuntos Económicos y Sociales de Las Naciones Unidas and Agencia Internacional de la Energía, *Indicadores Energéticos Del Desarrollo Sostenible: Directrices y Metodologías* (OIEA 2008) available at <https://www-pub.iaea.org/MTCD/publications/PDF/Pub1222s_web.pdf>; Guido Andrés Moncayo Vives, *Soporte Teórico de Derechos de Las Personas Usuarias de Servicios Públicos Domiciliarios En Ecuador* (Defensoría del Pueblo, Ecuador 2017) available at <https://www.academia.edu/42974580/SOPORTE_TEÓRICO_DE_DERECHOS_DE_LAS_PERSONAS_USUARIAS_DE_SERVICIOS_PÚBLICOS_DOMICILIARIOS_EN_ECUADOR?email_work_card=title>; Franco Carvajal and Others, *Más Allá de La Electricidad: Cómo La Energía Provee Servicios En El Hogar* (Inter-American Development Bank 2020) available at <https://publications.iadb.org/publications/spanish/document/Mas-alla-de-la-electricidad-Como-la-energia-provee-servicios-en-el-hogar.pdf> (last accessed 9 August 2021); Gustavo Castro Soto, "El Agua y La Luz Como Derechos Humanos" (2009) Derecho y Realidad 7; Henry Jiménez Guanipa and Javier Tous Chimá, *Cambio Climático, Energía y Derechos Humanos. Desafíos y Perspectivas* (Universidad del Norte & Fundación Heinrich Böll, Oficina Bogotá 2017) available at <https://uft.cl/images/noticias/2018/abril/publicacion-cambio-climatico/capitulo-interrelacion-comercio-cc-andrea-lucas-garin.pdf>; Hesselman and Others (n 1); Benjamin K Sovacool and Others, "Energy Decisions Reframed as Justice and Ethical Concerns" (2016) 7, 1 Nature Energy 16024 available at <https://www.nature.com/articles/nenergy201624>.

[12] Maria D'Assunção Costa, *O Direito De Acesso À Energia Meio E Pré-Condição Para O Exercício Do Direito Ao Desenvolvimento E Dos Direitos Humanos* (Universidade de São Paulo 2009) available at <https://www.teses.usp.br/teses/disponiveis/86/86131/tde-11082011-112846/publico/MariaDAssuncao.pdf>; Moncayo Vives (n 11); Jiménez Guanipa and Tous Chimá (n 11); Alejandro Vergara Blanco, *Derecho Eléctrico* (Editorial Jurídica de Chile 2004) available at <http://vergarablanco.cl/wp-content/uploads/delightful-downloads/2016/03/ENER-01-2004-Derecho-Electrico-Completo.pdf>; Íñigo Del Guayo Castiella, "Concepto, Contenidos y Principios Del Derecho de La Energía" (2020) Revista de Administración Pública 309 available at <http://www.cepc.gob.es/publicaciones/revistas/revistaselectronicas?IDR=1&IDN=1438&IDA=39070>; Christopher Decker, "Consumer Protection Frameworks for New Energy Products and Services and the Traditional Sale of Energy in Australia" (2020)

Nevertheless, one question still requires an answer: what would this so-called "energy" be? Within the right-to-energy framework, energy includes energy services and energy sources. This dual dimension of energy safeguards the passive satisfaction of energy needs and their active satisfaction by practising energy democracy[13] as an alternative to achieve individual and community energy sovereignty.[14] All energy services and sources that contribute to satisfying human energy needs and discriminating among them would jeopardise the energy needs that they satisfy. However, within the scope of this article and for clarity purposes, the right to energy will refer to electricity as an object under the European Union Directive (EU) 2019/944, also known as the Recast Electricity Directive (RED). Despite previous doctrinal analysis, the law continues to struggle with structuring the right to energy as an evolving right.

The RED regulates the internal electricity market. This directive seeks to ensure that energy remains affordable and accessible to all consumers in all Member States. The directive includes specific provisions (Articles 28 and 29) to protect vulnerable populations from energy poverty,[15] allowing Member States to intervene in price regulation and to impose public service obligations on energy suppliers.[16]

Moreover, transparency and consumer empowerment are core components of the RED. This regulatory body requires energy suppliers to provide transparent information on prices, tariffs and contractual conditions. It empowers consumers to switch suppliers without penalty and limits disconnection to a measure of last resort. While EU policies align with the goals of SDG 7 by promoting clean energy and reducing greenhouse gas emissions, they fail to explicitly recognise energy as a fundamental or human right within their legal frameworks. Instead, energy access is addressed through consumer protection laws and the fundamental right to access services of general economic interest (SGEI),[17] reflecting the complexities of the European energy market. At the same time, maintaining

available at <https://www.aemc.gov.au/sites/default/files/documents/consultant_final_report_-_consumer_protection_frameworks.pdf>; Mikul Bhatia and Nicolina Angelou, "Beyond Connections: Energy Access Redefined" (2015) available at <https://openknowledge.worldbank.org/bitstream/handle/10986/24368/Beyond0connect0d000technical0report.pdf?sequence=1&isAllowed=y>; Tully (n 5); Benjamin K Sovacool, Roman V Sidortsov and Benjamin R Jones, *Energy Security, Equality, and Justice* (Routledge 2014) available at <https://www.routledge.com/Energy-Security-Equality-and-Justice/Sovacool-Sidortsov-Jones/p/book/9780415815208>; Alberto Olivares Gallardo, "Servicio Público y Sector Eléctrico: Evolución En Europa Desde La Experiencia Española" (2012) Revista de Derecho de la Pontificia Universidad Católica de Valparaíso 437 available at <http://www.scielo.cl/scielo.php?script=sci_arttext&pid=S0718-68512012000200016&lng=es&nrm=iso&tlng=es> (last accessed 26 July 2021).

[13] James Angel, "Strategies of Energy Democracy" (2016) 10 available at <https://www.rosalux.de/fileadmin/rls_uploads/pdfs/sonst_publikationen/strategies_of_energy_democracy_Angel_engl.pdf>; Conrad Kunze and Sören Becker, "Energy Democracy in Europe: A Survey and Outlook" (2014) 63 Rosa Luxemburg Foundation 8 available at <http://rosalux-europa.info/userfiles/file/Energy-democracy-in-Europe.pdf>.

[14] Philipp Thaler and Benjamin Hofmann, "The Impossible Energy Trinity: Energy Security, Sustainability, and Sovereignty in Cross-Border Electricity Systems" (2022) 94 Political Geography 102579, 2 <https://doi.org/10.1016/j.polgeo.2021.102579>; José Grabiel Luis Cordova, Koen Byttebier and Yanelys Delgado Triana, "Decentralized Energy Generation for Sustainable Energy Development in EU" (2023) 32 European Energy and Environmental Law Review 164 available at <https://kluwerlawonline.com/journalarticle/European+Energy+and+Environmental+Law+Review/32.4 [pre-publication]/EELR2023010> (last accessed 20 April 2023).

[15] See more on energy poverty in José Grabiel Luis Cordova and Jorge Freddy Milian Gómez, "Energy and Food Poverty in Latin America, Towards a Rights Perspective" in Lira Luz Benites Lazaro, Sigrid de Aquino Neiva and Esteban Serrani (eds), *Energy Poverty, Justice and Gender in Latin America* (Switzerland, Springer Nature 2024) available at <https://link.springer.com/10.1007/978-3-031-80068-9>.

[16] Directive 2019/944 on common rules for the internal market for electricity and amending Directive 2012/27/EU 2019.

[17] Aviles (n 3).

a balance between energy market liberalisation and fulfilling public service obligations remains challenging.[18]

Despite these limitations, the EU remains committed to addressing energy poverty. through targeted policy and legal measures that safeguard vulnerable consumers, ensure universal access to energy, and promote sustainable solutions. In turn, RED[19] provide substantial protections for energy consumers, while the EU's broader energy strategy promotes sustainability and inclusion. In that sense, the recognition and protection of the right to energy, according to Quintavalla, et al., is also based on sustainable development, energy access and energy justice.[20]

In light of the evolution of recognition and protection of the right to energy at the European level, the role of energy in ensuring human dignity, particularly in socio-economic development, has become increasingly evident. This situation underscores the increasing demand for universal access to safe, affordable, reliable, and sustainable energy. Alongside this need, the European energy market has undergone rapid transformation through digitalisation, reshaping how energy is produced, transmitted, distributed, and consumed.

While the right to energy is crucial in safeguarding human dignity and other human rights, the European legal landscape remains fragmented. The European approach to the right to energy is largely shaped by consumer rights, particularly through the RED. At the same time, the General Data Protection Regulation (GDPR) firmly grounds data protection and privacy rights. This legal divergence creates regulatory tensions in the context of the twin transitions (energy and digital), which the following sections will analyse.

As Europe's energy systems become more digital, the realisation of the right to energy increasingly depends on data-driven technologies. However, this dependence raises new legal challenges, particularly in the European Union, where the RED regulates the internal electricity market while the GDPR governs data protection and privacy. The following sections of this article explore the key tensions between the two frameworks concerning the right to energy and data protection and privacy rights, proposing solutions to harmonise them.

Digitalising the energy sector is a challenging path that requires careful analysis. Considering that the EU is a valuable case study due to its leadership in twin transitions, this research focuses on the region where policymakers have integrated digitalisation into the Green Deal, mainly through its internal energy market strategies.[21] Consequently, implementing alternatives such as smart energy grids, smart metering and artificial intelligence tools require data for their operation.

From this context, tension has arisen among rights with differing legal realities in the European Union regarding their recognition, configuration, and enforceability. On the one hand, the right to energy is still a penumbral right, designed as a consumer right. This analysis will examine the right to energy through the lens of the RED. On the other hand, the EU explicitly and legally recognises data protection and privacy as fundamental

[18] Comisión de las Comunidades Europeas, "Libro Verde Sobre Los Servicios de Interés General" (2003) available at <https://eur-lex.europa.eu/legal-content/ES/TXT/PDF/?uri=CELEX:52003DC0270&from=EN> (last accessed 18 May 2022).

[19] Cf. Art 10. European Parliament and European Council (2019).

[20] Alberto Quintavalla, Franz Kienzl and Irakli Samkharadze, "The Human Right to Energy: Drawing Lessons from the Development of the Human Right to Water" (2023) 14 Journal of Human Rights and the Environment 49, 50–4 available at <https://www.elgaronline.com/view/journals/jhre/14/1/article-p49.xml>.

[21] European Commission, "The European Green Deal" (2024) available at <https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal_en> (last accessed 15 August 2024).

rights.[22] The analysis will examine these rights within the framework of the GDPR. As a result, this research will focus on:

1. How can the EU reconcile the regulatory tensions between RED and GDPR to ensure the right to energy and data protection and privacy rights within the digital energy transition?

Considering this question, this research will use the following research methods and techniques. Initially, the legal-historical research method[23] is used to substantiate the normative evolution of the right to energy at the international and regional levels, specifically within the EU. In addition, the literature review is used to obtain recent scientific evidence on recognising the right to energy, the side effects of digitising energy systems on data protection and privacy, identifying tension points between the rights under study and elaborating recommendations.[24] Moreover, the legal analytical method[25] is used to determine the meaning and scope of regional legal instruments within the EU, as well as to identify points of tension between the right to energy and data protection and privacy rights.

Therefore, this research first analyses the role of technological innovations in energy systems in satisfying energy needs. Subsequently, it also addresses the concerns of digitalised energy systems regarding data protection and privacy. Then, it identifies the tension points within EU law regarding the right to energy and data protection and privacy rights within an energy transition scenario. Finally, it also develops recommendations for a coherent legal framework regarding the abovementioned rights.

II. Discussion and results

1. Digitalisation and data protection and privacy concerns in the energy sector

While the legal recognition of the right to energy has evolved, its realisation relies increasingly on technological innovation in energy systems. Integrating digital technologies presents numerous opportunities to optimise energy systems and enhance access to energy in the European Union. However, this article will analyse these technological developments and explore conflicts between the right to energy, data protection, and privacy rights.

The energy sector's digital transformation has become one of the most relevant trends of the twenty-first century. The increasing demand for energy and the imperative to meet it, particularly the population's needs, necessitate more sustainable, secure, and efficient energy systems. To achieve this, digitalisation drives transformative change, propelling an evolutionary leap in the energy supply chain.[26] In this sense, the EU has integrated digitisation into the European Green Deal, which has several objectives, including ensuring

[22] Arts 7 and 8. Charter of Fundamental Rights of the European Union 2012.

[23] P Ishwara Bhat, *Historical Legal Research* (Oxford University Press 2020) available at <https://academic.oup.com/book/41749/chapter/354158467>.

[24] Mike McConville and Wing Hong Chui, "Legal Research as Qualitative Research" (2017) Research Methods for Law 18, 25–35 available at <http://www.jstor.org/stable/10.3366/j.ctt1g0b16n.7>.

[25] P Ishwara Bhat, "Analytical Legal Research for Expounding the Legal Wor(l)D" in *Idea and Methods of Legal Research* (Oxford University Press 2020) available at <https://academic.oup.com/book/41749/chapter/354158046>.

[26] European Commission, "Digitalisation of the Energy System" (*Energy, Climate Change, Environment* 2024) available at <https://energy.ec.europa.eu/topics/energy-systems-integration/digitalisation-energy-system_en#:~:text=Digitalisation> will transform the energy system%2C integrate more, from generation to transport%2C distribution%2C supply and consumption.> (last accessed 3 September 2024).

the security and affordability of energy supply, prioritising energy efficiency, and promoting the full integration, interconnection, and digitisation of the European energy market.[27]

As a result of these objectives, the European Commission aims to develop smarter and more digitised energy networks. With this strategy, the Commission aims to optimise energy efficiency and greenhouse gas reduction, which aligns with the EU's commitment to sustainability. To this end, digital technologies such as smart grids, artificial intelligence (AI), the Internet of Things (IoT), and big data play a key role. Such applications offer tools that can contribute to the realisation of the Green Deal's energy objectives, given their potential to optimise energy management, facilitate the integration of renewable energy sources whose variability is a challenge and improve grid stability. These tools undoubtedly contribute to the realisation of the right to energy in the EU.[28]

Many potentialities concerning the tools mentioned above can be cited. One example is using AI to predict consumption patterns, enabling more efficient demand-response strategies and reducing energy waste.[29] In turn, other digital technologies, such as IoT devices like smart meters, enable real-time monitoring of energy use, allowing suppliers to analyse consumption patterns and empower energy consumers with better control over their energy consumption.[30]

The digital revolution of European energy systems has been spearheaded by smart grids equipped with sensors and communication technologies, enabling the monitoring and management of energy flows.[31] This alternative to traditional systems contributes not only to the energy transition and secure access to reliable, affordable energy (the core of the right to energy) but also to integrating renewable sources, ensuring sustainability. Given the variability of these sources due to the non-stability of their energy carriers,[32] such integration requires sophisticated systems to balance energy supply and demand. Smart grids thus enable, to a certain extent, through data collection, the adjustment of energy distribution, the anticipation of demand fluctuations and grid stability.[33] These functionalities, therefore, contribute to ensuring continuous access to energy and, in turn, to the realisation of the right to energy.

However, digitising the energy sector involves multiple challenges, including data protection and privacy. The increasing use of data-driven technologies, such as AI, IoT, and smart meters, raises concerns about the potential misuse, unauthorised access, and over-collection of personal information.[34] Household consumption patterns can reveal sensitive

[27] European Commission, "Energy and the Green Deal" (*The European Green Deal* 2019) available at <https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/european-green-deal/energy-and-green-deal_en> (last accessed 3 September 2024).

[28] European Commission, "Digitalisation of the Energy System" (n 26).

[29] Vida Rozite, Jack Miller and Sungjin Oh, "Why AI and Energy Are the New Power Couple" (International Energy Agency 2023) available at <https://www.iea.org/commentaries/why-ai-and-energy-are-the-new-power-couple> (last accessed 28 August 2024).

[30] Shashini Rajaguru, Björn Johansson and Malin Granath, "Exploring Smart Meters: What We Know and What We Need to Know" in *Perspectives in Business Informatics* (Springer 2023) p 108 available at <https://link.springer.com/10.1007/978-3-031-43126-5_8>.

[31] Lea Diestelmeier, "A Legal Framework for Smart Grids" in Martha M Roggenkamp, Kars J de Graaf and Ruven C Fleming (eds), *Elgar Encyclopedia of Environmental Law* (Edward Elgar 2023) available at <https://www.elgaronline.com/display/book/9781785369520/b-9781788119689-IX_54.xml>.

[32] Francisco Flores and Others, "Assessment of the Impacts of Renewable Energy Variability in Long-Term Decarbonization Strategies" (2024) 368 Applied Energy 123464 <https://doi.org/10.1016/j.apenergy.2024.123464>.

[33] Diestelmeier (n 31) 648.

[34] Cf. Agostino Marengo, "Navigating the Nexus of AI and IoT: A Comprehensive Review of Data Analytics and Privacy Paradigms" (2024) 27 Internet of Things 101318 <https://doi.org/10.1016/j.iot.2024.101318>.

information about individuals' lifestyles, behaviours and routines. These data flows may infringe upon individuals' rights under the GDPR.[35]

In this context, the GDPR, the cornerstone of EU data protection law, sets strict rules for personal data processing throughout the European Union. This legal instrument explicitly protects natural persons concerning the processing of personal data and regulates the free movement of personal data. It also protects the fundamental rights and freedoms of natural persons concerning their right to data protection.[36] However, the nature of digital technologies often conflicts with the provisions of GDPR.

The data flow generated by digitised energy systems from household energy consumption patterns has raised a red flag within the energy sector. This alert is motivated by the GDPR regulatory provisions. Thus, the major challenge lies in balancing the need for data to produce energy efficiency improvements and control demand and generation while ensuring respect for data protection and privacy.

While digitalisation requires data to optimise energy systems, the GDPR provides mechanisms (eg, anonymisation) that can enable the responsible use of data while protecting the rights of energy consumers. Aligning RED with GDPR principles can facilitate a safe and fair digital energy transition.

Despite the EU's efforts to address this challenge through legal instruments such as the GDPR and other instruments explicitly targeted at the energy sector, such as the RED, new challenges will arise with the evolution of digitalisation. In this regard, energy systems are integrating emerging technologies, such as AI and blockchain, in the short and medium term.

2. EU legal instruments: right to energy vs. data protection and privacy

The European legal framework presents tension points between the right to energy (from a consumer rights perspective with a legal basis in a fundamental right) and data protection and privacy rights. The recognition, shaping, and legal protection of these rights through the GDPR and the RED collide in certain areas, such as data minimisation, informed consent, mitigation of energy poverty, promoting new digital technologies, and overlapping institutional competences.

While digitalisation offers opportunities to optimise energy systems, it does not inherently guarantee better energy access or affordability.[37] The development of digital solutions (eg, smart grids and AI-driven energy management) can deepen inequalities if not adequately regulated. At the same time, GDPR does not necessarily hinder digital energy innovation. Instead, by enforcing strong data protection standards, GDPR can help build trust, ensure fair energy prices and prevent the misuse of personal energy consumption data.[38]

The first point of tension, without this indicating an order of precedence, is the interrelation of the right to energy and data minimisation as one of the fundamental principles of the GDPR. Data minimisation as a regulatory mandate obliges collecting only

[35] Regulation (EU) 2016/678 of the European Parliament and of the Council 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 2016.

[36] Cf. Art 1. Ibid.

[37] Qian Yue, Ming Zhang and Yan Song, "Impact of Digital Divide on Energy Poverty across the Globe: The Mediating Role of Income Inequality" (2024) 195 Energy Policy 114349 <https://doi.org/10.1016/j.enpol.2024.114349>.

[38] Chao Wu, "Data Privacy: From Transparency to Fairness" (2024) 76 Technology in Society 102457 <https://doi.org/10.1016/j.techsoc.2024.102457>.

the information necessary for energy supply.[39] However, the digitisation of modern energy systems through smart grids and smart meters involves the collection of large volumes of data for their operation.

Consequently, energy consumers regularly transmit granular data on household energy consumption to energy suppliers.[40] Through this data transmission, energy suppliers can identify patterns of energy consumption, the use of household appliances, and even the times when household members are most likely to be at home.[41] Although this data is crucial for balancing energy supply and demand, its collection and use must ensure the realisation of the rights contained in Article 7 of the Charter of Fundamental Rights of the European Union[42] and Article 9 of the European Convention on Human Rights.[43] This implies limitations aligned with relevant legal instruments such as GDPR. Otherwise, there is a risk of infringing the rights to privacy and data protection.

Some research findings demonstrate how data obtained from smart meters can expose personal habits[44] that are susceptible to exploitation if not adequately protected. This is a collision between the GDPR's regulatory provisions on purpose limitation[45] and the promotion of using smart meters from the network. Although the latter body of law refers to GDPR, the two legal frameworks are still not fully compatible. On the one hand, RED highlights the need for a transparent, secure and affordable energy supply for all European citizens[46] (which promotes the realisation of the right to energy) through fair prices, the prevention of energy poverty, and the promotion of energy democracy. On the other hand, it is imperative to find a balance between the role of data in the energy system and compliance with GDPR.

A second point of tension is informed consent. The GDPR permits the processing of personal data upon obtaining the express consent of the data subjects, among other legal bases.[47] However, energy consumers still do not fully understand what data smart meters collect and how energy providers will use them.[48] Research has corroborated the existence

[39] Cf. Art 5.1 c) 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 2016.

[40] Hatzakis Tally, Rodrigues Rowena and Wright David, "Smart Grids and Ethics" (2019) 2 The ORBIT Journal 1, 11 <https://doi.org/10.29297/orbit.v2i2.108>.

[41] See also Dasom Lee and David J Hess, "Data Privacy and Residential Smart Meters: Comparative Analysis and Harmonization Potential" (2021) 70 Utilities Policy 101188, 7 <https://doi.org/10.1016/j.jup.2021.101188>.

[42] Cf. Art 7 Charter of Fundamental Rights of the European Union.

[43] Cf. Art 9 European Convention on Human Rights 2021.

[44] Günther Eibl and Dominik Engel, "Influence of Data Granularity on Smart Meter Privacy" (2015) 6 IEEE Transactions on Smart Grid 930, 938 available at <https://ieeexplore.ieee.org/abstract/document/6990609>.

[45] Cf. Art 6.1 b) 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; Saskia Lavrijssen, Brenda Espinosa Apráez and Thijs ten Caten, "The Legal Complexities of Processing and Protecting Personal Data in the Electricity Sector" (2022) 15 Energies 1088, 7 available at <https://www.mdpi.com/1996-1073/15/3/1088>.

[46] Directive 2019/944 on common rules for the internal market for electricity and amending Directive 2012/27/EU.

[47] Kaisa Huhta, "Smartening up While Keeping Safe? Advances in Smart Metering and Data Protection under EU Law" (2020) 38 Journal of Energy & Natural Resources Law 5, 17–18 <https://doi.org/10.1080/02646811.2019.1622244>.

[48] Jacqueline Nicole Adams and Others, "How Smart Meter Data Analysis Can Support Understanding the Impact of Occupant Behavior on Building Energy Performance: A Comprehensive Review" (2021) 14, 1–23 Energies.

of information asymmetries between service providers and users, where the latter often lack the time or capacity to engage with privacy disclosures.[49]

As real-time data collection proves essential for grid stability, the integration of RES, and the implementation of demand-response systems, data subjects must freely provide their consent in a specific, informed and unambiguous manner.[50] Such requirements are due to the complex materialisation of complex and automated systems such as digitised energy systems.[51] Despite this, it is challenging for energy consumers to opt out of data collection, as they would be excluded from the benefits of smart energy systems, such as lower prices or access to energy generated from renewable sources (RES). This raises concerns regarding the validity of consent under the GDPR, as this scenario may violate the freely given consent as regulated in Article 7(4) and Recital 43 of the GDPR.[52] In this regard, the European Data Protection Board (EDPB) Guidelines on Consent (2020) clarify that consent is not given freely "if the subject has no real choice, feels compelled to consent, or will endure negative consequences."[53]

A third point of tension arises from the spirit of the RED, which promotes the protection of vulnerable energy consumers and aspires to mitigate energy poverty through universal access to energy. In this sense, data collection through smart meters contributes to monitoring energy consumption, preventing disconnections, and enabling the application of differentiated tariff systems. Nevertheless, one of the side effects of these practices is "smart meter anxiety," which is exacerbated by several factors, including increased financial pressure, particularly when energy prices are high.[54] Additionally, real-time monitoring may conflict with the provisions of the GDPR.

For example, Canals et al. point to the GDPR mandate requiring data usage only after obtaining provable and explicit consent.[55] This statement pertains to Article 4(11), which concerns freely given, specific, informed, and unambiguous consent, and Article 7(1), which addresses the demonstrability of the consent obtained.[56] Therefore, energy data collection through smart meters requires explicit user consent, which is often difficult to obtain and prove.

[49] Cf. Yoan Hermstrüwer, "Contracting Around Privacy: The (Behavioral) Law and Economics of Consent and Big Data" (2017) 8 Journal of Intellectual Property, Information Technology and Electronic Commerce Law (JIPITEC) 9 available at <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3059639>.

[50] Cf. Art 4.11. "consent of the data subject means any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her." 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.

[51] At the same time, another challenge emerges. According to Huhta, the concept of consent represents challenges to the entire electricity system since making it dependent on the voluntary consent of millions of consumers would lead to uncertainty that may affect the security of supply. Huhta (n 47) 18.

[52] Regulation (EU) 2016/678 of the European Parliament and of the Council 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.

[53] European Data Protection Board, *Adopted on 4 May 2020* (European Data Protection Board, 2020) 7 available at <https://www.edpb.europa.eu/sites/default/files/files/file1/edpb_guidelines_202005_consent_en.pdf>.

[54] Colletta Smith, "'I'm Obsessed with My Smart Meter'" *BBC* (6 February 2023) available at <https://www.bbc.com/news/business-64493048>.

[55] Lluc Canals Casals and Others, "Smart Meters Tackling Energy Poverty Mitigation: Uses, Risks and Approaches" in *2020 IEEE Electric Power and Energy Conference (EPEC)* (IEEE 2020) p 2 available at <https://ieeexplore.ieee.org/document/9320062/>.

[56] Regulation (EU) 2016/678 of the European Parliament and of the Council 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.

Once again, energy providers must collect large amounts of data by monitoring energy consumption, which may include demographic[57] and even financial information[58] of energy consumers. Stricter scrutiny is necessary if this information reveals sensitive characteristics, such as those regulated in Article 9 of the GDPR.[59] This situation once again highlights a conflict regarding privacy and data protection. In addition, vulnerable energy consumers are less likely to be aware of their rights under the GDPR and the avenues for effectively exercising them.[60] In this respect, the complexity of the GDPR's regulatory provisions may pose a particular challenge for vulnerable energy consumers in enforcing their rights.

As a fourth point, closely connected to the previous tension, emerging technological applications such as integrating artificial intelligence and blockchain in European energy systems have raised concerns about data protection and privacy.

Firstly, the deployment and implementation of artificial intelligence tools in the energy sector have raised these concerns.[61] These tools need large volumes of data to optimise energy distribution and predict consumption patterns. These data volumes include personal data that can lead to profiling and automated decision-making processes, which fall under the scope of the GDPR.[62]

Secondly, using blockchain to enhance the transparency and security of energy trading also challenges the enforcement of the GDPR's regulatory provisions regarding the right to be forgotten. The nature of blockchain makes it extremely difficult to comply with GDPR's requirement to request the erasure of personal data.[63] The immutability of blockchain ensures that data, once recorded, cannot be altered or deleted without affecting the integrity of the entire chain. An example of the resulting point of tension is as follows: with the implementation of blockchain in a decentralised energy trading system (e.g., P2P energy trading), the personal data of participants (eg, prosumers) in transactions is stored on the blockchain. If one of these prosumers requests the deletion of their personal data

[57] Cf. Yi Wang and Others, "Deep Learning-Based Socio-Demographic Information Identification From Smart Meter Data" (2019) 10 IEEE Transactions on Smart Grid 2593 available at <https://ieeexplore.ieee.org/document/8291011/>; Adams and Others (n 48).

[58] In this sense, Carmody et al. argue how, through smart meters in combination with AI tools, households can be characterised getting insights on the age composition, household income, spending patterns, etc . . . Jillian Carmody, Samir Shringarpure and Gerhard Van de Venter, "AI and Privacy Concerns: A Smart Meter Case Study" (2021) 19 Journal of Information, Communication and Ethics in Society 492 available at <https://www.emerald.com/insight/content/doi/10.1108/JICES-04-2021-0042/full/html>.

[59] Cf. Art 9 Regulation (EU) 2016/678 of the European Parliament and of the Council 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.

[60] Stanislaw Piasecki and Jiahong Chen, "Complying with the GDPR When Vulnerable People Use Smart Devices" (2022) 12 International Data Privacy Law 113, 114 available at <https://academic.oup.com/idpl/article/12/2/113/6510568>.

[61] Bernd Carsten Stahl, Doris Schroeder and Rowena Rodrigues, "Ethics of Artificial Intelligence: Case Studies and Options for Addressing Ethical Challenge (Excerpt)" (2024) 25 Journal of Economic Sociology 85, 25–35 available at <https://ecsoc.hse.ru/data/2024/01/31/2092774504/ecsoc_t25_n1.pdf#page=85>.

[62] Cf. Art 21. Regulation (EU) 2016/678 of the European Parliament and of the Council 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.

[63] Pardis M Tehrani, "Energizing Blockchain: Legal Gaps and Power Plays in the Energy Sector's Digital Transformation" (2023) 57 available at <https://books.google.com.sg/books?hl=en&lr=&id=uwvjEAAAQBAJ&oi=fnd&pg=PA103&dq=transparency+traceability+assurance+%2522digital+sustainability+reporting%2522+OR+OR+OR+%2522ESG+reporting%2522+OR+OR+OR+%2522sustainability+standards%2522+OR+OR+OR+%2522CSRD%2522+OR+AND+OR+%252>.

under Article 17 of GDPR,[64] fulfilling such a request would be almost impossible due to the design of the blockchain. This is a straightforward collision between digital innovation in the energy sector and compliance with European data protection and privacy regulations.

Last but not least, a final point of tension results from overlapping competencies. While the two legal frameworks in energy and data protection and privacy are not fully compatible, generating undesirable side effects, the overlapping of competencies further complicates the context. On the one hand, the National Regulatory Agencies (NRAs) and, on the other hand, the Data Protection Authorities (DPAs) are assigned a set of overlapping functions under the RED and GDPR concerning data protection in the energy sector. The lack of regulatory coordination mechanisms between NRAs and DPAs in both bodies of law exacerbates this context. This can lead to situations where neither institution intervenes simultaneously or to multiple legal interpretations of each applicable legal framework.[65]

3. Recommendations towards a coherent legal framework

Considering the challenges of fulfilling the right to energy in the EU from increasingly digitised energy systems, it is necessary to establish a coherent legal framework that balances the realisation of the right to energy and data protection and privacy. The deployment of smart grids, smart meters, and emerging technologies such as AI and blockchain requires the EU to ensure the realisation of the right to energy without compromising data protection and privacy in its path. For this purpose, this article will formulate and develop the following recommendations.

a. First point of tension: data minimisation and the right to energy

First, regulatory guidelines are needed to establish a coherent and systematic framework for aligning European energy and data rights standards. Such guidelines should reconcile the tensions between the RED and GDPR through consistent data collection, use, and storage rules in the European energy sector. For example, the RED highlights the importance of energy data in ensuring efficient and secure energy provision, which may conflict with GDPR principles such as data minimisation and limited purpose. Thus, regulatory guidelines should define what specific data type is necessary for optimising the energy system, for instance, grid stability and integrating renewable energy sources. At the same time, organisations must implement data protection practices, such as anonymisation, pseudonymisation, and encryption, to reduce privacy risks. Similarly, these guidelines should ensure sufficient flexibility to meet the specific data needs for the operation of smart energy systems while ensuring compliance with GDPR provisions.

b. Second point of tension: informed consent and energy systems

A second recommendation is to improve mechanisms to ensure transparency and informed consent in European energy systems. Such mechanisms should ensure that energy consumers know how their energy data is collected, processed and used through smart grids and smart meters. To this end, energy suppliers must ensure transparency by providing concise, easily accessible and understandable information[66] concerning collecting specific data types, how they will use it, and the rights under the GDPR.

[64] Cf. Art 17. Regulation (EU) 2016/678 of the European Parliament and of the Council 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.

[65] Lavrijssen, Espinosa Apráez and ten Caten (n 45) 18–19.

[66] Cf. Recital 58. Regulation (EU) 2016/678 of the European Parliament and of the Council 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.

In addition, the EU should promote the more effective development of informed consent in its energy systems. This would ensure that energy consumers can opt out of collecting non-essential data if they lose access to energy services.[67] In addition, energy companies should uniformly adopt this practice to comply with the GDPR's mandate for freely given, specific, informed, and unambiguous consent.

c. Third point of tension: digital solutions to mitigate energy poverty

This research's third recommendation is related to identifying energy vulnerability and mitigating energy poverty while ensuring compliance with GDPR. Despite the spirit of the RED regarding the protection of energy consumers in vulnerable or energy-poor situations, the use of smart meters for monitoring such situations should align with the provisions of the GDPR. In this regard, the EU should establish clear rules for the processing of energy data associated with the identification and mitigation of energy vulnerability and energy poverty, ensuring the highest level of protection. For this purpose, data protection impact assessments adapted to this context should be further developed and implemented to assess how to mitigate fuel poverty without sacrificing privacy and data protection.

Moreover, while digital energy systems promise energy efficiency, they can also create or exacerbate forms of inequality. For example, digital divides worsen the unfair distribution of benefits and energy poverty.[68] Therefore, aligning GDPR principles (eg, transparency, fairness, data minimisation) with RED can help ensure that digitisation does not exacerbate existing vulnerabilities but contributes to a more equitable energy transition.

d. Fourth point of tension: emerging technologies and data protection and privacy

As the fourth recommendation, this research proposes integrating "data protection by design and default" legally instituted by GDPR[69] into the digital infrastructure of European energy systems. Such integration should specifically take place, for instance, when developing smart grids and smart meters. To this end, energy companies must prioritise ensuring data protection and privacy from the initial stages of technological development. This guarantees the integration of data protection into the core of modern energy systems. In turn, integrating data protection by design and by default in the architecture of energy systems can contribute to limiting the amount of data collected. Such integration can also be a proactive approach to preventing unauthorised access to energy data and ensuring that it is only used for the purposes legally envisaged in the regulatory guidelines explained above.

This approach is essential for developing, deploying, and implementing emerging technologies, such as AI and blockchain, that rely on large volumes of data but may result in GDPR breaches. In this regard, artificial intelligence tools, particularly those in the energy sector, must be designed to prevent profiling and automated decision-making processes that compromise the data protection and privacy of energy consumers. In turn, blockchain technologies must evolve to ensure compliance with GDPR, especially the right to be forgotten, despite the immutability of blockchain.[70]

[67] Nancy J King and Pernille Wegener Jessen, "For Privacy's Sake: Consumer 'Opt Outs' for Smart Meters" (2014) 30 Computer Law & Security Review 530 <https://doi.org/10.1016/j.clsr.2014.07.001>.

[68] Yue, Zhang and Song (n 37).

[69] Cf. Article 25. Regulation (EU) 2016/678 of the European Parliament and of the Council 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.

[70] M Tehrani (n 63) 157.

e. The fifth point of tension: overlapping competencies between NRAs and DPAs

A fifth recommendation is to propose the creation of collaboration mechanisms between the NRAs and DPAs to ensure the consistent application of both regulatory frameworks. In this regard, inter-agency collaboration can contribute to uniformly enforcing regulatory provisions. In this way, NRAs and DPAs can develop guidelines and practices that include dual obligations regarding the realisation of the rights to energy, data protection and privacy. Consequently, collaboration between NRAs and DPAs would contribute to ensuring that energy companies comply with regulations applicable to the energy sector, as well as data protection and privacy.

III. Conclusions

Since the dawn of human civilisation, energy has been a cardinal condition for survival, economic development, and safeguarding of human dignity. Consequently, the fundamental nature of energy needs has been a catalyst for the evolution of the recognition of the right to energy. Modern societies are increasingly relying on renewable energy sources to overcome their traditional energy dependence. In turn, the energy shift towards energy transition has led the EU to embrace digitalisation as a pillar for optimising its energy systems. However, integrating digital technologies has brought new data protection and privacy challenges, which are fundamental rights in the European Union.

Based on the above, this research has analysed the main points of tension and incompatibility between the right to energy (from a consumer law perspective) and the rights to data protection and privacy under two main legal bodies: RED and GDPR. The parallel development of both regional legal instruments has resulted in legal incompatibilities, that urgently require analysis to ensure the realisation of the right to energy, data protection, and privacy rights without sacrificing one for the sake of the others.

Among the main points of tension analysed were the challenges in implementing the principle of data minimisation in the large-scale collection of energy data from the implementation of smart energy systems. Such a tension is constituted based on the granular data collection necessary for the optimisation of energy supply and the integration of RES. This raises concerns about data protection and privacy regarding the potential misuse of sensitive data. Based on this, this article proposes the creation of regulatory guidelines to ensure a balance between the operational data needs of the European energy sector and the application of RED and GDPR provisions.

Another point of tension identified was informed consent under GDPR rules. In this context, with the increasing reliance of European energy systems on real-time data through smart grids and tools such as smart meters, the granting of informed consent by energy consumers has become more complex. As a result, an urgent need emerges for greater transparency and agency over their data, ensuring that they can exclude non-essential energy data that the law must define.

In addition, emerging digital technologies such as AI and blockchain in the energy sector have raised concerns regarding GDPR compliance, particularly regarding potential profiling practices, automated decision-making processes, and the effectiveness of the forgotten right to be forgotten. Despite the ability of these technologies to improve the EU's energy systems, their deployment and implementation must align with GDPR provisions from the earliest stages of development.

This research then analysed how the spirit of the RED rules, which aim to identify and mitigate vulnerability and energy poverty, puts data protection and privacy at risk through collecting sensitive data. This research proposes creating and implementing data

protection impact assessments to mitigate this situation and avoid compromising GDPR compliance while combating vulnerability and fuel poverty.

Ultimately, this research underscores the need to reconcile the legal frameworks governing the right to energy, as well as data protection and privacy rights. In turn, their institutional frameworks need mechanisms that promote their interrelation and collaboration. In this context, much remains to be done at the European level and in the member states to ensure the coherent realisation of the right to energy, as well as data protection and privacy rights.

This research highlights the inherent tensions between the digital and energy transitions, primarily through the lens of the European legal framework governing rights to energy, data protection, and privacy. The exposed tensions emphasise the need for an integrated approach to the twin transitions, where digital innovation and energy sustainability align with fundamental rights and fully comply with the law. RED and GDPR should be considered regulatory frameworks that can jointly evolve to support a fair and secure digital energy transition. This highlights the role of law in creating a future in which the twin transitions are legally compliant, compatible and mutually reinforcing.

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