EUROPEAN
COMMISSION

Brussels, XXX
[…](2022) XXX draft

COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS

Digitalising the energy system - EU action plan

1. TOWARDS A DIGITALISED, GREEN AND RESILIENT ENERGY SYSTEM

To end the EU's dependence on Russian fossil fuels and tackle the climate crisis, the European Green Deal and REPowerEU require nothing less than a transformation of our economy, society and energy system. For example, we need to install solar photovoltaic (PV) panels on roofs of all commercial and public buildings by 2027 and on all new residential buildings by 2029[1], install 10 million heat pumps over the next 5 years[2] and get 30 million zero-emission vehicles on the road by 2030.[3] Reducing greenhouse gas emissions by 55% and reaching a share of 45% renewables in 2030 can only happen if the energy system is ready for it. To this end, more than EUR 560 billion of electricity infrastructure investments are needed over the coming years.[4]

To integrate ever-higher shares of variable renewables while ensuring energy supply is affordable and resilient, and to ensure that what could be competing uses of the electricity grid become complementary in the most efficient way, it is clear that Europe needs to build an energy system that is much smarter and more interactive than it is today. Decarbonisation, electrification, sector integration and decentralisation of the energy system all require a tremendous effort in digitalisation. Digitalisation of the energy system is a policy priority and one where the European Green Deal and the digital agenda need to go hand-in-hand as a twin transition.

Digitalisation is already underway in the energy sector, as it is in many other sectors: electric cars, PV installations, heat pumps and many other new devices are equipped with smart technology that generate data and enable remote control. The number of active Internet-of-Things (IoT) devices in the world is expected to grow rapidly, and surpass 25.4 billion in 2030[5]. 51% of all households and SMEs in the EU are equipped with smart electricity meters[6]. EU digital[7] and energy policies[8] already guide digitalisation of energy as issues like security, privacy and consumer protection cannot be left to the market alone and its proper implementation is key.

But more is needed if we want fully exploit the potential of digital technologies and accelerate digitalisation of our energy system while addressing the challenges it brings. Sharing data across the energy value chain, and linking these data with weather models, mobility patterns,

---

1 Contributing to reach 600GW of solar PV capacity compared to 165GW currently: EU Solar Energy Strategy COM(2022)221

2 In 2020 there were 21.8 million installed heat pumps. Adding 10 million units in 5 years means a doubling of the installation rate: REPowerEU Communication: COM(2022)230 final

3 Sustainable and Smart Mobility Strategy – putting European transport on track for the future, COM(2020)789 final, Brussels, 9 December 2020. For comparison, in 2021 there were around 2.1 million passenger cars and vans with electric batteries within the EU

4 REPowerEU plans for an additional electricity infrastructure investment of EUR 29 billion, on top of the investments estimated at EUR 536 billion between 2020 and 2030 required to reduce greenhouse gas emissions by 55% (based on PRIMES modelling).

5 Compared to more than 10 billion devices in 2021, and compared to 27.3% in North America and 35.7% in the Asia-Pacific market; https://www.cbi.eu/market-information/outsourcing-itobpo/industrial-internet-things/market-potential, 7 June 2022

6 Estimate based on Smart Metering Benchmarking Report (March 2020), European Commission, Directorate-General for Energy, Alaton, C., Tounquet, F., Benchmarking smart metering deployment in the EU-28 : final report, Publications Office, https://data.europa.eu/doi/10.2833/492070;

7 Such as the General Data Protection Regulation, the Data Strategy, including the Data Governance Act and the proposed Data Act.

8 Such as the Clean Energy Package and the subsequent detailed market rules, as well as the Fit-for-55 proposals and the proposal for a Regulation on Ecodesign for Sustainable Products.

financial services and geographic location systems through ever-more powerful computing capacity will make innovative services at new levels of precision and adequacy possible which will contribute to growth and jobs in the EU. It will enable financial institutions to unlock private investments that support the energy transition and will enable consumers to actively manage their energy consumption or generation and benefit from direct participation in the market. This requires a strategic vision and concrete actions in the following areas:

- First and foremost, we must promote connectivity, interoperability and seamless **exchange of data** between different actors;
- Second, digitalisation requires more and better coordinated investments in **the electricity grid as the enabler for a smarter and more resilient energy system**;
- Third, **consumers** need support and protection to benefit from new ways to engage in the energy transition or from better services based on digital innovations;
- Fourth, as the energy system is critical for the economy, it needs to be **cyber-secure** – which requires a continuous effort and investment;
- Fifth, we need to ensure that the **growing energy consumption of digital technologies** themselves is a driver for the clean energy transition;
- Finally, digitalisation is an ongoing transition that requires **structural and joint learning** of all actors involved as well as continuous **support for R&I**.

2. TOWARDS AN EU FRAMEWORK FOR SHARING DATA TO SUPPORT INNOVATIVE ENERGY SERVICES

The key enabler for a digitalised energy system is the availability of, access to, and sharing of energy-related data based on seamless and secure data transfers among trusted parties. Better coordinating these exchanges and building an EU coordination framework to strengthen interoperability among different systems and technical solutions will make it possible for more innovative services to enter the market. Generally applicable principles will also need to be strictly upheld, including those on EU data sovereignty, cybersecurity, data privacy, consumer acceptance and interoperability.

That is why Europe needs a common European energy data space[9], and will need to start its deployment no later than 2024. The deployment of an appropriate data sharing framework for energy could facilitate the participation on the wholesale markets of more than 580 GW of flexible energy resources that make full use of digital solutions by 2050[10]. It is estimated that this would cover over 90% of the overall flexibility needs in the EU electricity grids[11]. Enabling the smart and bidirectional charging of electric vehicles (EVs), the participation of virtual power plants in the energy markets and exploiting the potential of energy communities, smart buildings and smart heating using heat pumps could contribute the largest share of that flexibility[12].

---

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

10 '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.

11 The EnTEC report estimates a demand for flexibility on the wholesale/spot electricity markets of 630 GW by 2050.

12 As estimated by the EnTEC study.

The existing European regulatory framework for energy already prepared the ground[13], and the Fit-for-55 proposals put forward specific provisions on data exchanges. In particular, the proposed revisions of the Renewables Energy Directive[14] and of the Energy Performance of Buildings Directive[15] include provisions on accessing data needed for smart-charging electric vehicles and data originating from (smart) buildings[16]. More generally, the proposed Data Act[17] lays down generic principles on data access and clarifies users' right to freely access and use the data generated by their products, including the right to share these data with third parties. Additionally, the proposed Data Governance Act[18] aims to foster the availability of data by strengthening the data sharing mechanisms and increasing trust in data intermediaries.

Now is the time to put these principles into practice and making many-to-many data exchanges happen effectively and efficiently. This requires a coordinated approach guided by the public authorities. The framework for data sharing is not just about standardisation, it requires a complex set of legal and operational arrangements, as well as technical requirements and guidelines.[19] Strong coordination is needed to ensure coherent and smooth processes at European level, which complement, coordinate, and add value to the national initiatives. Therefore, **the aim of this action area is to establish a common European Energy Data Space[20] and to ensure a solid governance for it, in the form of a coordinated European framework for sharing and using the energy data.** A preparatory phase will be completed by 2024, with the deployment starting immediately after. The indicative timetable and the steps needed towards this goal are presented below.

2.1 Strategic EU coordination

The Commission will set up, by March 2023 at the latest, the 'Data for Energy' (D4E) group. This group will bring together the Commission, the Member States and the relevant public and private stakeholders for building the European framework for sharing energy-related data. D4E will help strengthening the coordination at EU level on data exchanges for the energy sector, defining the driving principles and ensuring consistency across different data-sharing priorities and initiatives. Furthermore, D4E will support the Commission in developing and rolling out a common European data space for energy. Thus, the governance and the main building blocks of the upcoming data space will be designed and managed in partnership.

---

13 Through specific provisions regarding data laid down by the Electricity Directive ((EU) 2019/944) and the Electricity Regulation ((EU) 2019/943).

14 COM(2021) 557 final.

15 COM(2021) 802 final.

16 Data on the buildings' energy performance, data from building automation and control systems, meters and charging points for e-mobility.

17 COM(2022) 68 final.

18 COM(2020) 767 final.

19 The Smart Grids Reference Architecture (SGAM) Framework, prepared by the European standardisation organisations, became a worldwide reference for information flows and interoperability in energy. SGAM defines a hierarchy of interoperability categories that include, in addition to technical interoperability, informational and organisational layers.

20 A common European data space brings together relevant data infrastructures and governance frameworks, in order to facilitate data pooling and sharing. It will include the deployment of data sharing means and services, data governance structures, and will improve the availability, quality and interoperability of data. More details are provided in the Commission Staff Working Document on common European data spaces (SWD(2022) 45 final).

To ensure synergies with work that is already ongoing, the **Commission will formally re-establish the existing Smart Grids Task Force (SGTF)**[21] to further promote the digitalisation of the energy sector. **The group will be renamed the 'Smart Energy Expert Group'** and will undertake a necessary broadening of the responsibilities and membership by involving all Member States and additional relevant stakeholders. The Smart Energy Expert Group will include the new D4E as one of its permanent working groups[22].

D4E will focus its work on developing a portfolio of European high-level use cases[23] for data exchanges in energy that are key to deliver on the objectives of the Green Deal and the Digital Decade. The high-level use cases that will be addressed from the outset include: flexibility services for the energy markets and grids; smart and bi-directional charging of electric vehicles; and smart and energy-efficient buildings, including boosting private and public investments and harnessing the proposed solar rooftop initiative.

These priorities cover the most dynamic areas of the energy markets and services, where close coordination among many different parties is needed to ensure coherent approaches and economies of scale through interoperability. These priorities were confirmed by the public consultation and the workshops organised in February and March 2022[24]. The coordination at European level will aim to ensure that, on the one hand, these priorities evolve into the main elements of a future common European energy data space and, on the other hand, they build on the work already carried out either in the Member States or through various European initiatives. Additional high-level use cases can be considered later in the process, whenever needed.

D4E will further develop those priority areas by producing the implementing details and deliverables needed as building blocks for the future common European energy data space, and will propose them to the Commission for endorsement and to act upon. In doing so, D4E will capitalise on other initiatives and work streams that are being undertaken at the European level[25]. In particular, for smart and bi-directional EV charging, **the Commission will define,**

---

21 The Smart Grids Task Force is an informal expert group that advises the Commission on policy and regulatory frameworks for developing and rolling out smart grids (https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?do=groupDetail.groupDetail&groupID=2892).

22 In addition to already existing working groups, such as Expert Group 1 (EG1) that advised the Commission on the implementing act on metering and consumption data, EG2 that provided advice on cybersecurity, and EG3 that advised on market and regulatory provisions for supporting the deployment of smart grids.

23 The concept of high-level use cases refers to the main priority areas to be addressed. Each high-level use case will, in practice, encompass several use cases that will describe in more details the relevant actors, processes and data flows for each specific business and operational arrangement.

24 https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13141-Digitalising-the-energy-sector-EU-action-plan/public-consultation_en; https://ec.europa.eu/info/events/workshops-digitalisation-energy-system-2022-feb-16_en.

25 These include the current work of the Smart Grids Task Force, the ongoing work for a Network code on demand side flexibility (https://www.acer.europa.eu/sites/default/files/documents/Media/News/Documents/2022%2006%2001%20FG%20Request%20to%20ACER_final.pdf), the work related to the Commission proposal for a Regulation on the deployment of alternative fuels infrastructure (https://eur-lex.europa.eu/resource html?uri=cellar:dbb134db-e575-11eb-a1a5-01aa75ed71a1.0001.02/DOC_1&format=PDF) and the results obtained by the Sustainable Transport Forum, as well as the activity and products of the Expert group on European financial data space (https://ec.europa.eu/transparency/expert-groups-register/screen/expert-groups/consult?lang=en&groupID=3763) and the Energy Efficiency Financial Institutions Group (EEFIG) (https://eefig.ec.europa.eu/index_en).

by 2023, a joint work programme for D4E and the Sustainable Transport Forum[26] with the aim to ensure alignment between the energy and mobility data spaces, supporting system integration and providing cross-sectoral services. Additionally, D4E will closely cooperate with the Expert Group on the European financial data space for developing use cases of common interest to channel more private financial resources to the energy transition.

D4E will also help the European Commission to implement the governance of the common European data space for energy. This will be done in close coordination with the European Data Innovation Board[27] and the emerging governances of the other European data spaces, to ensure consistent approaches and embed interoperable processes from the outset. Seamless data flows across the energy data space, as well as between energy and other data spaces[28], are instrumental to create value added along and across European value chains. Furthermore, the Data Spaces Support Centre[29] will provide guidance to the upcoming sectoral data spaces, and support their creation by making available relevant technologies, processes, and tools. The guiding principles and recommendations of the European Interoperability Framework[30] will inform the processes of ensuring cross-sectoral interoperability.

2.2 Immediate results and building blocks to support the process

D4E will be set up in parallel with several other initiatives that will mutually reinforce each other. For all initiatives, it is important that consumers have a smart electricity meter installed in their home. This is still not the case in many Member States[31] and makes it even more pressing to step up efforts to more widely deploy smart metering. The Commission also calls on those Member States who have not yet achieved full roll out of smart meters to speed up their efforts. Where a cost-benefit analysis concluded against roll out of smart meters, the Commission calls on Member States to repeat these in light of the Green Deal and REPowerEU.[32]

When advising the Commission, D4E will factor in these activities that all support enhanced data exchanges, and will capitalise on their outputs. These initiatives include:

- Adoption by the Commission of an **implementing act on interoperability requirements, and non-discriminatory and transparent procedures for access to**

---

26 In particular the working group 'Common Data Approach for Electromobility and other Alternative Fuels (STF on Data)' that focuses on mapping the policy and technical elements needed to put in place an open data ecosystem for electromobility (https://transport.ec.europa.eu/transport-themes/clean-transport-urban-transport/sustainable-transport-forum-stf_en).

27 Expert group that will be established according to the provisions of the proposed Data Governance Act.

28 Such as the data spaces dedicated to mobility, construction and buildings, and the financial sector.

29 The Data Spaces Support Centre is being set up with the support of the Digital Europe Programme (https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/digital-2021-cloud-ai-01-suppcentre).

30 https://joinup.ec.europa.eu/collection/nifo-national-interoperability-framework-observatory/3-interoperability-layers.

31 At the end of 2020, in 11 Member States the installation rate of electricity smart meters to householders had reached more than 80%; Denmark, Estonia, Spain, Finland, Italy, and Sweden recorded a 98% roll-out rate or higher, followed by Luxembourg, Malta, the Netherlands, France and Slovenia, with roll-out rates between 83% and 93%. Smart metering roll-out plans and actual roll-out rates diverge widely, suggesting that a number of EU consumers will not have access to smart meters in the near future (source: ACER/CEER Market Monitoring Report 2021).

32 See Article 19(5) of the Electricity Directive, which states that where the deployment of smart metering systems has been negatively assessed as a result of the cost-benefit assessment, Member States shall ensure that this assessment is revised at least every four years, or more frequently, in response to significant changes in the underlying assumptions and in response to technological and market developments.

metering and consumption data (as provided for by the Electricity Directive, Article 24);

- Preparing the ground for **implementing acts on interoperability requirements, and non-discriminatory and transparent procedures for access to data required for demand response and customer switching** (as provided for by the Electricity Directive, Article 24);
- Promoting a **code of conduct for energy-smart appliances to enable interoperability and boost their participation in demand response schemes**[33].

The EU Research and Innovation, and Digitalisation programmes will continue to play a key role. Thus, the Commission intends to **support, through the Digital Europe Programme**[34]**, the deployment of a common European energy data space**. This will **build on the demonstrations and results that will be developed by a set of projects funded by Horizon Europe**[35], as well as on the use cases that will be developed by D4E. Additionally, **the Horizon Europe programme supports key research and innovation projects and initiatives**[36] **that provide valuable inputs on best practices and recommendations, including concrete deliverables such as tools and methodologies**. These inputs will, on the one hand, enhance the interoperability of the solutions proposed by Horizon Europe projects and, on the other hand, could be further scaled up and used to develop the high-level use cases and bridge the identified market gaps towards the deployment of a fully-fledged data space[37]. By doing so, the Commission will guide the work of D4E with the results brought forward by projects and programmes that pilot energy data spaces and common models for both data exchanges and interoperability.

3. PROMOTING INVESTMENTS IN DIGITAL ELECTRICITY INFRASTRUCTURE

Smart and digital energy infrastructure is a key requirement for all the high-level use-case priorities. The electricity grid needs to interact with many actors or devices based on a detailed level of observability, and hence availability of data, to enable flexibility, smart charging and smart buildings. The EU's electricity network has become increasingly digitalised in the last decade, but the speed of transformation needs to increase significantly. Coordination and cooperation will help to ensure the best value for money in driving change across the EU and contributing to an efficient digitalisation of the electricity grid. As stated above, to achieve the ambitious targets of both the "Fit for 55" and REPowerEU plans, EUR 565 billion of investment in the electricity grid will be required, between 2020 and 2030, in particular in the distribution grid.

---

33 This will facilitate the aggregation of flexibility coming from smart assets in households and companies. For more details see: https://ses.jrc.ec.europa.eu/development-of-policy-proposals-for-energy-smart-appliances.

34 This includes proposed support for the deployment of a common European energy data space with a budget of EUR 8 million, and support by and cooperation with the Data Space Support Centre for interoperability across data spaces (e.g. mobility, smart communities).

35 The Horizon Europe 2021 Work Programme supports 5 projects with a budget of EUR 40 million that aim to establish the ground for deploying a common European data space for energy (https://ec.europa.eu/info/funding-tenders/opportunities/portal/screen/opportunities/topic-details/horizon-cl5-2021-d3-01-01).

36 Such as projects that are cooperating under the Bridge initiative to provide policy advice with regard to smart grids: (https://bridge-smart-grid-storage-systems-digital-projects.ec.europa.eu/).

37 Examples of deliverables that are developed and maintained by a community of projects include: a repository of common use cases, a reference architectures to be widely used, and an improved set of harmonised role models for the actors in the energy markets.

A substantial part of these investments will need to be in digitalisation, otherwise the investments needed will be even greater. The International Energy Agency (IEA) estimated that, globally, demand-side responses could avoid USD 270 billion of investments in new electricity infrastructure,[38] Another study estimates that around EUR 170 billion investments in digitalisation will be needed out of a total of around EUR 400 billion[39] investments in the distribution grid over the period 2020-2030.

Therefore, the Commission announces today that it **will support the EU transmission system operators (TSOs) and distribution system operators (DSOs) to create a digital twin of the European electricity grid**: a sophisticated virtual model of the European electricity grid. The aim of the digital twin is to enhance the efficiency and smartness of the grid as a way to make not only the networks, but the energy system as a whole, more intelligent. The creation of a digital twin will be achieved through coordinated investments in five areas: (i) observability and controllability; (ii) efficient infrastructure and network planning; (iii) operations and simulations for a more resilient grid; (iv) active system management and forecasting to support flexibility and demand response; and (v) data exchange between TSOs and DSOs. The digital twin will not be created in one go but will be a continuous investment and innovation effort for years to come. As a first step, the European Network of Transmission System Operators for Electricity (ENTSO-E) and the EU DSO Entity will sign today a **Declaration of Intent** to kick-start the development of a digital twin of the EU-wide electricity grid with a comprehensive consultation of grid users and other stakeholders on concrete deliverables. The Commission intends to support ENTSO-E and the EU DSO Entity as well as concrete investments by system operators through various means including Horizon Europe.

Fostering investments in smart energy grids requires a comprehensive framework, but many Member States' regulations do neither appear to incentivise digitalisation nor innovation.[40] To foster investment in the smartness of the European electricity grid, and in the digital twin in particular, a coordinated approach is also needed that helps national regulators to determine what constitutes efficient investment in digitalisation and to provide incentives to system operators. Therefore, the Commission will aim to ensure that by 2023 a regulatory framework that is fit for purpose to attract and guide such investment is in place[41]. In particular, **the Commission will support the European Union Agency for the Cooperation of Energy Regulators (ACER) and the national regulatory authorities (NRAs) in their work to define common smart grid indicators, as well as objectives for these indicators, so NRAs can monitor smart and digital investments in the electricity grid annually as of 2023**[42] and **measure progress towards the creation of the digital twin**[43].

---

38 International Energy Agency, Digitalization and Energy, 2017 - https://iea.blob.core.windows net/assets/b1e6600c-4e40-4d9c-809d-1d1724c763d5/DigitalizationandEnergy3.pdf

39 Figure for the EU+UK. Source: Connecting the dots: Distribution grid investment to power the energy transition - Eurelectric – Powering People

40 Position on incentivising smart investments to improve the efficient use of electricity transmission assets, ACER, November 2021

41 Article 59.1(l) of Directive (EU) 2019/944 (the Electricity Directive) states that 'the regulatory authority shall have the following duties: monitoring and assessing the performance of transmission system operators and distribution system operators in relation to the development of a smart grid that promotes energy efficiency and the integration of energy from renewable sources, based on a limited set of indicators, and publish a national report every two years, including recommendations;

42 The common indicators will also provide guidance on the transposition of Article 59.1(l) of the Electricity Directive

43 As both actions will happen in parallel and common smart grid indicators will be defined in the same 5 areas as those for coordinated investments to create the digital twin

These actions, and the digitalisation of energy infrastructure more generally, have and will be supported through various instruments at EU level. Already before the revision of the TEN-E Regulation[44], cross-border smart grid projects had regularly been identified as PCIs[45], giving such projects access to substantial benefits including political visibility and support, the streamlining provisions for PCIs such as on permitting, or the possibility to apply for EU funding through CEF grants[46]. The revised TEN-E Regulation updated the definition of smart electricity grids and its related category for cross-border smart electricity grid projects of common interest (PCIs) as well as simplified the selection criteria and the role of project promoters.

In addition, digitalisation of national and regional administrative services can help to streamline permit processes for grid development[47] by making it possible to communicate online and by supporting the activities of the permitting national competent authorities and single points of contact[48]. The Commission will open the technical support instruments for this goal. Member States can request, via their coordinating authorities, assistance from the technical support instruments.[49]

4. BENEFITS FOR CONSUMERS: NEW SERVICES, SKILLS AND EMPOWERMENT

Digitalisation aims to bring benefits to households and SMEs in the form of innovative data-driven services that enable them to for example better manage their bills, share electricity they generated themselves with their neighbours or sell it back to the market, or save energy (and money) which is one of the cheapest, safest, and cleanest ways to reduce our reliance on fossil-fuel imports from Russia.[50] This is especially important with the current high prices as well as the supply disruptions and risk of a complete cut-off from Russian gas.[51]

Digital information about the energy consumption of appliances (through the European Product Registry for Energy Labelling[52]) or in the home (through smart meters) can help consumers in their efforts to reduce energy use, provided that such digital tools are made available[53] to all consumers at an affordable price[54]. But interoperability is key. For example, the first results of

---

44 Regulation (EU) 2022/869 on guidelines for trans-European energy infrastructure

45 The 5th Union List (2021) contains five cross-border smart electricity grid PCIs: 10.4, 10.7, 10.10, 10.11 and 10.12.

46 As a last resort mechanism for implementing a PCI when all other measures (tariffs, incentives and regulatory measures, etc.) have been exhausted

47 Including grid connection, as well as build out and operation of renewable power plants

48 For example, via the creation of electronic application portals and common repositories of permitting-related relevant data for energy infrastructure and renewable projects, one-stop shops for project developers or by increasing transparency on the availability of grid capacities to uptake additional renewable projects in specific local areas.

49 https://ec.europa.eu/info/funding-tenders/find-funding/eu-funding-programmes/technical-support-instrument/technical-support-instrument-tsi_en

50 COM(2022) 240 final

51 COM(2022) 360 final

52 https://ec.europa.eu/info/energy-climate-change-environment/standards-tools-and-labels/products-labelling-rules-and-requirements/energy-label-and-ecodesign/product-database_en

53 In the framework of the European Pillar of Social Rights and particular Pillar 20 on access to essential services, where both energy and digital services are part of the social protection and inclusion strategy

54 The EU's Affordable Housing Initiative contributed among other things to supporting projects aimed at developing IoT as well as domotic technologies in affordable and social housing: https://single-market-economy.ec.europa.eu/sectors/proximity-and-social-economy/social-economy-eu/affordable-housing-initiative_en

the DRIMPAC project[55] showed that making it easy for small energy consumers to participate in demand response through a unified interoperability framework can lower their energy bills by 20%, driven among other things by a 15% reduction in energy consumption.

4.1 A legal framework that empowers and protects consumers

The EU legal framework[56] lays down the rights of consumers, but implementation is slow.[57] This is not just a matter of detailed market rules[58], interoperability or data exchange. Consumers also need to be able to retain control over who can access their data. Under the proposed Data Act,[59] data sharing requires consent from the consumer for third-party access to its data. This is key to ensuring consumer's trust, choice, and privacy, in line with the principles and objectives set forth in the proposed European Declaration on Digital Rights and Principles.[60]

Consumer protection needs to be adequately ensured in light of the digitalisation of the energy sector. This is particularly relevant with regards to data-driven commercial practices that could exploit the behavioural biases of consumers or otherwise prevent them from making informed choices. The Electricity Directive addresses the issue of consumers' rights in relation to bundled[61] products or services.[62] General EU consumer protection legislation, such as the Unfair Commercial Practices Directive[63], Consumer Rights Directive[64] and Unfair Contract Terms Directive[65] aim to ensure that consumers have access to clear information and are not subjected to misleading or aggressive commercial practices online or offline. In order to ensure that the existing legal framework remains fit for purpose, the Commission has launched a **Fitness Check of EU consumer law on digital fairness**[66]. This evaluation will examine whether the existing rules are adequately tackling issues that are also relevant in a more digitalised energy sector, such as consumer vulnerabilities in the digital environment, manipulation of choice, difficulties with contract cancellations, etc.

4.2 Digital tools designed for and with consumers

---

55 Unified Demand Response Interoperability framework enabling Market Participation of Active energy Consumers. For more information see: CORDIS Results Pack on digitalization of the energy system – A thematic collection of innovative EU-funded research results

56 For example, the Electricity Directive allows consumers to participate in the electricity market and make money from their flexibility in energy use and generation, and this is further promoted in the revised Renewable Energy Directive 2018/2001/EU.

57 See for instance https://www rescoop.eu/policy#transposition-tracker for a tracking of the transposition by Member States of the different provisions of the Electricity Directive and the Renewable Energy Directive on energy communities.

58 In particular, the ongoing preparatory work for a possible network code on demand-side flexibility

59 COM(2022) 68 final

60 COM(2022) 28 final

61 I.e. packages of combined goods and/or services within a sector, or across multiple sectors (e.g. energy + household insurance + internet; or banking + travel insurance; or credit cards + travel; or other combinations thereof)

62 More precisely, it addresses consumers' basic contractual rights when purchasing bundled products (Art. 10), minimum information requirements (Annex 1) as well as alternative dispute resolution mechanisms (Art. 26).

63 Directive 2005/29/EC concerning unfair business-to-consumer commercial practices in the internal market.

64 Directive 2011/83/EU on consumer rights.

65 Council Directive 93/13/EEC on unfair terms in consumer contracts.

66 See https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/13413-Digital-fairness-fitness-check-on-EU-consumer-law_en. The Fitness Check will cover three Directives: the Unfair Commercial Practices Directive (2005/29/EC); the Consumer Rights Directive (2011/83/EU); and the Unfair Contract Terms Directive (93/13/EEC).

In 2021 only 54% of people[67] had basic digital skills[68] but in a digitalised energy market many more will need these skills. This will help them to make informed choices and ensure that they do not miss out on opportunities to become more competitive, or to save energy costs. For example, SMEs and households need to understand how to engage in demand-response, how to optimise their own use of electricity produced on-site, or what is entailed by charging an electric vehicle[69].

As not all consumers are able or interested to participate in the energy transition in the same way or to the same degree of involvement[70], it is important to create consumer-focused digital tools designed to meet the needs, skills, conditions, habits and expectations of different categories of market participants. Since energy poverty is a significant cause of the digital divide, public authorities can use digital tools to better map, monitor and address energy poverty.

The Commission has recently launched, under the Expert Group 3 of the Smart Grids Task Force, a new activity to further investigate the potential engagement of consumers with digital tools and technologies. It will help collect and review current practices, identify lessons learnt and possible gaps, as well as frame recommendations for reinforcing the role of consumers' flexibility and empowerment in the energy market. To support the new activity of EG3, **the European Commission will ensure that key R&I projects work together[71] to identify – by mid-2023 – strategies to engage consumers in the design and use of digital tools** and to identify indicators to assess engagement over time.

4.2 Energy communities and local energy initiatives

Engagement in the energy market is not simply an issue of individual consumers' participation. Public engagement can also take collective forms, which have proven to be highly effective.[72] Here too, digital tools play an important role in developing collective self-consumption schemes and energy communities. Collective energy schemes that involve a whole community, village or town can allow such consumers to connect and scale-up collectively their potential interaction with the electricity system. For example, such schemes could allow a community to: (i) better monitor how the community is performing in terms of energy consumption[73], or (ii) engage in energy sharing or peer-to-peer trading of electricity produced from joint investment projects that can make them less dependent on high electricity prices set in the wholesale market. The Commission will seek to make the best use of digital tools to support

67 People aged 16-74. From Digital Economy and Society Index 2022, 2022 results.

68 Digital and Economic Index (DESI) 2022 results, p. 14 of European Analysis 2022 retrieved from https://digital-strategy.ec.europa.eu/en/policies/desi

69 In accordance with the first principle of the proposed declaration on digital rights and principles for the digital decade: 'Putting people and their rights at the centre of the digital transformation'.

70 The acceptance of the transition, especially in terms of acceptance of renewable energy, is no longer a major issue in the European society as shown by multiple Eurobarometer surveys. What is lacking is the capacity for citizens to participate on equal footing as they often lack the resources (e.g. capital, knowledge) to be part of the transition.

71 Gathered in the BRIDGE (https://www.h2020-bridge.eu/) Citizens and Consumers' Engagement Working Group work stream on 'Exploration of citizens engagement methodologies in European R&I projects'.

72 See for examples: Mikkonen, I., Gynther, L., Matschoss, K., Koukoufikis, G., Murauskaite, I. and Uihlein, A., 'Social innovations for the energy transition', EUR 30446 EN, Publications Office of the European Union, Luxembourg, 2020, ISBN 978-92-76-25283-2, doi:10.2760/555111, JRC122289.

73 For example, the H2020-funded project COMPILE (https://www.compile-project.eu/products/compilot/) and the H2020-funded project NRG2peers (https://nrg2peers.com/) set up digital platform to help residential energy communities to increase energy efficiency and integrate a higher share of renewable energy in their consumption through gaming, turning gamers into local peer-to-peer energy traders.

energy communities and schemes for the local consumption of locally produced electricity. The Commission will also seek to promote the sharing of knowledge on existing digital tools. To achieve these goals, the Commission will:

- In the context of the Energy Communities Repository project, **identify and shortlist digital tools** and **produce guidance on energy sharing and peer to peer exchange arrangements. These tools and this guidance will** improve the understanding and skills of policy makers, regulators and local communities so they can build up and support information and communications technology (ICT) and data-driven business models.
- **Develop a first-of-its-kind experimentation platform** to test and simulate energy communities in combination with innovative activities such as blockchain-based energy trading. This experimentation platform could also help to better understand behavioural responses to price signals to optimise benefits for communities and identify potential legal, regulatory, fiscal or technical barriers.[74]

4.3 A skilled workforce to accelerate the digital transition.

There is a risk that new data-driven services and innovative technology solutions will not be implemented (fast enough) if there are not enough skilled workers and trained professionals to help deploy them[75]. Integrating energy transition-related topics into mainstream education and training is a challenge across the EU.[76] This could hamper the deployment of clean energy technologies and hinder the growth and competitiveness of the sector. Building on the 2020 skills agenda, the Council Recommendation on ensuring a fair transition towards climate neutrality and the ongoing blueprint for sectoral cooperation on skills for digitalisation of the energy value chain[77], **the European Commission will support the establishment – by end 2023 – of a large-scale partnership on the Digitalisation of the energy value chain as part of the EU's Pact for Skills**. Synergies will be exploited with the upcoming large-scale partnership on onshore renewables[78], the large-scale partnership in the Digital ecosystem, the Digital Skills and Jobs Community, the initiatives for digital skills in energy under the Digital Europe Programme and other relevant sectorial skills alliances and related initiatives.

5. STRENGTHENING CYBERSECURITY AND RESILIENCE IN THE ENERGY SYSTEM

Cybersecurity is an essential requirement for the reliability of the increasingly digitalised energy system. It plays a key role for the energy system to remain secure and robust against cyber incidents and major attacks, covering the whole value chain of the energy system, from production and transmission to distribution and the consumer, including all the digital interfaces along this path.

---

74 With the European Commission's Joint Research Centre's Living Lab for Testing Digital Energy Solutions

75 Based on the results of the public consultation, the Commission has identified shortcomings in skills development and the lack of adequate skilled workers as the most important barrier to the uptake of digital technologies (Synopsis Report COM/2022/XX)

76 JRC forthcoming, *Skills for the clean energy transition*, science for policy report

77 The blueprint for sectoral cooperation on skills is one of the key initiatives of the new skills agenda for Europe. Under the blueprint, stakeholders will work together in sector-specific partnerships, also called sectoral skills alliances. Partnerships from each project will develop a sectoral skills strategy to support the overall growth strategy for the sector at EU level (to be further rolled out at national and regional level).

78 EU Solar Energy Strategy, COM/20222/221 final

The requirements for - and costs of - addressing cybersecurity risks need to be approached in a way that ensures an accessible and competitive market for new services and products. In addition to the critical role of large electricity generation and transport infrastructure (both existing and new, such as offshore wind farms and grids as mentioned in the strategy on offshore renewable energy[79]), more decentralised generation and consumption of energy that are IoT connected increase the 'attack surface' of the entire energy system, and thus increase cyber-related risks.

The EU has a systemic approach to strengthen the cybersecurity of energy networks. This approach combines energy-specific measures building on the cross-sector cybersecurity framework. The reviewed Directive concerning measures for a high common level of security of network and information systems across the Union (Network Information Systems 2 Directive) is foreseen to be adopted soon. It defines the energy sector as one of the EU's critical infrastructures, and provides for cyber-security, obligations related to supply chain security and risk-management measures.

To increase the resilience to cybersecurity-risks in the electricity system, the Commission (with ACER, ENTSO-E and the EU DSO Entity) intends to **propose a delegated act in the form of the network code for cybersecurity aspects of cross-border electricity flows** (NCCS) stemming from the requirements of **Article 59(2)(e)** of the Electricity Regulation, including rules on common minimum requirements, planning, monitoring, reporting crisis management, aiming for its adoption in early 2023.[80] Similarly, with the proposal to amend the Security of Gas Supply Regulation[81], the Commission aims to adapt the gas system to new risks, such as cyber security, and the Commission may, and once this amendment is adopted, propose **a delegated act on the cybersecurity of gas and hydrogen networks**.

The Commission will also aim to improve the **resilience of critical energy infrastructures** against possible physical, cyber or hybrid attacks **through an** upcoming **Commission Recommendation** that will address areas such as a harmonised approach to identify critical energy infrastructure, the exchange of information, and available options to finance the resilience of critical energy infrastructure. An expert group will be set up to offer a platform to facilitate some of the work and discussions proposed by the Recommendation.

Lastly, the Commission plans to propose in the third quarter of 2022[82] a Cyber Resilience Act. The proposal for a Cyber Resilience Act intends to set out harmonised cybersecurity rules for the placing on the market of digital products in the Union. It intends to outline the duty of care for the whole lifecycle of these products, as well as corresponding rules on market monitoring and surveillance. These requirements would be objective-oriented, technology-neutral and future proof. As relevant, the Act would also cover devices embedded in the energy supply cycle; for example, digital industrial control systems used for frequency control in the electricity grid. The Cyber Resilience Act intends to propose not only enhancing the baseline security of the digitalized devices but also helping to increase the trust among the different operators. The Commission will therefore promote best use of those schemes by stakeholders.

---

79 COM(2020) 741 final

80 The network code will take the form of a Delegated Act, and is based on the powers that the European Parliament and the Council delegated to the Commission in the Electricity Market Regulation (Regulation (EU) 2019/943) to develop sector-specific rules (a so called "network code")

81 Proposal to amend the Gas Security of Supply Regulation, December 2021 (EU) 2017/1938

82 The consultation was open until 2 May 2022, see https://digital-strategy.ec.europa.eu/en/consultations/cyber-resilience-act

6. ENERGY CONSUMPTION OF THE ICT SECTOR

Although it brings benefits to nearly all sectors of our economy[83], the ICT sector accounts for approximately 7% of global electricity consumption, and it is forecasted that this share will rise to 13% by 2030[84]. This electricity use at worldwide level is currently comparable to the cumulated electricity consumption of the entire population taken together in Germany, France, Italy, Spain and Poland, and thus requires comprehensive planning given the demand it puts on our electricity grid. In addition, the energy footprint of ICT represents 3-5% of global carbon emissions, which puts it on a par with the aviation industry's emissions[85]. Ensuring that the growing energy needs of the ICT sector are met in a way that does not impede the wider objective of achieving climate neutrality is therefore an essential part of the twin green and digital transition.[86] In addition to the production and operation of ICT devices, networks and datacentres are themselves significant consumers of energy. Most recent analysis suggests that, the energy consumption of consumer devices in 2020 accounted for roughly 50% of the overall energy consumption of ICT technologies, with the two next largest contributors being respectively the production of ICT devices (~20%) and the operation of data centres (~15%).[87] However, this picture is expected to change dramatically by 2030, as the overall energy consumption of ICT technologies is expected to increase by 50% over this decade. The top three contributors in 2030 would then be the operation of consumer devices (33%), the operation of data centres (30%) and the operation of networks (27%)[88]. It is crucial to address: (i) the energy and resources consumption over the full ICT value chain; and (ii) key emerging additional sources of ICT-related energy consumption. Solutions already exist, such as re-using waste heat from data centres, or moving towards circular models (longer lifetimes, reparability, reuse and recyclability). On new technologies like high-performance and quantum computing, the Commission will pay close attention to their energy consumption and will take necessary measures to drive investments towards the most energy-efficient solutions.

6.1 ICT devices and equipment – production and use

To address energy consumption during the production of ICT devices (such as a smartphone, a television or a server), the proposed framework of the **Ecodesign for Sustainable Products Regulation (ESPR)[89]** aims at (i) establishing **EU rules to make producers responsible for providing more 'circular' products** (i.e. products that can be easily reused and recycled) **and**

---

83 These benefits are mainly are mainly thought of in socio-economic terms, but are also of an environmental nature: in 2022, the European Commission launched the European Green Digital Coalition (EGDC) which currently includes 34 signatories committed to working together with experts and academia on science-based methods to measure the net environmental impact of digital solutions across priority sectors, including the energy and power sectors. By the end of 2022, 18 real-life case studies will be examined to help validate and refine the iterative development of the net environmental impact methodology across sectors. The first calculations of environmental effects of green digital solutions for energy systems, as well as draft guidelines for deployment of digitalisation with enabling effects, will be available in 2023.

84 Bertoldi, P.; Avgerinou, M.; Castellazzi, L. (2017) "*Trends in data centre energy consumption under the European Code of Conduct for Data Centre Energy Efficiency*", EUR 28874 EN, Publications Office of the European Union, Luxembourg, 2017, ISBN 978-92-79-76445-5, doi:10.2760/358256, JRC108354

85 Nicolas Jones, "How to stop data centres from gobbling up the world's electricity". See https://www nature.com/articles/d41586-018-06610-y

86 In line with the energy efficiency first principle: See https://energy.ec.europa.eu/topics/energy-efficiency/energy-efficiency-targets-directive-and-rules/energy-efficiency-first-principle_en

87 Andrae, A.S.G. (2020a) "New perspectives on internet electricity use in 2030". Engineering and Applied Science Letters DOI: 10.30538/psrp-easl2020.0038

88 Ibid.

89 Proposal for a Regulation establishing a framework for setting Ecodesign requirements for sustainable products and repealing Directive 2009/125/EC, COM(2022) 142 final

intervening before products can become waste; (ii) creating a framework for **digital product passports**[90], and (iii) issuing EU rules for setting **mandatory minimum sustainability requirements on public procurement of products**, for a selection of product groups including electronic and ICT products. To address the energy consumption of ICT devices in operation, the Commission will **develop an energy-labelling scheme for computers**,[91] addressing the different uses of computers such as (i) office work; (ii) gaming; and (iii) graphic design and video editing respectively.

6.2 Energy consumption of telecommunication networks

More and more ICT devices are being connected, both to each other and to the internet. Over 60% of overall internet traffic is used for video streaming, with online gaming and social networking the second and third largest sources of traffic[92]. In 2019, the Commission raised in its communication *Shaping Europe's digital future* the possibility of introducing '*transparency measures for telecoms operators on their environmental footprint'* at EU level[93]. More recently, the proposed Declaration on European Digital Rights and Principles emphasises that 'everyone should have access to accurate, easy-to-understand information on the environmental impact and energy consumption of digital products and services, allowing them to make responsible choices'[94]. The Commission will act on these commitments and principles, and look into possibilities to **develop common indicators for measuring the environmental footprint of electronic communications services,** building on the work already carried out by regulators and electronic communications providers.[95] In addition, as part of this action plan, the Commission will fund a study and prepare a **communication and awareness-raising campaign** on the responsible energy consumption of day-to-day digital behaviours.

The Commission will also build on the exploratory work and expertise of the Body of European Regulators for Electronic Communications[96], and consider setting up platforms to coordinate and cooperate across energy and telecoms to facilitate the clean energy transition. Cooperation in this area will also help digitalise the energy system. For example, ComReg, the statutory body responsible for the regulation of electronic communications in Ireland, in 2019 announced that most of its 400-MHz Band spectrum was awarded to smart-grids solutions.

6.3 Energy consumption of data centres

The Commission has set the strategic goal of ensuring that data centres are climate-neutral, energy-efficient and resource efficient by 2030. More and more calculation tasks and storage

---

90 Whose scope of applications will extend beyond electronic devices, notably under the ESPR and the Batteries regulation.

91 It should be noted that electronic displays, the only category of electronic devices having an energy consumption higher than desktop and laptop computers, are already targeted in the UE by an existing energy labelling scheme.

92 See https://www.sandvine.com/covid-internet-spotlight-report, https://www.sandvine.com/hubfs/Sandvine_Redesign_2019/Downloads/Internet%20Phenomena/Internet%20Phenomena%20Report%20Q32019%20201909 10.pdf

93 See https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/shaping-europe-digital-future_en

94 COM(2022) 28 final

95 Note that as far as products are concerned, the above-mentioned ESPR will bring customers the necessary additional transparency to allow them to make responsible and informed choices.

96 See https://www.berec.europa.eu/en/document-categories/berec/reports/draft-berec-report-on-sustainability-assessing-berecs-contribution-to-limiting-the-impact-of-the-digital-sector-on-the-environment and https://www.berec.europa.eu/en/document-categories/berec/reports/external-sustainability-study-on-environmental-impact-of-electronic-communications

capacities are being carried out over the cloud or High-Performance Computers (HPC). This has meant that data centres have become a core infrastructure element of ICT systems, and the energy consumption of EU data centres is expected to increase over 200% between 2020 and 2030[97]. In 2018, data centres accounted for 2.7% of electricity demand in the EU[98]. The Commission takes due note of the significant energy-efficiency improvements the data-centre industry has made in recent decades. But to make the twin digital and green transitions happen, public authorities or system operators should not be put in the position of having to choose between attracting better telecoms networks and (hyperscale) data centres on the one hand, and ensuring that businesses and households can access electricity on the other hand. The Commission has already acknowledged the strategic role of data centres in the Digital Strategy, which states the aim of achieving *"making these infrastructures climate neutral and energy efficient by 2030"*.[99] This was supplemented by the target of putting in place 10,000 climate-neutral, highly secure edge nodes by 2030.[100] The Commission has already taken a number of actions to reach these objectives[101]. In addition to these actions, the Commission will do the following:

i) By 2025 the Commission will introduce an **environmental labelling scheme for data centres[102],** building on the **monitoring and reporting requirements for energy consumption for data centres** as proposed in the review of the Energy Efficiency Directive (EED)[103].

ii) The Commission will explore introducing **separate reporting lines for indirect greenhouse gas emissions stemming from the purchase of cloud computing and data centre services in EU sustainability standards** under the Corporate Sustainability Reporting Directive[104];

iii) The Commission will improve requirements on the **operating conditions of servers and data storage products[105] and consider an energy label for servers and data storage products** through the revision of the **Ecodesign rules for servers and data-storage products.[106]**

---

97 To this respect, it can be noted that while the share of cloud data centres accounted for 10% of data centres' energy consumption in 2010, it increased to 35% in 2018 and is expected to rise to 60% in 2025. See https://ec.europa.eu/newsroom/dae/document.cfm?doc_id=71330.

98 It will reach 3.21% by 2030, if development continues on the current trajectory: https://digital-strategy.ec.europa.eu/en/library/energy-efficient-cloud-computing-technologies-and-policies-eco-friendly-cloud-market

99 COM(2021) 118 final

100 See https://ec.europa.eu/info/strategy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en

101 Through, most notably, the EU Code of Conduct on Data Centre Energy Efficiency, an important number of studies and research projects, regulation (EU) 2019/424 on the Ecodesign of servers and data storage products, the EU Taxonomy for Sustainable Finance, which includes criteria for data centres, as well as the European Chips act, which has among its main purposes to build and reinforce Europe's own capacity to innovate in the design, manufacturing and packaging of advanced, energy-efficient and secure chips.

102 Such a scheme would obviously need to be multifactorial, based on a number of different metrics such as the effectiveness of cooling systems, energy consumption, water consumption, waste heat reuse, etc.

103 Directive (EU) 2012/27 on energy efficiency, Article 11(10)

104 Depending on the technical advice that the Commission receives from the European Financial Reporting Advisory Group

105 In particular in terms of maximum temperatures, which could have a positive impact on the energy consumption of cooling systems

106 Regulation (EU) 2019/424

iv) The Commission will promote reuse of waste heat from data centres to heat homes and businesses as part of the revised Energy Efficiency and Renewable Energy Directives[107] to ensure that these centres play a positive role for the communities around them.
v) The Commission intends to fund R&I in systems that can store waste heat produced by data centres during summer season to warm households and businesses in winter.[108]
vi) The Commission will **launch a study end of 2022 on optimising the integration of data centres in the energy and water systems**.

6.4 Energy consumption of cryptocurrencies

The energy consumption of cryptocurrencies has increased by 900% in the past 5 years (and has more or less doubled compared to 2 years ago)[109], reaching around 0.4% of worldwide electricity consumption[110]. Most of the energy consumption is linked to the relatively outdated Proof-of-work consensus mechanism, which is nevertheless used by the two most popular cryptocurrencies (most significantly by Bitcoin).[111] As Europe currently represents only around 10% of global Proof-of-work mining activities, international cooperation is needed to tackle the issue of the high energy consumption of proof of work mining in a globally impactful way.

Blockchain technology has developed since Bitcoin was launched. Most other use cases including non-Bitcoin crypto-assets and other enterprise solutions are using new generation consensus mechanisms such as Delegated Proof-of-stake that are as energy efficient as most conventional technologies in information processing (such as credit card transactions).

In addition to measures addressing data centres and cloud services (see section above), the Regulation of Markets in Crypto Assets (MiCA) requires actors in the crypto-asset market to disclose information on the environmental and climate footprint of crypto-assets. The European Securities and Markets Authority will develop draft regulatory technical standards on the content, methodologies and presentation of information regarding principal adverse environmental and climate-related impacts.[112] In addition, the Commission will **develop a report by 2025 that includes a description of the environmental and climate impact of new technologies in the crypto-asset market.** The report will also include **an assessment of potential policy options that could be warranted to mitigate adverse impacts on the climate of technologies used in the crypto-asset market, in particular in relation to consensus mechanisms.** In developing this report, the Commission will cooperate internationally with, and build on the technical expertise of, standardisation bodies to develop by 2025 an **energy-efficiency label for blockchains.**

7. AN EU-WIDE COORDINATED APPROACH

[107] The proposals for a revised EED and REDII have introduced a number of provisions to promote reuse of waste heat.
[108] In the framework of the 2023-2024 Horizon Europe work program
[109] Based on June 2022 data
[110] See Cambridge Bitcoin Electricity Consumption Index: https://ccaf.io/cbeci/index.
[111] See for instance https://www.bloomberg.com/professional/blog/why-bitcoins-energy-problem-is-so-hard-to-fix-quicktake/#:~:text=1.,which%20keeps%20a%20running%20estimate. Modern blockchain consensus mechanisms require much less energy to operate than the one used in Bitcoin (e.g. "proof of stake").
[112] The final MiCA text was agreed by co-legislators on 30 June 2022.

Digitalisation is an ongoing process changing society and the energy system. It needs both a dedicated dialogue and political guidance on how best to deliver on the EU's digital and green policy objectives. The speed and global nature of digitalisation means that the following should be prioritised: (i) supporting twin transition synergies through the EU's funding tools; (ii) a closer cooperation at EU-level between public authorities as well as between energy and digital stakeholders across the entire energy value chain, and (iii) closer cooperation at international level with like-minded countries and international organisations, is a priority.

7.1 Supporting REPowerEU and the recovery from the COVID19 pandemic

In their Recovery and Resilience Plans (RRPs), Member States recognised the potential of synergies between the Green Deal and the digital agenda. For example, many RRPs referred to using digital solutions to: (i) accelerate the decarbonisation of energy networks; (ii) integrate smart meters in energy systems; or (iii) upgrade the smartness of the electricity grids[113]. The Recovery and Resilience Facility (RRF) also has the potential to be a key tool to help deliver on the REPowerEU plan as it is an agile instrument to address challenges in a wide range of policy areas over and medium-term horizon.

In May 2022, the Commission made a legislative proposal to add REPowerEU chapters to the the national Recovery and Resilience Plans, to support the specific reforms and investments required to implement REPowerEU.[114] Therefore, in the context of the ongoing dialogues between the EU and the Member States on how the RRPs can help delivering on the REPowerEU objectives, the Commission **invites Member States to reflect on how to accelerate the energy transition and ensure energy security, including by outlining measures in the field of digitalisation of the energy system of the energy infrastructure**.

7.2 Synergies between the EU's energy and digital agenda

It is important to exploit further synergies (e.g. using data and digital tools for energy system integration and planning) through two other main instruments at EU level that guide the European Green Deal and the digital agenda, namely: (i) the National Energy and Climate Plans (NECPs) – and in particular their updates due by June 2024[115] to reflect the increased ambition of the revised 2030 framework; and (ii) the national projected trajectories to achieve the 2030 digital decade targets.[116]

How to exploit such synergies will be considered in the guidance for Member States' updates of their NECPs that the Commission intends to publish as part of the State of the Energy Union Report in October 2022.

Moreover, the Commission **will use the Smart Energy Expert Group[117] to set up a structured high-level dialogue with national representatives on 'Digitalisation of energy: state of play, progress, opportunities and challenges'**. In addition to providing continuity to the work of the Smart Grids Task Force and the newly determined task of improving data

[113] Recovery and Resilience Scoreboard. Thematic Analysis: Digital public services, European Commission, December 2021.

[114] Commission Proposal COM(2022) 231 final, amending the Regulation as regards REPowerEU chapters in recovery and resilience plans, and the guidance on RRPs in the context of REPowerEU.

[115] Regulation (EU) 2018/1999 on the Governance of the Energy Union and Climate Action sets out the regular revision of NECPs to align them with latest policy developments. The daft NECPs are expected by June 2023.

[116] 2030 Digital Compass: the European way for the Digital Decade, COM(2021) 118, final. In particular, relevant targets are "Secure and performant sustainable digital infrastructure", Digital transformation of businesses" and "Digitalisation of public services".

[117] See chapter 2.1

exchange, the expert group will aim to launch a complementary analysis between the Commission and Member States based on both the NECPs and the cooperative dialogues foreseen for the national Digital Decade projected trajectories. This analysis will seek to draw up a common agenda, trajectories and milestones to improve the digitalisation of the energy system through a coherent planning and monitoring framework.

7.3 Connecting local and regional innovators

Building a shared vision and pathway for digitalising the energy system will only be successful if the EU and its Member States can build on innovation ecosystems where many digital and energy actors at European, national, regional and local level cooperate[118]. EU-level support can help this cooperation by speeding up innovation and the entry-to-market of digital solutions. Therefore, the **Commission will create the 'Gathering Energy and Digital Innovators from across the EU' (GEDI-EU) platform for structural cooperation** between, on the one hand, the **European Digital Innovation Hubs** (EDIHs) and the **Artificial Intelligence Testing and Experimentation Facilities** (AI TEFs) established under the Digital Europe Programme that focus on energy[119], **and** on the other hand, the EU network of innovators and research institutions in the energy sector **set up under the SET Plan[120]**. The platform will cooperate closely with cities as beneficiaries, investors and incubators of digital technologies in the energy sector, for example through the cooperation of smart cities and communities.

The activities of the platform will aim at (i) drawing up a common agenda of priority needs and mutual interests; (ii) supporting knowledge communities, through vertical (EU-local) as well as horizontal (local-local) and cross-sectoral sharing of best practices and enhancing skills; and (iii) strengthening interoperability of new products or services based on co-design by innovators on the platform to facilitate market-uptake across the EU. The platform will report to the Smart Energy Expert Group and also promote sharing of best practices and recommend future measures, for example in expert workshops and an annual high-level event.

7.4 Building international partnerships for the green and digital transition

Interoperable technical standards, cyber-security, data protection and other key features of digitalisation of the energy system must be ensured globally, in international fora and in cooperation with other like-minded countries. Team Europe will need to be well coordinated and to set out its plans clearly if it is to help to avoid incompatible standards and shape a global consensus on the choice of technologies and services where innovation happens rapidly. Innovative digital energy technologies can boost the EU competitiveness if international collaboration can open new global markets for components and services, and help spread a 'European approach' to standards, products, and services. To advance the green and digital transition with partner countries through bilateral contacts, **the Commission will integrate digital and green aspects more coherent in energy-related projects, partnerships and**

---

[118] Workshop conclusions "Promoting cooperation between digitalization of energy centres of expertise and Digital Innovation Hubs", online event, 25 February 2022. https://ec.europa.eu/info/sites/default/files/energy_climate_change_environment/conclusions_2502_edihs_1.pdf

[119] 34 out of the 136 EDIHs that will be co-funded via Digital Europe and will start in September 2022 will focus (but not exclusively) on the digitalisation of the energy sector. This number may grow in 2023.

[120] namely the European Technology & Innovation Partnership –Smart Networks for Energy Transition (ETIP SNET), the European Research Area Co-fund (ERA) Net Smart Grids Plus and the European Energy Research Alliance (EERA). In addition, the platform will also build on the activities of the European Partnership for Clean Energy Transition under the Horizon Europe Cluster on Climate, Energy and Mobility.

cooperation agreements. In particular, the countries of the European Economic Area, the United Kingdom, Japan and the United States could be cooperation partners.

The Commission will participate actively in international fora, such as the UN[121], G7, the Clean Energy Ministerial, Mission Innovation, and the International Smart Grid Action Network (ISGAN). It will also build on the important work of the IEA and the International Renewable Energy Agency (IRENA). In doing this, the Commission will seek to strengthen international cooperation and promote digitalisation of energy as a horizontal issue or by promoting specific solutions. The Commission will also promote international cooperation, in particular through joint research and innovation activities supported under Horizon Europe and build on existing experiences, such as the EU-India High-Level Platform on Smart Grids[122].

7.5 Financial support for faster uptake of digital energy technologies

To ensure that innovation in digital technologies - and innovation enabled by digital technologies - are taken up in the energy sector, continuous and targeted support for their development and use is key.

It is critically important to ensure public and private support for R&I at EU level and in Member States, and finding synergies between both. The SET Plan can help to find these synergies. TA part of the review of the SET Plan scheduled for next year will focus on the enabling role of digital technologies. **The Commission calls on Member States to: (i) increase their R&I support for the testing and piloting of digital technologies in the energy sector; and (ii) promote cooperation between digital and energy stakeholders through the national R&I programmes.**

At EU level, the Commission intends to include in the **Horizon Europe work programme for 2023-2024 a flagship initiative to support digitalisation of the energy system, which addresses the key priorities of this action plan**. In addition, Horizon Europe will support the uptake of digital technologies to promote the competitiveness of clean energy technologies in the EU, notably by using digital technologies to support improved performance or reduced technology costs.[123] Also, the EU Climate-neutral and Smart Cities Mission to establish 100 climate neutral cities by 2030 will be supported by funding for the development of Digital Twins of cities that will include energy infrastructure.[124] Where possible, the Commission will promote/support the use of Open Source to ensure accessibility and market uptake. Furthermore, the European Innovation Council (EIC) supports start-ups and scale-ups that develop and apply digital technologies in the energy sector in 2022[125] and 2023. With regard to cybersecurity, the newly established European Cybersecurity Competence Centre[126] and the Network of Cooperation Centres, co-funded by Horizon Europe, the **Digital Europe Programme** and Member States, aims at increasing capacity building, innovation and

---

121 Coalition for Digital Environmental Sustainability (CODES) www.sparkblue.org/CODES

122 EU-India High Level Platform on Smart Grids - Florence School of Regulation (eui.eu)

123 For example, through predictive maintenance based on big data in offshore wind parks or for PV installations

124 In the work programme 2023-2024, see Ec.europa.eu/info/research-and-innovaiton/funding/funding-opportunities/funding-programmes-and-open-calls/horizon-europe/eu-missions-horizon-europe/climate-neutral-and-smart-cities_en

125 EIC Transition Challenge: Green digital devices for the future, EIC Accelerator Challenge: Technologies for 'Fit for 55'

126 European Cybersecurity Competence Centre: https://digital-strategy.ec.europa.eu/en/policies/cybersecurity-competence-centre

investments, and the Digital Europe Programme also supports operators of critical infrastructures (including energy).

The **cohesion policy** supports investments by Member States, regions and local authorities. Financial assistance will target the digital transformation across sectors, including energy, with a particular focus on smart energy systems and smart grids. **Copernicus**, the Earth Observation component of the Union Space Programme and Destination Earth, provides environmental data that enable for example better siting and operation of renewable energy generation.

The **LIFE Clean Energy Transition (CET) sub-programme** supports the development of smart energy services' solutions to empower citizens and communities in the energy system, to allow for a better control of energy consumption and thus to trigger behavioural changes and demand for building renovations. In addition, the LIFE CET sub-programme supports the market uptake and integration of solutions able to improve the smartness of the EU building stock and its integration in a digitalised energy system to fully exhaust the optimisation and flexibility potential of buildings and building systems. This includes addressing gaps linked to the availability of data, interoperability, user acceptance and skills.

8. CONCLUSION

As the electrification and decarbonisation of the EU energy system is accelerating. Increasing its digitalisation is essential to achieve the Union's 2030 and 2050 climate targets in a cost-effective way. The Russian invasion of Ukraine and current high energy prices have only increased the need and speed to ensure that the EU increases both its independence from Russian fossil fuel imports and its strategic sovereignty and security in creating a digital energy system.

As indicated in this action plan, this will require both medium-term and long-term actions as well as skilled governance. It will involve multiple stakeholder communities, businesses and international partners and it will require clever use of scarce public funding and more private investments. There is no transition towards clean energy without a plan for digital. Therefore, the Commission invites the European Parliament and the Council to endorse this action plan and contribute to its swift implementation.

ANNEX: DIGITALISING THE ENERGY SYSTEM: KEY COMMISSION ACTIONS AND INDICATIVE TIMELINE

The Commission will:

A European framework for sharing data	
Formally establish the Smart Energy Expert Group.	Q.IV 2022
Set up 'Data for Energy (D4E)' as a permanent working group of the upcoming Smart Energy Expert Group	Q.I 2023
Establish the governance of the common European energy data space	2024
Define a joint work programme for D4E and the STF on Data to develop together the high-level use case on smart and bidirectional EV charging	Q.IV 2023
Calls on Member States that are not proceeding with a rollout of smart meters following a negative or inconclusive cost-benefit analysis to revisit their assessment	Q.III 2022
Adopt an Implementing Act on interoperability requirements and procedures for access to metering and consumption data.	Q.III 2022 (Submission to comitology)
Prepare the ground for adopting Implementing Acts on interoperability requirements and procedures for access to data required for demand response and customer switching.	Q.III 2022 (start of activity)
Promote a code of conduct for energy-smart appliances to enable interoperability and boost their participation in demand response schemes.	Q.IV 2023
Intend to support the deployment of the common European energy data space through a Digital Europe Programme call for proposals	2024
Build mechanisms to support the interoperability of the technical solutions and demonstrators developed by EU-funded research projects.	2022 - 2024
Promoting investments in digital electricity infrastructure	
Support EU TSOs and DSOs to create a Digital Twin of the European Electricity grid	as of 2022 (signature of the DoI)
Support ACER and the National Regulatory Authorities in their work to define common smart grid indicators	By 2023
Ensuring benefits for consumers: new services, skills and empowerment	
Ensure that key R&I projects work together to identify strategies to engage consumers in the design and use of digital tools	Q.II 2023
Identify and shortlist digital tools and produce guidance on energy sharing and peer to peer exchanges for the benefit of energy communities and their members as part of the Energy Communities Repository	2023-2024
Develop an experimentation platform to test and simulate energy communities	2023-2024
Support the establishment of a large-scale partnership as part of the Pact for Skills	End of 2023
Strengthening cybersecurity and -resilience in the energy system	
Propose a delegated act on the cybersecurity of cross-border electricity flows	Q.I 2023
Propose a delegated act on cybersecurity for gas networks (subject to confirmation after the outcome of the legislative procedure and confirmation)	tbc
Issue a Recommendation to strengthen the resilience of critical energy infrastructures	2023
Controlling the energy consumption of the ICT sector	
Intends to increase the sustainability of the production of ICT devices through the proposed Eco-design for Sustainable Products Regulation	Q. IV 2023
Develop an energy-labelling scheme for computers.	Q. IV 2023

Explore the possibility to develop common indicators for measuring the environmental footprint of electronic communications services, thus allowing citizens to make responsible choices when choosing to purchase a given digital product or service	Q. IV 2023
Fund a study and prepare a communication and awareness raising campaign on the responsible energy consumption of day-to-day digital behaviours	2022-2023
Propose binding obligations and transparency requirements, as well as provisions to promote the reuse of waste heat, for data centres	Q.IV 2022
Explore and prepare the introduction of an environmental labelling scheme for data centres	2025
Explore the introduction of separate reporting lines for indirect greenhouse gas emissions stemming from the purchase of cloud computing and data centre services in EU sustainability standards under the Corporate Sustainability Reporting Directive	2023
Evaluate and possible revision of the eco-design regulation on servers and data storage products	Q. IV 2023
Intends to fund R&I in systems that can store waste heat produced by data centres during summer season to warm households and businesses in winter	2023
Fund a study on optimising the integration of data centres in the energy and water systems	Q.IV 2022
Develop a report including a description on the environmental and climate impact of new technologies in the crypto-asset market	2025
Develop an energy efficiency label for blockchain	2025
An EU-wide coordinated approach	
Invite Member States to reflect on how to accelerate the energy transition and ensure energy security, including by outlining measures in the field of digitalisation of the energy system and of the energy infrastructure	2022
Set up a structured high-level dialogue with Member States on digitalisation of energy supported by the Smart Energy Expert Group	Q.I 2023
Create a platform 'Gathering Energy and Digital Innovators from across the EU' (GEDI-EU)	2022
Integrate digital and green aspects in international energy-related projects, partnerships and cooperation agreements	2023
Make use of international cooperation structures to promote digitalisation of energy globally	As of Q.III 2022
Calls on Member States to increase their R&I support for the testing and piloting of digital technologies in the energy sector, and to promote cooperation between digital and energy companies through the national R&I programmes as part of the revision of the Strategic Energy Technologies Plan.	Q.I 2023
Intends to provide financial support for R&I and market uptake of digital technologies in the energy sector, through the Digital Europe Programme, LIFE, cohesion policy and a flagship programme for Digitalisation of Energy in Horizon Europe	2023-2024