

CurrENT's input to the call for evidence on Digitalisation and AI in the energy sector

Europe recognizes electricity grids as vital for decarbonization, energy security, and competitiveness. The energy transition demands accelerating the digital transformation of grids to manage increasing complexity. Innovative grid technologies and AI are key to improving monitoring, management, and investment, while also posing new energy demands. CurrENT urges rapid deployment of these technologies to maximize grid potential at minimal consumer cost. Digitalization and AI are essential for optimizing grid efficiency.

1. Faster scale-up of innovative grid technologies

While research and innovation remain important, it is equally important to quickly scale and deploy the technologies that have been used. The electricity grid is largely un-monitored, optimization techniques are notoriously slow, new connections to the grid take years, and much of existing grid capacity is underutilized thanks to overly conservative operational limits. Grid enhancing technologies with and without AI has a crucial role to play in addressing all these challenges. New technologies and enhanced analytic tools leveraging increased sensor capabilities and computing power will also support the NOVA principles for grid development strategy that put optimization of existing assets before reinforcement and expansion.

Based on the experiences from the members of CurrENT, we believe innovative grid technologies will be key to optimise grid-planning, optimising grid operations through dynamic line rating, predictive maintenance and demand forecasting.

2. Monitor performance of electricity grids at EU level

The European Commission must propose a limited number of binding, quantifiable grid targets at both transmission and distribution level. Regular monitoring of the progress of these targets will demonstrate whether Europe is on track to decarbonize the electricity

system well before 2040, and raise the alarm when Europe risks falling behind, particularly as this affects European Competitiveness.

3. Financing fit to scale-up digitalisation and AI

Europe needs financing mechanisms that will enable the mass deployment of innovative grid technologies, e.g. benefit-sharing incentives that reward system operators for expanding their toolbox of technologies to save consumers money, guarantees that alleviate grid operator financial risks specific to trialling new technologies, dedicated grid technology calls under the Innovation Fund and other research and innovation programmes.

4. Establish governance for a European data space for energy, with data sovereignty, interoperability and cloud infrastructure.

To fully realise the benefits of increased digitalisation and the use of AI in electricity grids, the strategy should support robust governance and coordination for a European data space for energy. This framework must ensure data sovereignty under EU law and align with key regulations such as the NIS2 Directive, Cyber Resilience Act, and AI Act. Interoperability should be based on common data models, open standards, and certification schemes, enabling secure and seamless data exchange across Member States and stakeholders. The strategy should also support EU-resident cloud platforms that meet strict security, privacy, and operational resilience requirements.

Strengthening Europe's energy security requires leveraging innovative grid technologies that enhance both physical resilience and cybersecurity. Well-governed cloud deployments can provide stronger security and availability than isolated local systems; therefore, regular security assessments, independent audits, and transparency from cloud providers regarding data handling and storage should be required. Outdated safety and security requirements that hinder secure digital solutions should be reviewed and amended, ensuring new requirements are technology-neutral and adaptable.

Finally, governance frameworks should not only ensure compliance but also support innovation and scalable deployment of new digital and AI-driven solutions, encouraging pilot projects and cross-border collaboration.

Consultation on Strategic roadmap for Digitalisation and AI in the energy sector

Part 1 – Your involvement in digitalisation and AI in the energy sector

Q1) How do you assess your level of knowledge and perception of the sector?

	Excellent	Very good	Good	Basic	No knowledge	I do not know / No opinion
a. My knowledge of the energy system and its dynamics is:	x					
b. My knowledge of how digital solutions could	x					

	Excellent	Very good	Good	Basic	No knowledge	I do not know / No opinion
apply to the energy system is:						
c. My knowledge of how AI could apply to the energy system is:			x			

Q2) What is your or your organisation's involvement in digitalisation of the energy system?

CurrENT is a business association that is the leading voice of innovative grid technology providers.

Part 2 – Accelerate the deployment of digital and AI solutions to benefit energy system and consumers

Q3) Which key areas of the energy system stand to benefit most from the deployment of digital and AI technologies? Maximum 3 selection(s)

- ☒ a. Power grid management: real-time monitoring, predictive maintenance, grid balancing
- b. Renewable energy generation: permitting, digital repositories of data, environmental impact assessment (EIA) etc.
- ☒ c. Renewable Energy Integration: grid integration, dispatch optimisation
- ☒ d. Demand Management: smart consumption, demand-side flexibility, dynamic pricing.
- e. Energy efficiency in buildings or energy intensive industries and processes

Other, please specify
No opinion

Q4) Select the three main barriers to deploy digital and AI technologies in the energy sector. Maximum 3 selection(s)

- a. Lack of interoperability and standards
- b. Limited access to high-quality data
- c. Cybersecurity and data privacy concerns
- d. High upfront investment costs
- ☒ e. Regulatory and policy gaps
- f. Skills and workforce shortages
- g. Low digital maturity of legacy systems
- ☒ h. Lack of demonstration projects and use cases
- ☒ i. Fragmented governance and coordination
- j. Unclear business models and uncertain returns on digital investments
- k. Social perception issues and mistrust of digital and AI technologies
- l. Resistance to organisational change
- m. Fear of vendor lock-in
- n. Other, please specify
- o. No opinion

Q5) To what extent can digitalisation and AI have an impact on energy poverty? Maximum 3 selection(s)

- a. Digital and AI tools can eradicate energy poverty
- b. Digital and AI tools can be implemented by local authorities to identify and support energy poor households, via specific technology easy to handle
- c. Digitalisation has only an indirect positive effect on energy poverty
- d. Digital and AI tools have limited impact on alleviating energy poverty
- e. Digital and AI tools increase the energy consumption of energy poor and vulnerable households, negatively affecting their welfare and increasing energy poverty
- ☒ f. Other, please specify
- g. No opinion

Question Other, please specify. 100 character(s) maximum

Digitalisation can help to reduce grid expansion and optimisation cost, thus reducing energy price

Part 3 – Establish the common European energy data space

Q6) Which are the three main barriers when establishing a common European energy data space, to enable demand side flexibility and smart energy services. Maximum 3 selection(s)

- ☒ a. Absence of an established data governance framework
- ☒ b. Lack of a consistent data access regulatory framework
- c. Lack of sufficient funding for creating a data sharing infrastructure
- d. Complexity of technologies and lack of simple plug-and-play solutions
- ☒ e. Lack of data interoperability and insufficient use of commonly agreed data exchange standards
- f. Trade-off between open access and data privacy
- g. Lack of sufficient data exchange due to commercial confidentiality
- h. Lack of digital competences and skills
- i. Lack of trust and/or public acceptance
- j. Cybersecurity vulnerabilities
- k. Lack of awareness by the different actors
- l. Other please specify
- m. No opinion

Q7) What would be the most adequate type of entity to oversee the governance of the common European energy data space?

- a. The European Commission acting as the overarching governing body responsible for the governance of the energy data space
- ☒ b. An independent EU entity mandated by an EU regulation
- c. Joint task force of EU entities (e.g. the network operators)
- d. A Commission expert group
- e. A Combination of the above
- f. None of the above, but please specify below
- g. No opinion

Q8) What are the main actions that could help mitigate risks associated with data spaces? Maximum 3 selection(s)

- ☒ a. Establishing oversight for data privacy and security protocols
- b. Defining clear guidelines for data ownership and control
- ☒ c. Coordinating the development of interoperability standards
- d. Setting up regulatory bodies for compliance management
- e. Implementing systems for regular data quality assessments
- ☒ f. Developing a financial strategy for sustainable funding
- g. Facilitating communication and collaboration among stakeholders
- h. Building scalable infrastructure for future growth
- i. Other, please specify
- j. No opinion

Part 4 – Develop AI foundation models for the energy sector

Q9) Given that most existing applications in the energy sector rely mostly on traditional AI methods, do you think there's a case for deploying AI foundation models?

- a. Yes, definitely, AI foundation models hold strong potential to accelerate innovation and improve decision-making across the energy sector.
- b. Yes, but with caution, it should be explored in specific use cases, with clear safeguards and governance in place.
- c. Possibly in the future, the technology is promising, but it needs further maturity and testing before wide deployment.
- d. No, too risky, the uncertainties and potential misuse outweigh current benefits in critical energy infrastructure.
- e. Not sure, more information and real-world examples are needed to form an opinion.
- f. Other, please specify
- ☒ g. No opinion

Q10) Do you think an EU-wide initiative bringing together European energy and technology companies for the development of AI foundation models, would accelerate the deployment of digital and AI solutions to the energy system?

- ☒ a. Strongly agree
- b. Agree
- c. Unsure
- d. Disagree
- e. Strongly disagree
- f. No opinion
- g. Other, please specify

Q11) What should be the priorities for an EU-wide initiative to support the development of AI foundation models for the energy sector? Maximum 3 selection(s)

- ☒ a. Establish a trusted environment for data sharing for the purposes of development and training of AI models
- b. Testing and validation of AI models
- ☒ c. Develop regulatory sandboxes for application of AI models
- d. Joint procurement for AI model development
- e. Deploy of AI models at large scale
- f. Management of risks associated to the application of AI models
- ☒ g. Share best practices for risk for compliance with national and EU regulation
- h. Secure access to compute infrastructure (e.g. AI factories)
- i. There is no need for an EU-wide initiative, the market actors can build AI models privately
- j. Other, please specify
- k. No opinion

Part 5 – Prepare the energy system of tomorrow and boosting EU competitiveness

Q12) Investments in smart grids – What are the major barriers that prevent investments in smart/digitalised grid solutions? Maximum 3 selection(s)

- ☒ a. Legal constraints - grid tariffs are not incentivising smart/digital solutions.
- ☒ b. Financial constraints – the financial resources that are available for grid developments are directed to other areas.
- c. Technical constraints - the technical complexity or maturity of the smart solutions might raise problems during operations, therefore such investments would pose higher risks.

d. Interoperability issues - it is difficult to ensure compatibility between the installed grid assets and the new smart components and technologies.

☒ e. Know how – the grid operators find challenging to understand the costs and benefits of the novel technologies, or do not have the capacity to integrate them in their systems.

Other, please specify

No opinion

Q13) The use of digital twins in electricity grids – What would be the most pressing needs of the grid operators to enable them to deploy integrated digital twin solutions in their grids? Maximum 3 selection(s)

a. Improved observability of grid assets and data made available by those assets.

b. Improved access to grid edge data (e.g. smart meters, distributed energy resources).

☒ c. Improved interoperability among different technologies/grid components.

☒ d. Suitable remuneration framework to support effective investment recovery.

e. More advanced solutions for integrated digital twins made available on the market.

☒ f. Other, please specify

g. No opinion

Question Other, please specify. 100 character(s) maximum

European 'test bed' to show benefits of digital twin with other innovative grid technologies.

Q14) Research and innovation – What further actions would most effectively strengthen Europe's capacity to innovate in smart energy systems? Maximum 3 selection(s)

☒ a. Making available suitable EU funding for piloting innovative solutions (e.g. Horizon Europe).

b. Having access to other funding sources, notable private to bring innovation to markets.

☒ c. Offering dedicated de-risking financial instruments to reduce the implementation risks of innovative technologies.

d. Building partnerships (e.g. between grid operators and academia & research), establishing innovation hubs (among key players in the energy value chains).

☒ e. Strengthening trans-European cooperation (e.g. through a more effective implementation of the SET Plan).

f. Other, please specify

g. No opinion

Q15) The European Commission supports the development of AI solutions for the energy sector. Already available measures include the creation of AI factories, and of Testing and Experimentation Facilities (TEFs). Would any additional measures be needed and if yes, which ones?

- ☒ a. Support for creating ecosystems/hubs that bring together developers and energy players to build AI-based solutions, applications, foundational models etc.
- b. Support for the development of AI-based applications, foundational models, solutions etc.
- c. The current public support is sufficient for the time being. Private companies, R&I organisations, grid operators, aggregators and other energy players should make the best use of it when developing applications and solutions for the energy sector.
- d. Other, please specify
- e. No opinion

Part 6 – Integrate the electricity demand of data centres in the energy system in a sustainable way

Q16) What are the major barriers that hinder grid connection of data centres?
Maximum 3 selection(s)

- ☒ a. Infrastructure constraint, lack of grid infrastructure limiting access
- b. Time constraints, connection requests are too long to process
- c. Financial constraints, connection to the grid and power are too costly
- ☒ d. Planning constraints, connection requests are denied based on location or redirected to other locations
- e. Complexity, difficulty to navigate applicable rules and procedures
- f. Divergent national rules and procedures
- ☒ g. Other, please specify
- h. No opinion

Question Other, please specify. 100 character(s) maximum

Grid capacity is one of the main barriers to increase demand from grid connection of data centers

Q17) What are the major challenges that arise from the rapid expansion of data centres? Maximum 3 selection(s)

- ☒ a. Grid congestion in areas with data centre clusters
- ☒ b. Complexity in grid planning caused by rapid development of data centres
- c. Inflexible and firm demand profiles of data centres with little variability
- d. Delays in grid connection approvals caused by rising demand
- e. Risk of overloading substations resulting to costly and time-consuming upgrades
- ☒ f. Challenges in integrating renewable energy: meeting data centres' power needs with clean energy sources requires careful matching of generation and demand
- g. Impact in energy affordability: perception that data centres compete with households and local businesses for limited energy resources
- h. Environmental concerns related to water use, land use and landscape preservation (e.g. visual impact)
- i. Other, please specify
- j. No opinion

Q18) What immediate measures should be taken to ensure the sustainable integration of data centres into the power grid? Maximum 3 selection(s)

- a. Improve transparency and set data sharing obligations for data centre developers and grid operators by establishing early and continuous dialogue
- ☒ b. Coordinate long-term planning integrating data centre expansion into national and regional grid development plans
- c. Reflecting grid capacity and sustainability requirements more strongly in local permitting requirements
- d. Incentivise data centres to be built in areas with available grid capacity and close to renewables' generation areas
- e. Promote flexibility and load shifting through financial or non-financial incentives
- f. Mandate the use of renewable energy or green PPAs
- ☒ g. Grid connection requirements linked to sustainability – conditioning grid access on sustainability criteria, such as carbon impact or load flexibility
- ☒ h. Other, please specify
- i. No opinion

Question Other, please specify. 100 character(s) maximum

Optimise the existing grid thanks to innovative grid technologies

Q19) What actions could support the shift to more sustainable and energy efficient data centres? Maximum 3 selection(s)

- a. Creating a rating or labelling scheme for data centres

- b. Introducing minimum performance standards that aim to improve resource efficiency (power, water usage or other resources)
- c. Ensuring access to clean energy through financial instruments such as PPAs
- d. Incentivising waste heat recovery and reuse in industrial or residential cluster in proximity
- e. Incentivising the enrolment of data centres in flexibility programs
- f. Incentivising research into hybrid grid connection with on-site renewable power generation
- g. Other, please specify
- ☒ h. No opinion

Part 7 – Enhance transparency and risk oversight

Q10) Which of these actions would be most beneficial to mitigate risks associated with the use of digital and AI in energy systems and create a trusted environment? Maximum 3 selection(s)

- ☒ a. Regulatory advice and guidance on compliance with requirements and obligations under the AI Act provisions on high-risk systems and with other Union legislation applicable to AI (e.g. NIS 2, Cyber Resilience Act, GDPR etc.)
- ☒ b. A clear liability framework and principles for shared responsibility across the AI value chain in case of AI failure
- ☒ c. Coordinating energy stakeholders to agree on safeguards for digital and AI technologies (identify common risks, secure critical infrastructure, and establish standards that ensure safety, interoperability, and accountability)
- d. Requiring mechanisms for human oversight and intervention (human-in-the-loop for direct approval and human-on-the-loop for ability to override)
- e. Other, please specify
- f. No opinion

Q21) On what aspects of AI and digitalisation related legislation would you see the highest need for further guidance for deployment of digital and AI technologies in the energy sector? Maximum 3 selection(s)

- a. GDPR compliance: advising on effective GDPR-compliant anonymisation techniques suitable for smart meter and grid operational data
- ☒ b. AI Act compliance: high-risk systems for the energy sector
- ☒ c. The Network and Information Systems (NIS2) Directive
- ☒ d. The Cyber Resilience Act
- e. The Data Act
- Other, please specify

No opinion

Part 8 – Establishing a coordination and governance framework

Q22) What do you perceive as the main barriers in building a coordination and governance framework among the different actors for digital and AI technologies in the energy sector? Maximum 3 selection(s)

- ☒ a. Insufficient knowledge transfer and collaboration between Member States x
- b. Lack of engagement with international organisations and forums like the IEA and Clean Energy Ministerial
- ☒ c. Limited or insufficient infrastructure for supporting a diverse AI innovation ecosystem in energy
- ☒ d. Inadequate integration of digitalisation of energy policies, including AI principles, in national strategies (or National Energy and Climate Plans)
- e. Lack of monitoring and exploitation of results
- f. Other, please specify
- g. No opinion

Q23) What are the main aspects to be prioritized by the European Union when setting up a coordination and governance framework among the different actors in the digital and energy domains? Maximum 3 selection(s)

- ☒ a. Harmonizing national regulatory frameworks
- ☒ b. Supporting sectoral innovation
- c. Establishing clear formal governance structures for AI systems
- d. Enhancing EU's participation in new international initiatives on AI in energy
- e. Designing of 'European AI in energy' plans and measures in line with international best practices.
- ☒ f. Ensuring comprehensive coverage of digitalisation of the energy system in national EU regulations.
- Other, please specify
- No opinion

Q23) Which of the following actions do you think would be most effective in developing a coordinated framework to advance AI and digital technologies in the energy sector? Maximum 3 selection(s)

- a. Establish an expert group dedicated to AI in energy, possibly under an existing group such as the Smart Energy Expert Group (SEEG)
 - ☒ b. Establish a dedicated implementation working group on AI in energy within the SET Plan
 - ☒ c. Engage Member States to develop a unified strategic approach to AI in energy or strengthen synergies between Digital Decade Policy Programmes and National Energy and Climate Plans
 - d. Enhance EU's participation in international initiatives on AI in energy to understand the needs of relevant actors
 - ☒ e. Ensure proper coverage of the digital transformation of the energy system in the upcoming revision of the Energy Governance Regulation
- Other, please specify
- No opinion

Q25 What are the priority topics for digitalisation and AI in energy that the EU should engage with in various international fora? Maximum 3 selection(s)

- ☒ a. Exchange best practices on the integration of AI in the energy system, focusing on regulatory barriers and how to overcome them
- ☒ b. Develop high-level strategic orientations on the development and use of AI in the energy system
- ☒ c. Foster AI policies that support development of beneficial, trustworthy, and robust artificial intelligence in the energy system