

## **Context**

Europe stands at a pivotal moment. When increasing electrification is key to secure Europe's energy resilience and boost competitiveness, the expansion of data centres is reshaping power demand along with the electrification of other sectors. Meanwhile, longer-term trends do not bode well for Europe: productivity growth is stagnating, and industrial investment - in part due to relatively high energy costs - is increasingly shifting to jurisdictions with more agile regulatory and permitting systems. This raises fundamental questions about whether Europe is well equipped to address its current and future energy challenges.

The transformative potential of **digitalisation and AI** is where the solution must be sought. As it stands, the changes unfolding in this space represent a major opportunity for Europe's competitiveness and decarbonisation agendas.

It is no secret that, in **energy systems**, digitalisation and AI are cost-efficient instruments to reduce operational costs, optimise resource and energy efficiency, accelerate electrification, support the deployment of renewables as well as clean and low-carbon solutions. For example, the deployment of smart grids, predictive maintenance, energy control, automation and management systems, advanced data analytics, and high-performance computing already demonstrates how digital solutions can reduce downtime, improve demand-response flexibility, and enhance cross-border energy flows.

**However, ERT companies continue to face infrastructural, operational, and investment barriers that prevent them from deploying such digital enablers at scale.** Although digitalisation was positioned as one of the core elements of the EU's "twin transitions" alongside the green transition, and has been recognised as a horizontal enabler under the Clean Industrial Deal, Europe still lacks a coordinated political drive to make digital technologies, software, and services a true cornerstone of its decarbonisation strategy. This gap is becoming increasingly problematic, as today's energy challenges require ever more integrated planning across energy, digital, and industrial policies.

ERT therefore calls on the European Commission and Member States to seize this moment and focus on the key enablers of a digitally driven green transformation.

## A. Key barriers and recommendations

### 1. Barriers to investment prevent the upgrading and deployment of new energy infrastructure needed to meet rising energy demand

Modernising and expanding power grids is fundamental to accelerating electrification and unlocking the sustainable development of strategic sectors such as AI and advanced industries. Given the unprecedented volume and pace of grid connection requests across Europe - particularly driven by the fast deployment of data centres - the current state of Europe's energy infrastructure is struggling to keep up. Due to a combination of regulatory and other bottlenecks, existing infrastructure is neither being upgraded at the speed required nor managed efficiently. Modern, digitalised grids that **optimise congestion management, and integrate large volumes of flexible demand and distributed generation** (including self-supply solutions with a clear decarbonisation pathway) **to enable anticipatory industrial investments** are not being deployed at scale.<sup>1</sup>

Permitting remains one of the biggest bottlenecks with procedures taking up to **5 to 15 years for grids and other assets, including 7 to 10 years for data centres**<sup>2</sup>. These processes deter investment, create uncertainty for project developers, and slow the deployment of both clean generation and digital infrastructure at a time when demand growth is accelerating.

The repurposing of existing industrial assets, combined with the development of onsite low-carbon generation and smart backup-grid connection schemes, in a way that aligns with Europe's broader net-zero agenda, also represents a core enabler for the deployment of strategic compute capacity in Europe. A truly sustainable grid network can reduce pressure on already congested transmission and distribution systems, shorten connection timelines, and support the faster deployment of data- and energy-intensive infrastructures.

#### **ERT recommendations:**

##### ***Immediate measures / low-hanging fruit***

- ⇒ **The EU should reduce permitting timelines to fast-track critical infrastructure projects**, using digital tools as the default.
- ⇒ **The improvement of the “first-come, first-served” towards readiness-based grid-connection models should also be encouraged** to tackle the critical issue of connection queues. Queue management issues could in some areas cause a key bottleneck in the deployment of both data centres and RES projects. New grid-connection models could be based on objective, measurable and transparent eligibility criteria, e.g. efficiency and grid reliability, combined with preventive (e.g. milestone-based monitoring) and corrective measures. Also in this case, the guidance on grid connection queues recently proposed by the Commission in its recent Grids Package constitutes a step in the right direction.

---

<sup>1</sup> The list of bottlenecks is plentiful. For example, in Spain, grid capacity saturation levels for new connections average around 83.4%, reaching up to 93% in certain areas such as Madrid. This bottleneck is currently estimated to be holding back approximately €58 billion in industrial investment, with nearly one-third of these projects linked to new data center connections that cannot proceed due to capacity constraints (source: [AELEC](#)). Similarly, in Italy alone, over **66 GW** of grid connection requests for new data centres have already been submitted to the national transmission system operator, with realistic execution projections between **2–3 GW by 2028–2030**. Similar dynamics are emerging across other EU markets, signaling a structural capacity gap between planned demand and feasible grid access timelines.

<sup>2</sup> International Energy Agency (IEA) and Ember: [5-15 years for grids, 7-10 years for data centres](#).

- ⇒ **The EU needs a revamp of its infrastructure investment signals.** Europe should further encourage a stable remuneration model that enables anticipatory and other investments in grid extensions, reinforcements and digital upgrades (including, where relevant or possible, OPEX), and the EU should implement existing requirements, such as under the Electricity Market Design revision.<sup>3</sup> In parallel, regulatory frameworks should recognise complementary investments that alleviate pressure on public grids, including decentralised and self-supply solutions supporting system adequacy and resilience. Combining investment incentives with smart-grid and building performance indicators can further reward and benchmark investments in digital readiness.<sup>4</sup>
- ⇒ **The EU and Member States should ensure a conducive framework to sustainably integrate data centres into power grids by improving their energy efficiency, ensuring their clean energy supply and possibly unlocking opportunities for flexibility.** Being the backbone of the digital revolution, data centres should be designed and orchestrated to act both as flexible loads and as contributors to grid stability. Supporting agreement frameworks between hyperscalers, utilities and energy producers to accelerate clean and low-carbon energy sourcing could help create “ready-to-connect” low-carbon zones. These zones should be understood as areas where grid capacity, permitting, and clean energy availability are proactively coordinated to accelerate the deployment of clean energy and digital infrastructure rather than as preferential or exclusionary zoning instruments.

#### ***Longer-term / more structural measures***

- ⇒ **Existing and new funding mechanisms - particularly those earmarked for digitalisation to finance telecom infrastructure - should prioritise the deployment and upgrading of advanced connectivity, such as 5G Standalone.** Advanced connectivity is a fundamental infrastructure and the backbone of digitalisation. Only such deployments and upgrades will be able to support real-time data exchange, advanced grid monitoring, and the large-scale deployment of digital energy management solutions.
- ⇒ **Member States should create predictable and competitive conditions for the deployment of renewable and low-carbon energy sources, along with grids, demand-response flexibility, storage, EV charging.** They should also enable PPAs, CfDs, and state guarantees to scale investment in electrification and energy efficiency, as well as to support hybrid energy models combining renewable, low-carbon, and storage assets. This could include, for example, scaling up the EIB’s planned €1.5 billion counter-guarantees for grid upgrades and launching tripartite agreements to support electrification and energy efficiency. These conditions may in turn also incentivise the uptake of 24/7 Carbon-Free Energy (CFE) commitments as a medium-term measure to advance system integration. Further attention should be paid to harmonising grid fees during charge and discharge of flexible assets. Apart from the already mentioned enabling conditions, the formal recognition of granular, hourly electricity matching within existing standards and carbon-accounting frameworks would also be key for their uptake.

---

<sup>3</sup> Under the Electricity Market Design revision (Art. 18(5) of Regulation (EU) 2019/943, as amended by Regulation (EU) 2024/1747), and Art. 59(1)(l) Directive 2019/944.

<sup>4</sup> As mandated in Article 18(5) of Regulation (EU) 2019/943, amended by Regulation (EU) 2024/1747 for CapEx/OpEx approach. Art. 59(1)(l) Directive 2019/944 for Smart Grids Indicators development.

## **2. Companies are currently not enabled to fully apply digital solutions across the grid**

Despite growing recognition of the role of digitalisation in managing increasingly complex electricity systems, companies are not yet enabled to fully operate digital solutions across the grid. Fragmented market designs, uneven implementation of flexibility frameworks, and limited access to harmonised and real-time system data, along with concerns about data safety and cybersecurity vulnerabilities, continue to constrain the deployment and operation of digital energy solutions. In many cases, companies lack sufficient visibility of network conditions and flexibility needs, limiting their ability to optimise operations and provide system services in a reliable and scalable manner.

### **ERT recommendations:**

- ⇒ **Ensure data centre efficiency metrics provide a complete picture.** Data centre performance reporting, beyond energy efficiency, is useful but could be made more consistent and thorough. The forthcoming review of efficiency metrics used for sustainability reporting should ensure a reliable assessment of the real efficiency of infrastructure and computer hardware (including a possible contribution to system flexibility).<sup>5</sup>
- ⇒ **Distribution Network National Development Plans should incorporate non-wire solutions** (e.g. energy storage or advanced control and digitalisation) **and AI-driven demand scenarios** into forecasting, including more granular quantification of equipment and solution needs, in line with National Energy and Climate Plan (NECP) objectives.
- ⇒ **Improve data quality, interoperability and security by using the same data language through harmonised data foundations while advancing interoperability standards across the data value chain and data sharing frameworks.** Data is key to obtaining the information needed to optimise Europe’s energy system and provide novel technologies and functionalities, such as AI, for the control and management of grids. Energy-related data needs to flow between users, distributors and producers, to be able to perform e.g. forecasting, grid management and flexibility solutions. Through harmonised data and joint protocols for data sharing, data safety, data governance and asset control, interoperability and access to data need to be incentivised.<sup>6</sup>
- ⇒ **Industrial flexibility resources - such as demand response, storage, and sector coupling - should be integrated into electricity systems to build viable value streams and support wider deployment.** While the Electricity Market Design reform and national flexibility roadmaps recognise the importance of flexible resources, their roll-out remains uneven across Member States. This creates uncertainty for companies seeking to deploy scalable digital flexibility solutions across different national markets.

---

<sup>5</sup> We expect the first public consultation for the revision of the Commission Delegated Regulation (EU) 2024/1364 before the end of 2025.

<sup>6</sup> Accelerating the existing DataSpace 4 Energy (D4E) would be a viable way to strengthen data governance, interoperability, cybersecurity and relevant business models at scale.

## B. Case Studies

COMPANY	CASE STUDY
<p><b>ABB</b></p>	<p><b>ABB and Kevlinx data centers build digital security together</b>  <i>Challenge:</i> Kevlinx is building a 40 MVA Tier III data center campus in Brussels to serve AI-ready hyperscale workloads. This requires uncompromised uptime, energy efficiency, and scalability—while meeting sustainability goals and reducing operational risk.  <i>Solution:</i> ABB provided its HiPerGuard medium-voltage UPS (uninterruptible power supply) technology as the backbone of Kevlinx’s power architecture. Unlike traditional low-voltage UPS systems, HiPerGuard operates statically without mechanical components, reducing failure risk and extending intrusive maintenance intervals to up to 10 years. It delivers up to 98% efficiency from 50–100% loading and enables flexible power distribution across data halls.  <i>Impact:</i> The solution ensures optimal uptime, lower energy costs, and the ability to scale AI and cloud workloads without compromise. Eco Passport certification guarantees sustainability, avoiding 1,245 tons of CO<sub>2</sub> emissions per 2.5 MW over the product lifetime. ABB’s UPS also supports grid balancing and renewable integration, transforming backup power into a strategic asset.  <i>Future outlook:</i> ABB and Kevlinx are setting a benchmark for Europe’s digital economy—building energy-intelligent data centers that meet today’s demands and anticipate tomorrow’s, with resilience, efficiency, and sustainability at their core.</p>
<p><b>E.ON</b></p>	<p><b>LiveEO – AI-Enhanced Vegetation Management</b>  LiveEO is an AI-powered satellite analytics platform supporting E.ON and Westnetz in managing vegetation and infrastructure risks across extensive distribution networks. By analysing satellite imagery, the tool automatically identifies vegetation encroachment and fall-in risks along middle voltage overhead lines. For Westnetz, LiveEO streamlines annual vegetation planning by converting satellite-detected risks into actionable tasks, reducing manual inspections and enabling efficient work scheduling. Digital workflows - from task assignment to documentation with photos - simplify collaboration with service contractors and improve data consistency. E.ON benefits from LiveEO’s ability to monitor large areas cost-effectively, enhancing grid reliability and enabling more precise budgeting for maintenance cycles. AI is used throughout the workflow: image classification, height modelling, risk scoring, and automated task generation. This accelerates decision-making, increases accuracy, and reduces operational effort -ultimately improving safety, lowering costs, and supporting sustainable asset management.</p>
<p><b>Eni</b></p>	<p><b>Mes-OPT (Multi Energy Systems OPTimization)</b>  With the growing importance of decarbonization and sustainability, innovative approaches are required to design and operate facilities in the energy industry. In particular, multi energy systems (MES) integrating both dispatchable technologies and intermittent renewables offer a promising framework for achieving cost and decarbonization objectives, while posing significant challenges in balancing short term operational dynamics with long term lifecycle efficiency. For these reasons, Eni has developed an innovative high-throughput optimization tool, named Mes-Opt (Multi Energy Systems Optimisation), that is able to assess and automate the evaluation of complex configuration and operations trade-off.  The tool is routinely applied in pre-feasibility and feasibility studies throughout the company, allowing to assess decarbonization opportunities from upstream plants to (bio)refineries, from LNG terminals to hybrid plants, reducing the design phase while delivering richer insights and multi-scenario evaluations, made possible by the intensive utilization of Eni’s HPC6, i.e. the proprietary high performance computing facilities through which the tool has been deployed.</p>

	<p>This innovation, born from Eni’s collaboration with the PoliMI and evolved internally, marks a transformational step in energy system planning, reinforcing the role of mathematical optimization as a fundamental enabler of the energy transition. The tool has been included among the winners in the Eni Award for Innovation 2025 (Digital category), the section of this prestigious prize that selects the most innovative projects developed by Eni researchers and technical experts.</p>
<p><b>Ericsson</b></p>	<p><b>Power Network Energy Balance</b></p> <p>Cellular communication networks and connectivity are vital for the digitalisation of electricity grids. Based on fundamental cellular communication functionality, Ericsson has developed a solution for stabilising power grids by leveraging precise timing and advanced inverter roles.</p> <p>The benefits with the solution are:</p> <ol style="list-style-type: none"> <li>1. Solves the timing problem in modern grids</li> <li>2. Creates a foundation for digitalised “software-defined” grids</li> <li>3. Replaces expensive hardware with flexible inverter behaviour</li> <li>4. Enables active, predictive stabilisation</li> </ol> <p>The solution introduces a synchronized control architecture for stabilising AC power grids using enhanced inverter-based energy resources. By combining precise timing from a central clock with local measurements (could be phase-crossing), each inverter determines its exact temporal alignment within the grid. A central compensation control device instructs each unit to take on specific operating roles—such as real-power compensation, inductive behavior, or capacitive behavior—enabling fast and distributed power balancing. The result is a software-defined grid-stabilisation layer that operates independently of heavy data exchange and scales from microgrids to national power systems. The solution uniquely allows dynamic switching between inverter roles, replacing traditional mechanical or passive stabilisation equipment. This creates a highly responsive, flexible, and cost-efficient means to maintain stability during disturbances, islanding, and rapid load or generation changes.</p>
<p><b>Iberdrola</b></p>	<p><b>Use case: e-LVIS Project – Low Voltage Information System</b></p> <p>The e-LVIS project represents an evolution of the grid towards the smart grid model, demonstrating how digitalisation and artificial intelligence can enhance the control and optimisation of low-voltage distribution networks. The e-LVIS system improves visibility of digital equipment, enables the recording of all interventions and active resources, and facilitates the automation of operational processes. By increasing observability and control, the project enhances the grid’s capacity to connect new supplies and supports the integration of future “flexible” customers with distributed energy resources, such as electric vehicles, storage systems or solar panels.</p>
<p><b>Nokia</b></p>	<p><b>Digital twins and stream processing for renewable energy production</b></p> <p>Nokia’s energy innovation venture <a href="#">Enscreb</a> is a platform that enables the creation of digital twin energy systems and deploys new steering mechanisms to maximize the value of energy flexibility for industrial and commercial consumers. Enscreb can simulate distributed energy systems of any size and complexity from grid, to meter, to connected assets.</p> <p>Using stream processing technology, Enscrebs optimises and manages renewable energy systems, thus making them smarter, more resilient, and more efficient. It connects the dots between behind-the-meter and front-of-the-meter flexibility - helping energy stakeholders from commercial and industrial (C&amp;I) customers, asset developers, aggregators and grid operators unlock the full value of their portfolios while supporting system-wide resilience.</p>

<b>Schneider Electric</b>	<a href="#">Schneider Electric X Deloitte “The Edge”</a> (Amsterdam, NL): This building features a broad range of integrated BMS, IT infrastructure and electrical distribution system to create a smart building, featuring building efficiency measures. As a result, the Edge building had the highest rating ever given to any office building at that time (BREEAM-NL of 98.36%), supported by net-zero+ operation (producing 102% of its own energy). The core gains are from real-time energy monitoring and control that optimize HVAC/lighting to cut consumption.
<b>SAP</b>	<p><b>AI-assisted emission factor mapping and grid optimisation</b></p> <p>As part of SAP Sustainability Footprint Management, a software solution to help companies decarbonise their value chain and calculate their corporate and product carbon footprint at scale, SAP has built out a GenAI-based capability to map emission factors. Through this AI capability, companies can reduce their manual effort and time needed to map emission factors to products by about 80%, allowing them to calculate a more accurate product and carbon footprint faster.</p> <p>SAP also supports the Utilities industry with AI by optimising grid operations, predicting equipment failures, and improving energy distribution efficiency. AI-driven insights in SAP S/4HANA Utilities help forecast demand, balance loads, and reduce outages. Machine learning enhances meter data management and billing accuracy, while intelligent automation streamlines field service and maintenance. These capabilities enable utilities to operate more reliably, lower costs, and deliver better service to customers.</p>
<b>Siemens</b>	<p><b>Hardware savings and outage prevention</b></p> <p>Through the <a href="#">RomeFlex project</a>, Areti an Italian local distribution network operator is projected to optimise its hardware investments by 45 percent, saving €420 million of over the next 8 years, thanks to strategic flexibility management. Siemens' <a href="#">Digital Twin software</a> for the low-voltage grid, provides also reliable data-driven insights and real-time transparency, which enables system operators to enhance its usable grid capacity and reducing outage times by up to 30 percent through the automated prediction of outage location and impact</p>
<b>Telefónica</b>	<p><b>Dynamic Line Rating Platform by Telefónica/Red Eléctrica de España</b></p> <p>This project has contributed to digitalize the Spanish electricity transmission grid in order to increase the use of high-voltage lines, improving the efficiency of the electricity system and increasing the integration of renewable energy into the system. The Dynamic Line Rating Platform is based on the use of dynamic line rating system that enables Electric System Operators to operate transmission lines using real time data and forecasts. The system encompasses conductor sensors and local weather stations, IoT communications, a cloud platform and an algorithm that computes the real time thermal rating and the forecasting. With this system, the System Operator can make use of the idle capacity that already exists in the lines, increasing the capacity of the network to integrate renewable energy into the power system. The deployment of the DLR allows to avoid manufacture of steel structures, use of big cranes and their corresponding emissions.</p> <p>Links:</p> <ul style="list-style-type: none"> <li>○ <a href="#">Case Studies - European Green Digital Coalition</a></li> <li>○ <a href="#">sustainability-transformation-handbook-2024.pdf</a></li> </ul>