Alliance for AI, IoT and Edge Continuum Innovation

Brussels, 20 October 2025

Public Consultation on the Strategic Roadmap for digitalisation and artificial intelligence (AI) – Additional Input

DG Energy (European Commission) has launched a public consultation and call for evidence on a Strategic Roadmap for digitalisation and artificial intelligence (AI) in the energy sector. The Alliance for AI, IoT and Edge Continuum Innovation IVZW (AIOTI) is providing additional input to the consultation, besides the online questionnaire.

AI in Energy paper (Release 1.0, Nov 2024)

The AIOTI paper on AI in Energy published in November 2024, synthesises outcomes of EU-funded projects and stakeholder consultations on the deployment of Artificial Intelligence in the energy sector.

Key Recommendations

1. **Establish federated energy data spaces** as the backbone for AI services, ensuring secure, standards-based access across DSOs, TSOs, aggregators, OEMs, SMEs, and prosumers.
2. **Scale AI-enabled flexibility services** (demand response forecasting, automated market participation, consumer engagement agents), linking to local energy communities and EV smart charging.
3. **Deploy digital twins for grids and assets**, mandating vendor-neutral twin models with open interfaces for AI-driven planning, congestion management, and predictive maintenance.
4. **Fund focused R&I tracks**: (i) federated learning and multi-agent reinforcement learning, (ii) physics-informed AI and uncertainty-aware models, (iii) energy-efficient edge AI for substation/DER inference.
5. **Create EU-wide TEFs** (test & experimentation facilities) and regulatory sandboxes to validate AI models in real-time energy operations, integrating HPC/edge compute capacity.
6. **Develop sector guidance under the EU AI Act** specific to high-risk AI in energy (EMS, DMS, DERMS, outage restoration) including robustness, explainability, and human-in-the-loop requirements.
7. **Set up an EU repository for AI-related incidents** and near-misses in the energy sector to build collective intelligence and improve resilience.
8. **Certify datasets, AI models, and edge devices in critical energy use**, with requirements for signed models, attestation, and secure updates (aligned with the Cyber Resilience Act).
9. **Mandate open interfaces, ontologies, and conformance profiles for interoperability** across Member States, tied to procurement and EU funding conditionality.
10. **Build adoption capacity**: fund operator training, SME onboarding, and replicate successful AI pilots through living labs in each Member State.

1) Accelerate the deployment of digital and AI solutions in the energy system

What the EU should do

1. **Set up governance body:** *Advance AI in Energy* Task Forces

Coordinate governance via an EU *Advance AI in Energy* Task Forces where Member States, regulators, operators, vendors, academia, prosumers will align on standards, testing, and procurement profiles across the Member States. This set up can take best practices from D4E and other Task Forces and formats extested in smart grids and energy, but advance the functions and competencies.

Facilitate data availability, sharing mechanisms and enabling infrastructures:

Further advance scaling up of energy data spaces as the default way to share operational and market data across DSOs/TSOs, retailers, aggregators, OEMs and prosumers, advance requiernments of common semantics, access policies and interfaces so SMEs can train and run AI services with privacy/security and sovereignity of data by design.

Scale AI ready flexibility services by mainstreaming tools proven in EU projects (e.g., iFLEX, BD4OPEM) for DR forecasting, automated flexibility bidding, and consumer engagement agents; link these to local energy communities and EV smart/bidirectional charging.

Further enable extention for AI enabled "digital twins for grids". Advance projects with vendor neutral grid digital twins and smart grid AI rediness indicators; require TSOs/DSOs to provide non sensitive twin interfaces for AI driven planning, congestion management and predictive maintenance.

Create Sovereign EU test and experimentation facilities (AI TEFs) for AI in critical energy operations (real-time EMS/DMS/DERMS), including sandboxes for model validation and safe rollout. Regional and Member state level set ups.

AIOTI's report and the analysis of EU projects shows that federated energy data spaces plus edge/IIoT and AI agents are already enabling secure data sharing, DR, and grid optimisation at scale; the bottleneck is consistent EU-level adoption and interoperability and the enabling infrastructures

2) Foster research, innovation and coordination to prepare tomorrow's energy system

Priorities for Horizon Europe, DEP, LIFE, CEF-Energy:

Fund three focused research tracks

(i) **Federated learning/MARL** for DER coordination and market participation; (ii) **Physics-informed and uncertainty aware models** for RES forecasting and grid stability; (iii) **Energ efficient edge AI** (scheduling, pruning, quantisation) for substation/feeder level inference. (AIOTI tables on research priorities for federated learning, digital twins, and energy-efficient edge systems.)

Bridge R&I to operations

require every funded project to deliver reference implementations into open repositories with conformity profiles that DSOs/TSOs can benchmark against.

3) Sustainably integrate data centres' electricity demand into the energy system concrete measures:

Make flexibility by design a grid service for data centres where the connection agreements are to include DR baselines, peak-shaving/shift commitments, and participation in local flexibility markets—supported by AI for load prediction and orchestration at site/park level. (AIOTI highlights edge/IIoT + AI for local optimisation and energy-efficient compute.)

Set an EU rating scheme and minimum performance indicators (PUE, WUE, CUE, grid friendliness: responsiveness/ramps, curtailment tolerance, heat reuse utilisation)

Incentivise on-site RES, storage and heat reuse with standard contracts to supply nearby districts/industry, and publish best practice playbooks co developed by DSOs, developers and municipalities.

4) Enhance transparency and risks transparency by design for AI compute continuum

Trust, safety and resilience actions:

Sector guidance for the AI Act from sovereign infrastructures to use

Set up an EU incident repository for AI in critical energy systems, with anonymised sharing, root-cause taxonomies, and recommended mitigations; require reporting via NIS2/CRA channels.

Transparent and sovereign AI supply chains, consider solutions to certify datasets, model artefacts and edge devices used in substations and DER controllers; require signed models, inference attestation. AIOTI stresses cybersecurity for AI/6G and energy-efficient AI security.

5) Establish a coordination and governance framework along full Cloud – EDGE compute continuum (consider also along and within the evolving Digital Spine)

Harmonisation across the EU

Create a European "digital spine" for energy a lightweight governance model for cross border services (data-space connectors, identity/consent, catalogues, conformance profiles) so **AI apps interoperate** across Member States and market roles. (AIOTI emphasises collaboration, interoperable services, and digital governance mechanisms emerging from projects like OneNet and Enershare.)

Mandate open interfaces and semantics that require procurement to adopt common data models/ontologies and publish interface profiles for grid twins, flexibility platforms and metering.

Build skills and adoption capacity, that facilitate Competence Centers set ups, operator trainings and SME onboarding to the data spaces; pair each Member State with at least one facilitation set up on scaling up AI DSO/TSO and stakeholders where AI services can be designed, developed and validated and then replicated EU-wide best practices. These set ups should have sovereign AI enabling clusters or infrastructures. to facilitate the continuum from public infrastructures to private sovereign AI Factories.

About AIOTI

AIOTI is the multi-stakeholder platform for stimulating AI, IoT and Edge Continuum Innovation in Europe, bringing together small and large companies, academia, researchers, policy makers, end-users and representatives of society in an end-to-end approach. We strive to leverage, share and promote best practices in the AI, IoT and Edge Continuum ecosystems, be a one-stop point of information to our members while proactively addressing key issues and roadblocks for economic growth, acceptance and adoption of the AI, IoT and Edge Continuum Innovation in society. AIOTI contributions go beyond technology and address horizontal elements across application domains, such as matchmaking and stimulating cooperation by creating joint research roadmaps, defining policies and driving the convergence of standards and interoperability.