i-nergy
Artificial Intelligence for Energy

Artificial Intelligence in the Energy Sector for Environmental Sustainability

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Project Facts

Artificial Intelligence for Next Generation Energy

I-NERGY

Started:
01/01/2021

Duration:
36 Months

Coordinator:
Institute of Communication and Computer Systems (ICCS)

European Union's **Horizon 2020** Research and Innovation Programme

Budget:
4,999,844.50 €

Grant Agreement Number:
101016508

ICT-49-2020 Artificial Intelligence on demand platform

Who we are

17 partners from 9 Countries

7 Leading Research & Academy Institutions, SMEs and Large ICT companies - With leading expertise on AI, ICT and Data in the energy sector

Funding box - cascade funding to start-ups and SMEs

9 EPES stakeholders covering the **full energy value chain**:

- Power network operators, including TSO and DSO
- Energy suppliers
- Aggregator/Energy Cooperative
- Power market actors
- ESCOs
- Financing institutions, energy agency and policy makers

Motivation (1/2)

Artificial Intelligence is bound to revolutionise the Energy Sector

- Fast and accurate forecasts
- Demand / Supply predictions
- Grid flexibility
- Optimised maintenance
- Optimal operation

Motivation (2/2)

AI proliferation in the **energy** sector holds the premise for a larger **environmental** and **social impact**

- Decentralisation, Democratisation Digitalisation } of energy

- Environmental sustainability
- Alleviating energy poverty
- Fighting climate change and environmental degradation

Challenges to be addressed

- **EPES Community**
  - Lack of appropriate tools and resources
  - Scarcity of and competition for AI experts
  - Need for knowledge transfer to and for training AI in new contexts

- **@ Application Level**
  - Lack of holistic view of how AI techniques can be integrated from the energy system perspective
  - Lack of a cross-stakeholder coordination perspective
  - Fear of AI and potential misuse

- **@ ML Models Level**
  - Experimentation and assessment of AI models for the energy domain

- **@ Data Services Level**
  - Existence of consolidated functional / organisational silos combined with lack of semantic and business interoperability across data stream providers

I-NERGY Vision...

Deliver an energy-specific **open modular framework for supporting AI-on-Demand in the energy sector (AI4 Energy)**

Based on state-of-the-art AI and Data technologies

Energy Commodities Networks: AI for energy networks optimised operation

Distributed Energy Resources: AI for RES generation, buildings, districts, communities

Energy Efficiency and Non-energy related Services: AI enabling synergies / implications on other energy and non-energy domains

… and Objectives

O1. Reinforcing the service layer of the AI4EU-platform

- **Strengthen European-wise Research and Innovation on AI** through contributing to the **AIoD Platform**
- **Deliver** a smart contract-based implementation of an **energy data decentralized governance technological enabler**.
- Adapt, upscale and deploy a technology enabler for advanced AI-based data management and **deploy Energy Analytics Applications**

O2. Reaching out to new user domains and boosting the use of the platform

- **Validate** the I-NERGY analytics by developing **cutting edge AI-based analytics**, along with a number **piloted applications.**
- Lay the foundation for a **pan European AI for energy ecosystem**, boosting EU-scale data economy and use cases.

Reinforcing the AIoD Platform

AI-on-Demand Platform

AI Catalogue I-NERGY section

AIoD Experiments

AIoD Energy

Proliferate AIoD platform with AI and resources for the Energy Sector

- AI as a Service (AIaaS) APIs
- I-NERGY Applications / Dashboards
- Code / Library / Notebook / Docker
- Documentation
- Datasets
- ML Models

***AI-on-Demand** is a **one-stop-shop** for anyone looking for **AI** knowledge, technology, tools, services and experts.*

i-nergy Assets

- Project assets tested on real pilot cases
- Open Calls

I-NERGY Assets

Technical Enablers

- I-NERGY data management services
- Common data model
- Model serving framework
- Trained AI models deployed as services
- Visual analytics and Reports
- Assets and services from **Open calls**

Use cases in EPES sector

- 15 business cases in EPES sector

Services

- Energy Load Forecasting Service
- Predictive Maintenance Service
- Operation planning
- Digital Twin for DER / DPSIM
- Digital Twin for Electrical Communities
- Energy Flexibility Forecasting and Demand Response
- Anomaly Detection in citizen patterns from Smart Meters
- Energy Efficiency Action Plans Evaluation and Prioritisation
- Decision Support for energy action plans and policies
- Forecasting Changes in Solar Radiation

Pilot Use Cases

- **UC 1:** AI for enhanced network assets predictive maintenance, integrating off-grid data with condition-based monitoring
- **UC 2:** AI for network loads and demand forecasting towards efficient operational planning.
- **UC 3:** AI for energy demand prediction to optimize DHN operation
- **UC 4:** AI for energy saving verification service, increasing the trust on EPCs
- **UC 5:** AI for multi energy systems decision-support - Reina Sofia
- **UC 6:** Cross-functional AI-based predictive analytics to support integrated DSOs asset management and network operation
- **UC 7:** AI-based consumption and flexibility prediction for local community optimal aggregation and flexibility trading
- **UC 8:** AI-based energy-driven and non-energy services (consumer comfort and preferences)
- **UC 9:** AI-based IoT-enabled PV module-level portfolio optimal predictive maintenance and PV-enhanced industrial plant optimal operation
- **UC 10:** AI in EV charging infrastructure
- **UC 11:** AI for peer-to-peer RE trading in virtual energy community
- **UC 12:** AI for the Ambient Assisted Living and personal safety/security at home
- **UC 13**: AI for energy efficiency investments de-risking
- **UC 14:** AI for improved Energy Performance Certificates Reliability
- **UC 15:** AI for predicting the climate change impact in RES and energy demand at regional level.

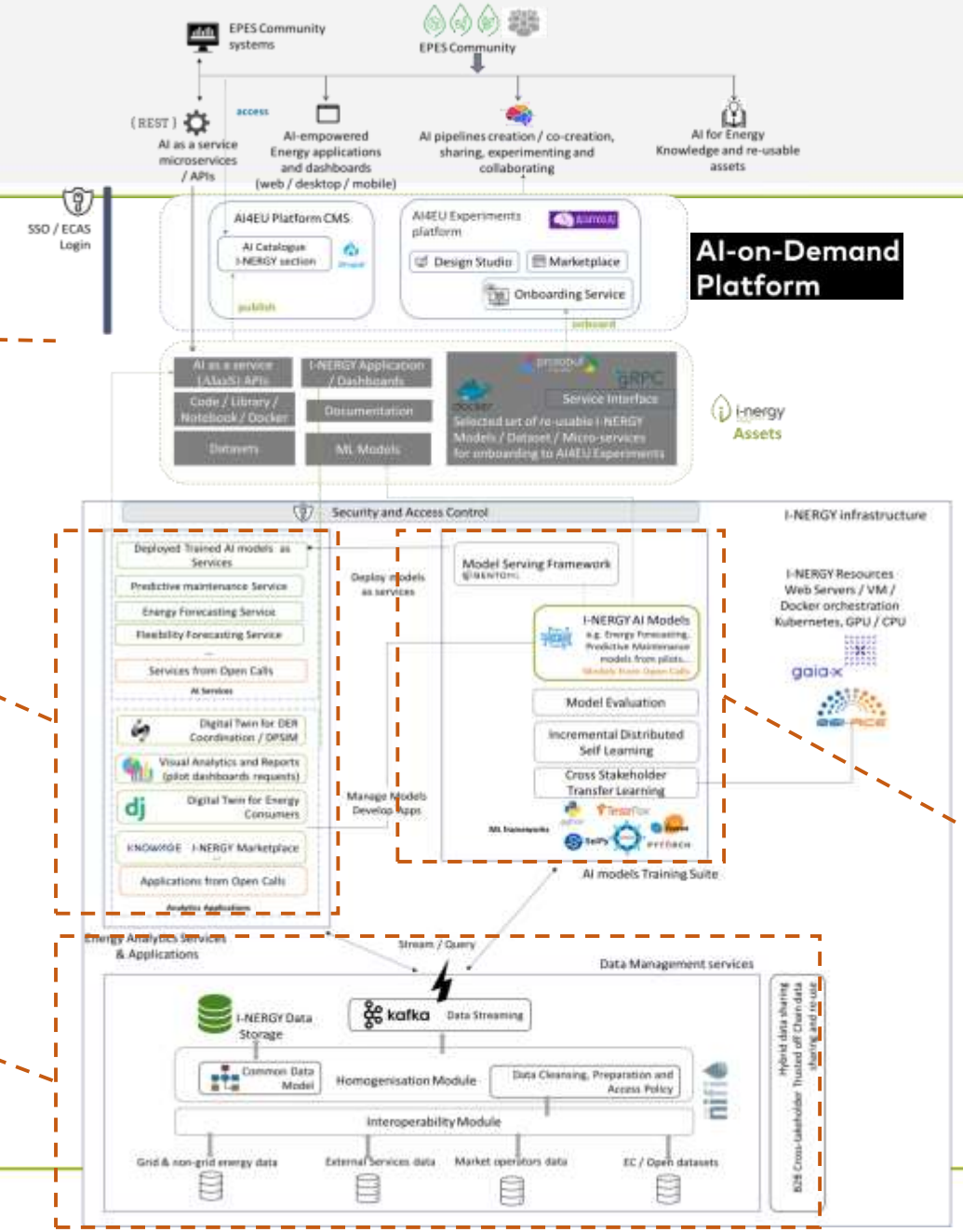
Conceptual Architecture

End-users and Community using the apps and services

Energy Analytics Services and Applications

Data Management Services

AI Models Training Suite



Opportunities for collaboration with the maritime domain

- Re-use of services, and AI models for the maritime domain. For instance:
  - I-NERGY Data and AI Processing pipelines and tools
  - Digital Twin for DER / DPSIM
  - Predictive Maintenance Service models
  - Assets and services from Open calls
  - Operation planning
- Collaboration on Maritime use cases (VesselAI Pilot 2 - design of energy ship systems)
- Invitation to Maritime companies to apply to I-NERGY 2nd Open Call with focus on relevant energy systems

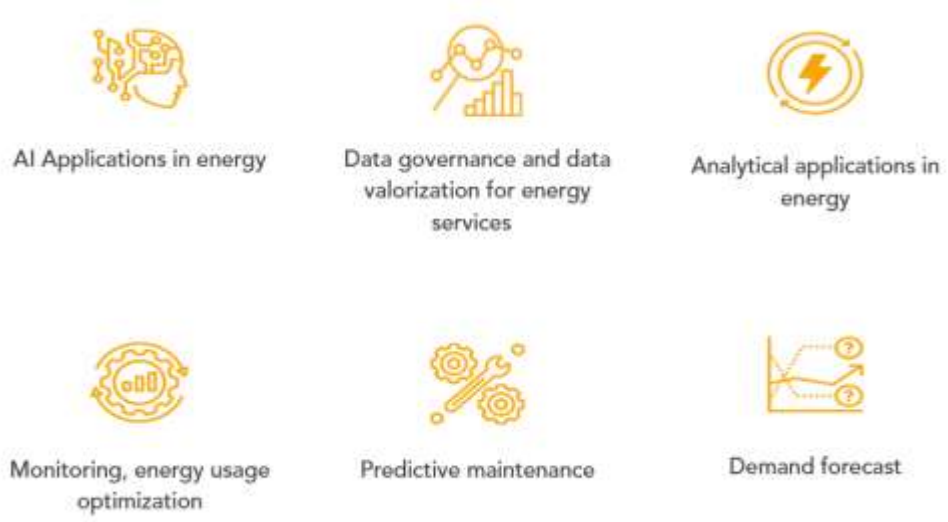
2nd I-NERGY Open Call

➢ WHO ARE WE LOOKING FOR?

The experiments have to be proposed and carried out by a **Consortium of 2 entities**, comprising:

- 1 Service developer/provider
- 1 Pilot infrastructure provider/Data Owner

➢ WHICH ARE THE AREAS OF EXPERIMENTATION?



➢ WHERE TO APPLY?

https://i-nergy-2-oc.fundingbox.com/

➢ MEET THE WINNERS OF THE 1ST OPEN CALL

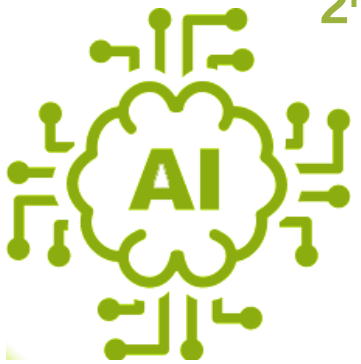
https://i-nergy.eu/1st-open-call-newsletter

Open Calls

- **2 M€** Financial Support to Third Parties (FSTP)
- Technical Mentoring

	TECHNOLOGY TRANSFER PROGRAMME I	TECHNOLOGY TRANSFER PROGRAMME II
CALL LAUNCH	NOV 2021 - JAN 2022I	OCT- DEC 2022
WHO CAN APPLY	SMEs Including Startups	SMEs, Startups and EPES beneficiaries (2 organizations per bottom-up project are required)
SCOPE	Building blocks for new AI algorithms / services and small-scale experiments (prototypes)	Developing new services on top of existing technologies (MVPs)
DURATION OF SUPPORT PROGRAM	6 months	9 months
BOTTOM-UP PROJECTS	10	15

Second Open Call



2nd Open call is open! Deadline 12th December 2022 (17.00 CET)

Scope: Developing new AI services on top of existing technologies (Minimum Viable Products)

100.000 € - 9 Months

2 Organisations are required:

1 technology service provider/developer with SME status, including startups.

1 infrastructure provider/data owner willing to implement an energetic solution.

Challenges

- AI for network assets predictive maintenance
- AI for network loads and demand forecasting
- AI for energy demand and supply prediction
- AI for energy storage management decisions
- AI-based predictive analytics to support TSOs / DSOs asset management
- AI-based consumption and flexibility prediction
- AI services for Solar Energy and Photovoltaic Applications
- AI for Electric Vehicles
- AI for trading in energy communities
- AI for energy efficiency investments and decision support systems
- AI for improved energy performance
- AI for energy savings and contracts.
- AI for fighting climate change and transform environment impact of business
- Applications of reinforcement learning in energy systems

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Thank you!

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