flexitranstore

Hogyan csatlakozzunk egy sikeres konzorciumhoz?

Tamás MÁTRAI – BME VET
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This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774407

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Előadás témái

- BME Villamos Energetika Tanszék bemutatkozása
- Flexitranstore projekt
  - BME feladatok
- Hogyan készült?

Where are we?

Who are we?

What are we doing?

What do we have?

VET

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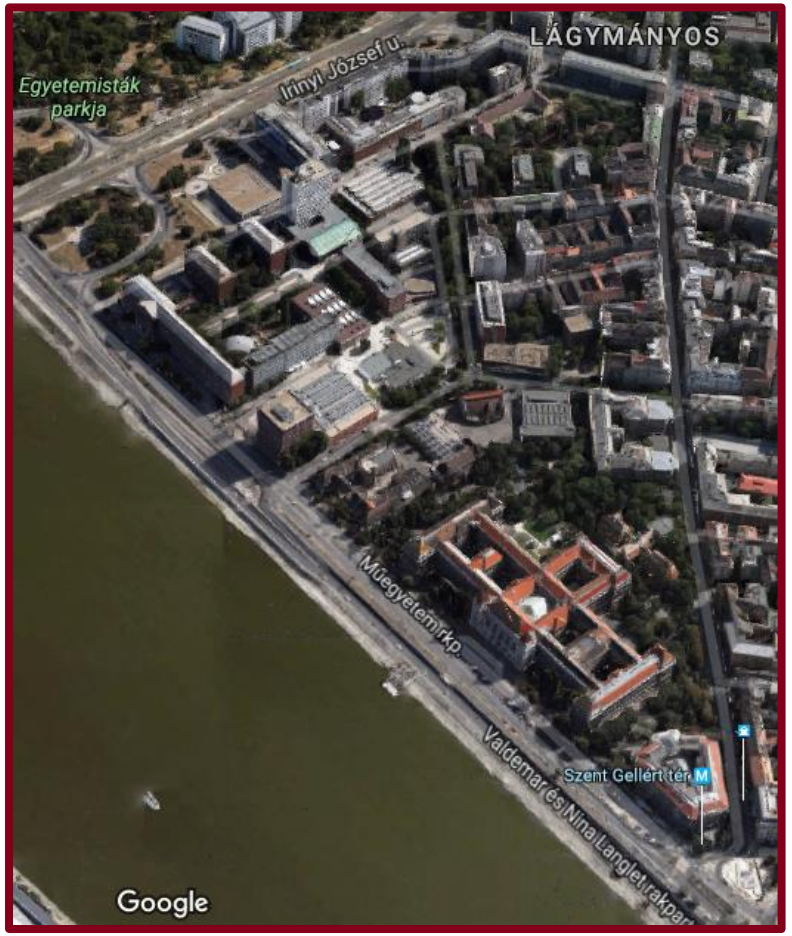
HIGHVOLTAGE LABORATORY

BME V1



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HIGHVOLTAGE LABORATORY

BME established in 1782

Department of Electric Power Engineering (1893)
Power Systems and Environment Group (1931)
BME High Voltage Laboratory (since 1936)

- 24 000 students
- 1160 instructors
- 28 buildings
- 315 000 m² of Campus
- Education, research

R&D in 8 faculties: Civil Engineering, Mechanical Engineering, Architecture, Chemical Technology and Biotechnology, **Electrical Engineering and Informatics**, Transportation Engineering and Vehicle Engineering, Natural Sciences, Economic and Social Sciences

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HIGHVOLTAGE LABORATORY

What are we doing?

Education

Research and development

Laboratory testing

Education

University

- Bachelors curriculum
  - ✓ Electric Switching Devices
  - ✓ Electrotechnics
  - ✓ High Voltage and Insulation Engineering
  - ✓ Power System Engineering
  - ✓ Electric Power Transmission
  - ✓ Planning and Operation of Smart Distribution Networks
- Masters curriculum
  - ✓ Building Management Systems
  - ✓ Electrical Systems of Sustainable Energetic
  - ✓ Electrical Insulations and Discharges
  - ✓ Electric Energy Market
  - ✓ Power System Operation and Control
  - ✓ Power System Transients
- PhD level
  - ✓ High Voltage and High Current Engineering
  - ✓ Electromagnetic Compatibility
  - ✓ Physics and Diagnostics of Insulations
  - ✓ Power Systems
- Project laboratory
  - ✓ TDK- scientific competition for students
- Facultative subjects
  - ✓ Lightning Protection
  - ✓ Health Effects of Electricity
  - ✓ Electric Power Quality
  - ✓ Power Plants of Budapest
  - ✓ Power Supply of Critical Infrastructures
  - ✓ Energy in the Future
  - ✓ Electric Supply of Railway Traction Systems

Adult education

- Engineering advance studies
  - ✓ explosion safety
  - ✓ Lightning
  - ✓ EMC
- Live line maintenance
  - ✓ MV training
  - ✓ HV training
- Workers safety training

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Research and development

- ✓ Lightning protection
- ✓ Electrostatics
- ✓ Insulation diagnostics and condition management
- ✓ Electromagnetic compatibility and disturbance protection
- ✓ Live-line maintenance

- ✓ Expertise in smart grids
- ✓ Demand-side management
- ✓ E-mobility
- ✓ Electricity markets
- ✓ Energy audits
- ✓ Classical power sytem topics

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HIGHVOLTAGE LABORATORY

Smart Grid and Power Quality Laboratory

- Our main strengths in power systems topics (network analysis, measurement technology and lab background) and related border areas would place us as ideal candidates for complementing IT-related projects in electric energy systems.

- We are most proud of being **long-time, landscape-shaping partners of local industry**, since early stages of electrification through the construction of the 750 kV line up to today's „Smart" era.
- Local partners: TSO, DSOs, Hungarian Energy Agency, power plants (incl. Paks NPP), local companies/factories of multinational companies (GE Hungary, Siemens), railways, energy traders, planning and projecting companies, Hungarian relay protection, substation automation device manufacturer, SCADA system developer, etc.

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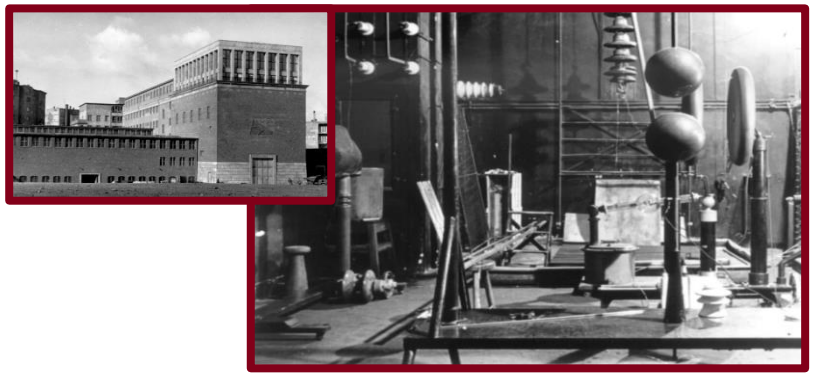
High Voltage Laboratory

- In the 1970s when Hungary introduced the 750 kV OHL, the laboratory was equipped with a **600 kV test transformer** and a **750 kV impulse generator**.
- The installation of the first **250 kV transformer** was soon followed by a **1000 kV impulse generator**.
- Nowadays: current impulse generator, climate and ageing chambers, EMC cells, MV and HV live working training center

Károly Zipernowsky, one of the three genial Hungarian engineers of Ganz Electric Factory, who **invented the transformer with closed iron core**, has **123 years ago** established the Department of Electrotechnics of the Budapest University of Technology, and later, in ***1936 he organized the High Voltage Laboratory.***

The Zipernowsky-laboratory was the predecessor of the today's High Voltage and Live Working Laboratory, whose new building was constructed in 1959-1961 and **fully renovated 2012.**



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HIGHVOLTAGE LABORATORY

flexitranstore

An Integrated Platform for Increased FLEXIbility in smart TRANSmission grids with STORage Entities and large penetration of Renewable Energy Sources

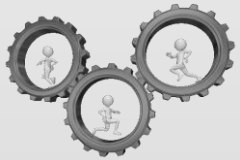
Project presentation

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774407

Agenda

The Project

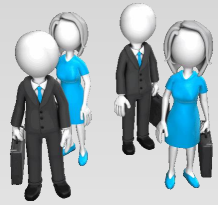
Objectives



Technical Framework

Demonstrations

Impact and Exploitable Results



The Partners

About FLEXITRANSTORE

Project Grant Agreement No. 774407

Budget: 21.7 M Euro

Grant: 17 M Euro

Start: 1 Nov 2017 (M1)

End: 31 Oct 2021 (M48)

LCE-04-2017 call: Demonstration of system integration with smart transmission grid and storage technologies with increasing share of renewables

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 774407

Objectives

To **enhance and accelerate** the **integration of renewables** into European energy systems, especially addressing imbalances

To increase cross border electricity flows across Europe

STRATEGIC OBJECTIVES

At a technical level:

→Develop a **next generation of Flexible Energy Grid (FEG),** which provides the technical basis to support the valorization of flexibility services, **enhancing the existing European Internal Energy Market (IEM)**

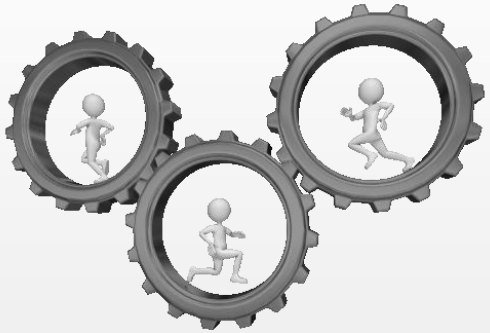
At a market level:

→ A **wholesale market infrastructure** and new business models should be upgraded to network players, incentivize new ones to join, while demonstrating new business perspectives for cross border resources management and energy trading

Specific Objectives

FLEXITRANSTORE Project aims to **increase Flexibility**:

1. **Across the Energy Industry Value Chain:**
   Integrating Battery Energy Storage Systems (BESS) at different grid connection points: TSO/DSO border substations and Wind Farms and synchronous Gas Turbine Plants
2. **In the transmission grid:**
   Power Flow Controllers for the first time in the SEE region, Dynamic Line Rating (DLR) sensors and algorithms, efficient controllers for active substations at the TSO/DSO border and Wind Power Plant (WPP) connections to High Voltage networks
3. **In the distribution grid:**
   Enhancing demand-response mechanisms using the TSO/DSO controller
4. **At conventional generators:**
   Installation of Power System Stabilizers (PSS), development of a representative grid model at plant level
5. **Within the wholesale electricity markets:**
   Integrated market platform based on an enhanced EUPHEMIA market model



Technical Framework

FLEXITRANSTORE Project will implement technologies and novel concepts aiming to:

- Create a pan-European energy Market under a common framework free of national restrictions and legislative barriers imposed by individual nations.
- Integrate the South Eastern European energy markets, where market coupling activities are progressing slowly.
- “Touch” different grid flexibility resources: improved operations, grid modernization, demand response, fast ramping supply, energy storage.

Demonstrators

FLEXITRANSTORE will create 8 demonstrations in 6 countries.

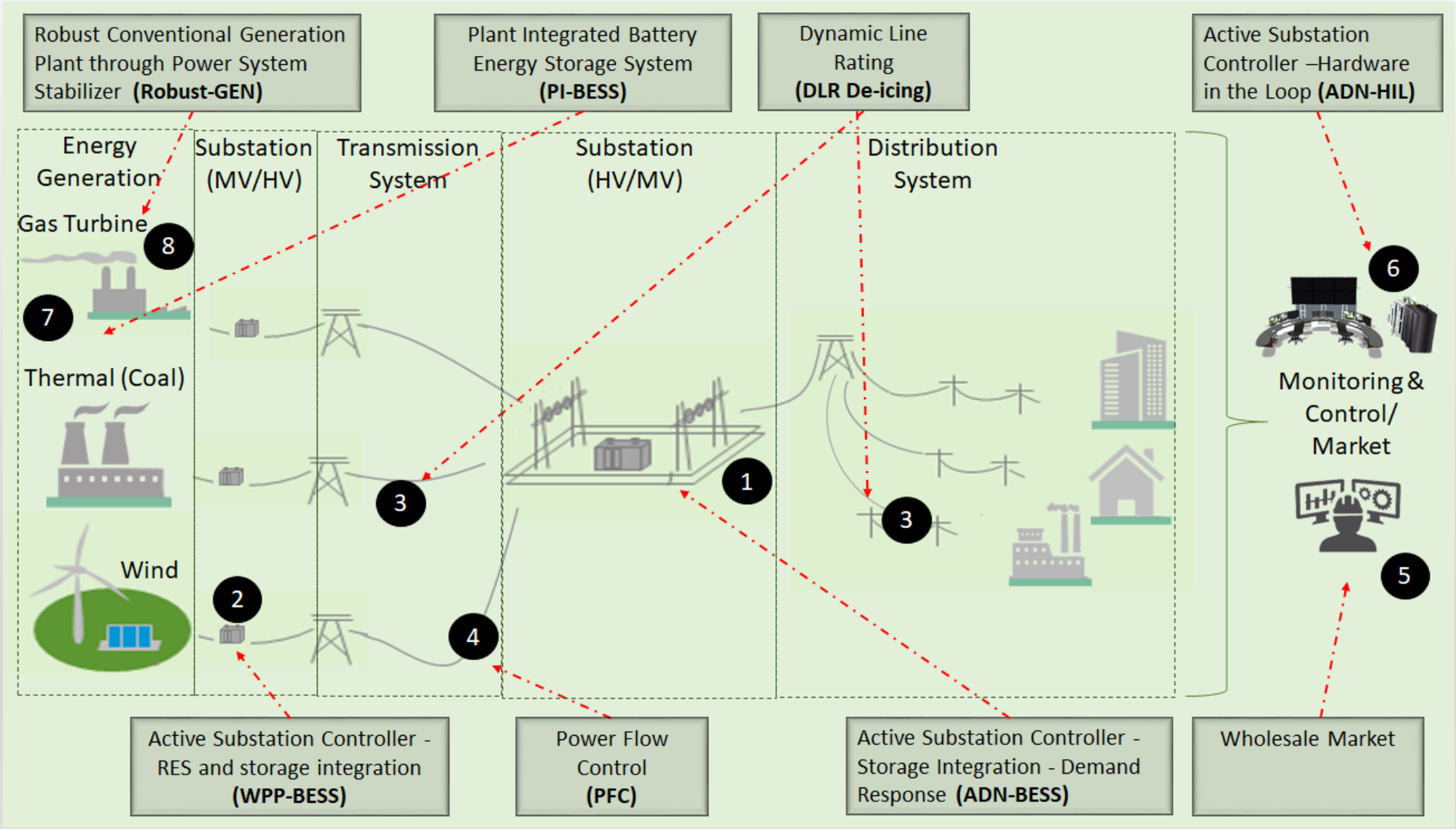
The demonstrators are divided into three layers, according to their application point across the energy value chain.

- **Layer 1:** Flexibility at transmission connection points: Production and demand.
- **Layer 2:** Increasing cross border capacity and clean energy flows.
- **Layer 3:** Flexibility entering the market.

Demonstrators

1. **Active Substation Controller with storage integration at the TSO/DSO interface** (site: Cyprus)
2. **Active Substation Controller with storage integration at the Wind Park Plant Substation** (site: Northern Greece)
3. **Dynamic Line Rating** technology (sites: Slovenia, North Eastern Bulgaria)
4. **Power Flow Control devices** – Power Line Guardian (sites: Southern Bulgaria, Southern Greece)
5. **Wholesale market** demonstration and clearing (sites: Bulgaria, Cyprus)
6. **Active Substation Controller in Hardware In the Loop** (HIL) demonstration (site: Virtual lab in Spain)
7. **Plant Integrated Battery Energy Storage System in GT generator** (site: Belgium)
8. **Robust Conventional Generation plant through Power System Stabilizer** (site: Belgium)

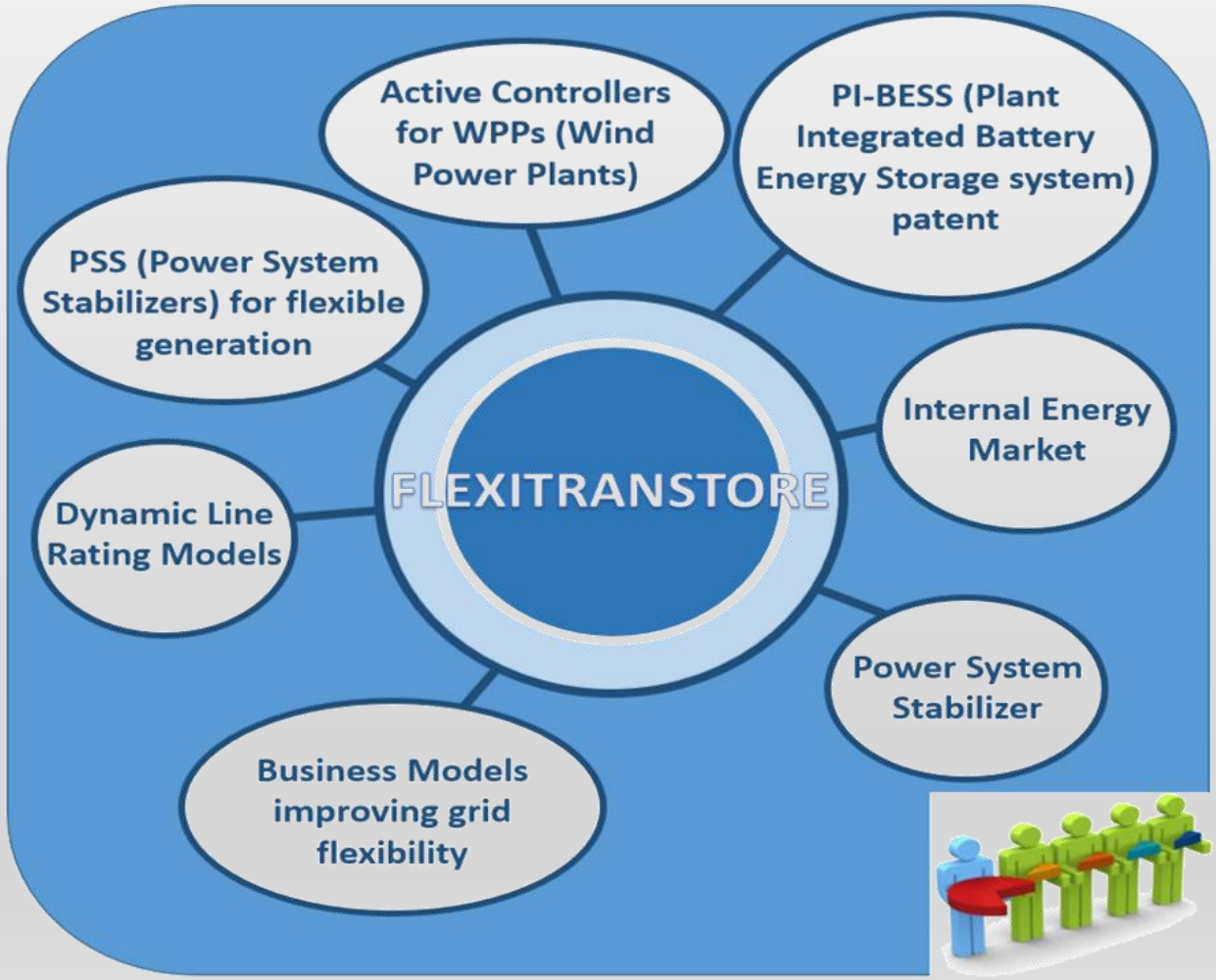
Conceptual Workflow



Impact

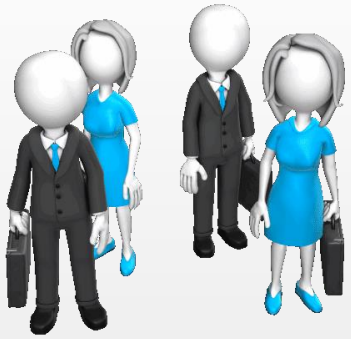
- Develop new policies governing the energy exchange and the energy markets.
- Include new actors and players.
- Transform the European Internal Energy Market (IEM) according to the framework defined by the ENTSO-E and the ETIP-SNET Roadmaps.
- Contribute towards higher RES penetration and CO2 levels reduction.
- Utilize available energy and distribute the available capacity more efficiently, thus reducing costs.

Exploitable Results



exploitation methods

new research	ALL
market penetration	Service Providers, Manufacturers, IT, VPP
science and education	Universities
policies	Service Providers, TSOs, DSOs, Market Operators, Regulators



The Partners

European Dynamics

ICCS ΕΠΙΣΕΥ

Technical University Sofia

University of Cyprus

Műegyetem 1782

Universidad Loyola Andalucía

EMAX Light up the future

WING Business prin Inovare

ABENGOA

Jema Irizar Group

imagination at work France

Schneider Electric

Smart Wires Reimagine the grid

C & G d.o.o. Ljubljana

Studio Elektronike Rijeka

SC

ΑΔΜΗΕ

ESO

ΔΣΜΚ Διαχειριστής Συστήματος Μεταφοράς Κύπρου Transmission System Operator - Cyprus

R&D Nester

OSM Operatori i Sistemit të Transmetimit

ELEKTRO Ljubljana

Electricity Authority of Cyprus

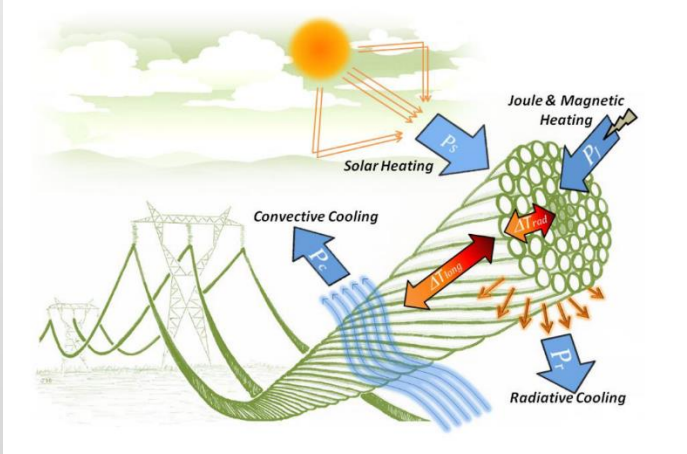
IBEX Independent Bulgarian Energy Exchange

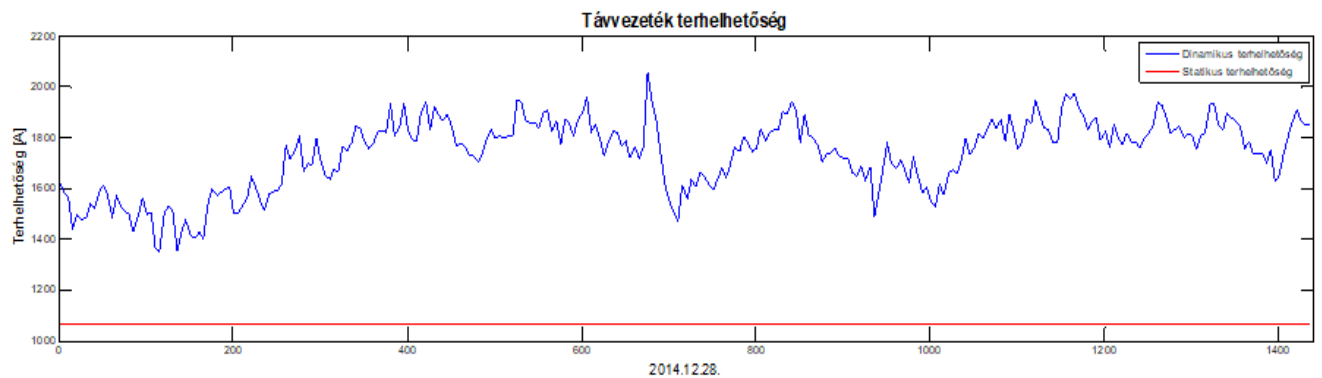
vpp Intelligent Energy

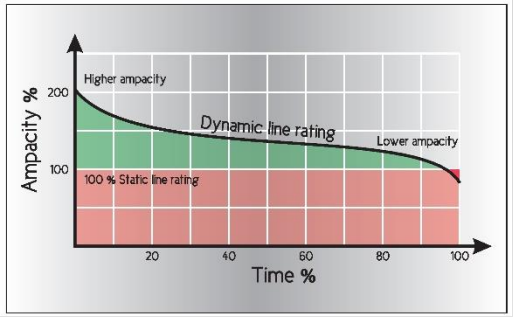
Ρυθμιστική Αρχή Ενέργειας Κύπρου Cyprus Energy Regulatory Authority

BME – WP4, WP7

- Nowadays the world is getting hungrier for the energy. Consequently it is important to know how much energy can be scrubbed on an powerline.
- DLR is a method to determine the maximum capacity of an overhead line by using real time data (DLR sensor, weather condition and prediction, SCADA, conductor parameters etc.)
- Increased capacity compared to static rating







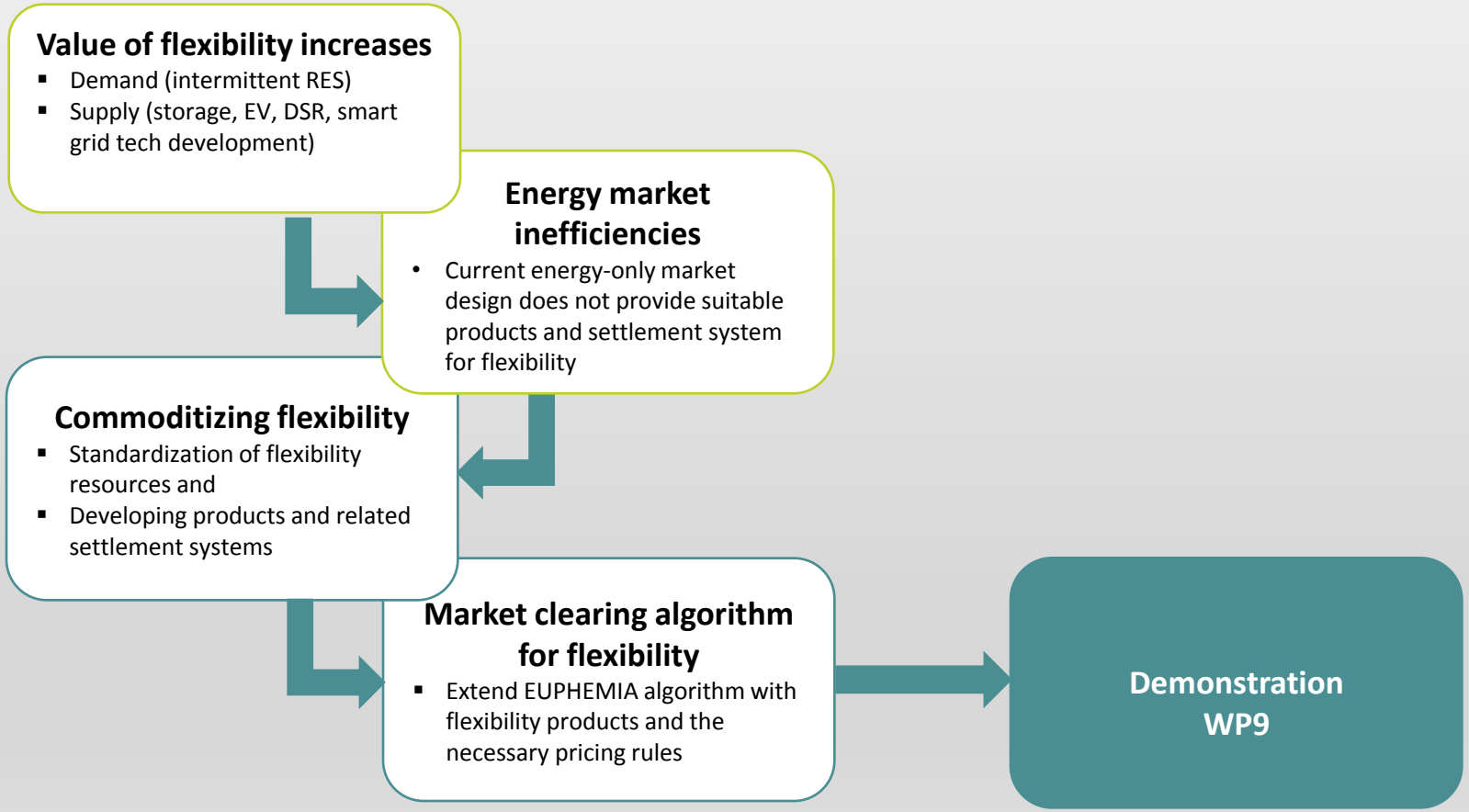
BME – WP4, WP7

- The main aim of de-icing methods is to increase the reliability of transmission grids, especially in case of **unpredictable weather conditions**.
- De-icing methods:
  - Passive
  - Thermal
  - Mechanical
  - Miscellaneous
- DLR provides a real-time computing method to specify the adequate current to **prevent the ice formation on conductors**.
  - Real-time measurement:
    - DLR sensors
    - Weather stations
  - Computing methods:
    - White-box model
    - Black-box model

BME – WP4, WP9

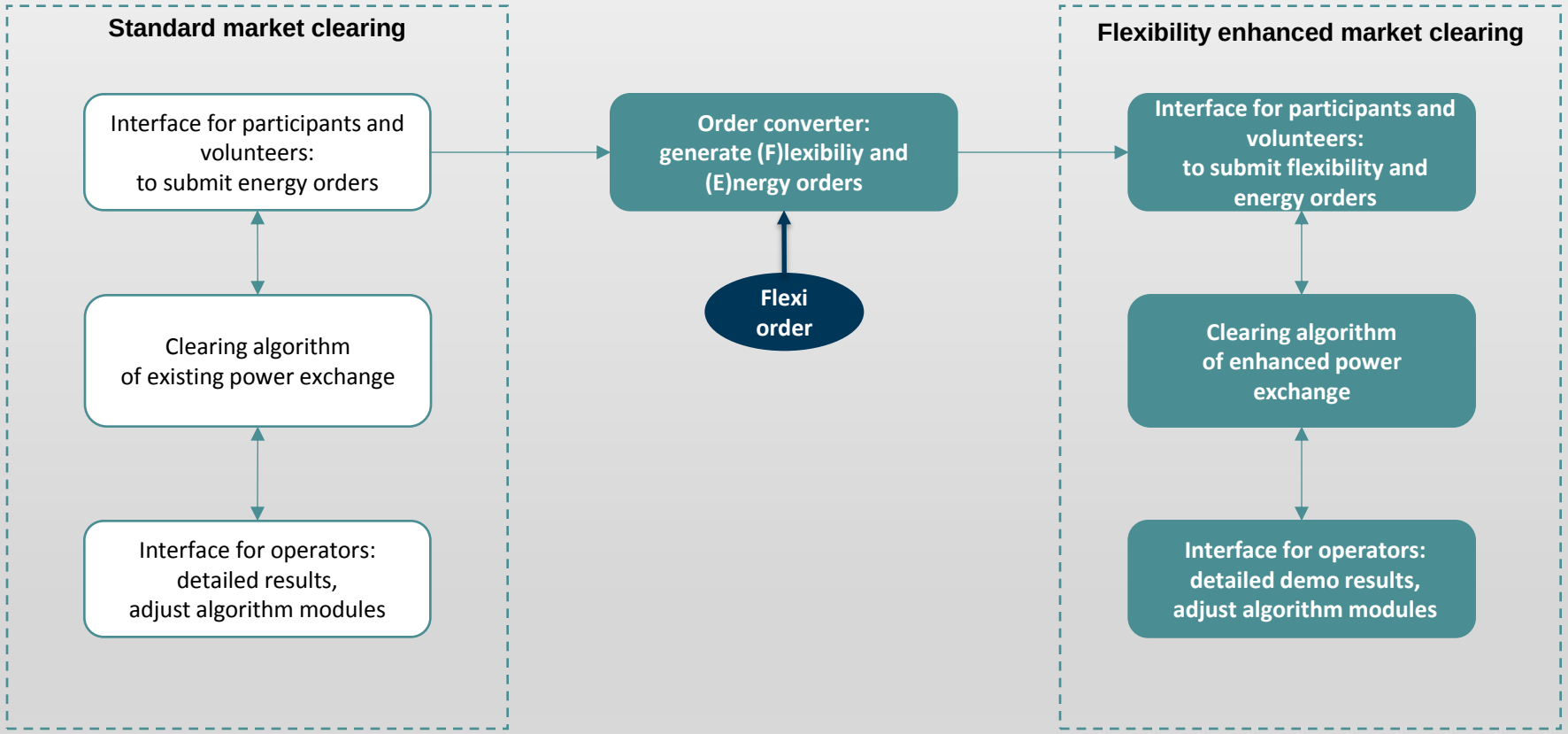
Background and objectives of enhancing market design with flexibility

WP 9 focuses on delivering a flexible market algorithm & a solution



BME – WP4, WP9

Goal of Flexitranstore WP9



Hogyan készült?

- Korábbi **Fp7 projektben** sikeres részvétel
- Folyamatos kapcsolattartás és **K+F bázis** kialakítása a hazai DSO és TSO számára
- Aktív ***nemzetközi jelenlét***:
  - **ENTSOe** – European Network of Transmission System Operators for Electricity
  - **Cigré** – International Council on Large Electric Systems
  - **IEEE** – The Institute of Electrical and Electronics Engineers

entsoe
Reliable Sustainable Connected

cigré
FOR POWER SYSTEMS EXPERTS

IEEE
Advancing Technology for Humanity

Hogyan készült?

- Meglevő nemzetközileg is publikált **fejlesztési eredmények**
- Nemzetközi jelenlétből fakadóan **meghívás** a konzorciumba
- Kezdetektől transzparens, egyértelmű **szerepvállalás**
- Pályázati anyag előkészítése, majd elkészítése – részünkről technikai és pénzügyi feladatok, pályázat írása: European Dynamics
- Megfelelő hazai és nemzetközi **támogatások** megszerzése (support letter)

Join us …

www.flexitranstore.eu

FLEXITRANSTORE – H2020 GA No. 774407

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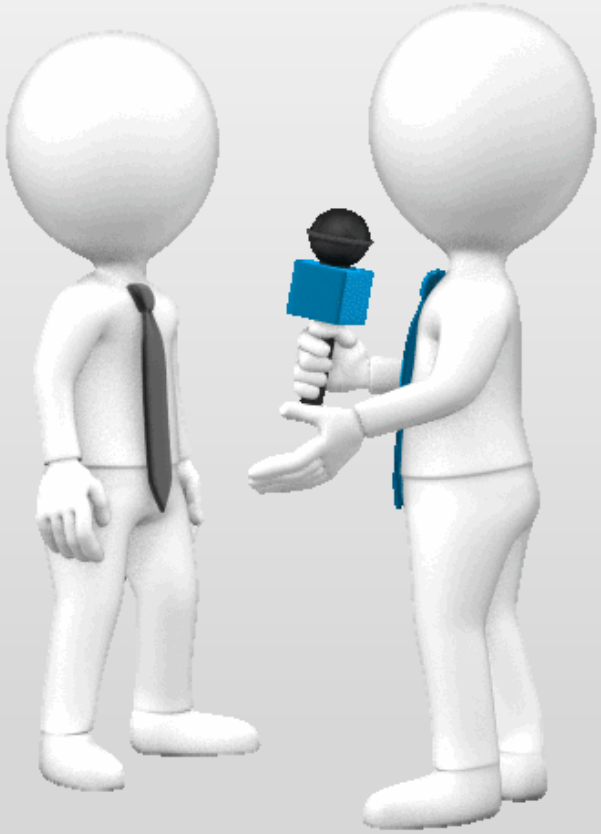
Questions?



Thank you very much for your attention!!

www.flexitranstore.eu

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AT 110kV - E07
UAB 116.6 kV
F 49.96 Hz
67.2 kV
67.6 kV
67.5 kV
585 A
584 A
584 A
116.7 kV
117.1 kV
116.5 kV
108.8 MW
45.6 MVAr
0.0 kV
0.00 Hz
0.0 °
38,5kV
AT
UAB 0.0 kV
F 49.96 Hz
UAB 116.6 kV
F 49.96 Hz
10
10
10
10
10
31.3 °C