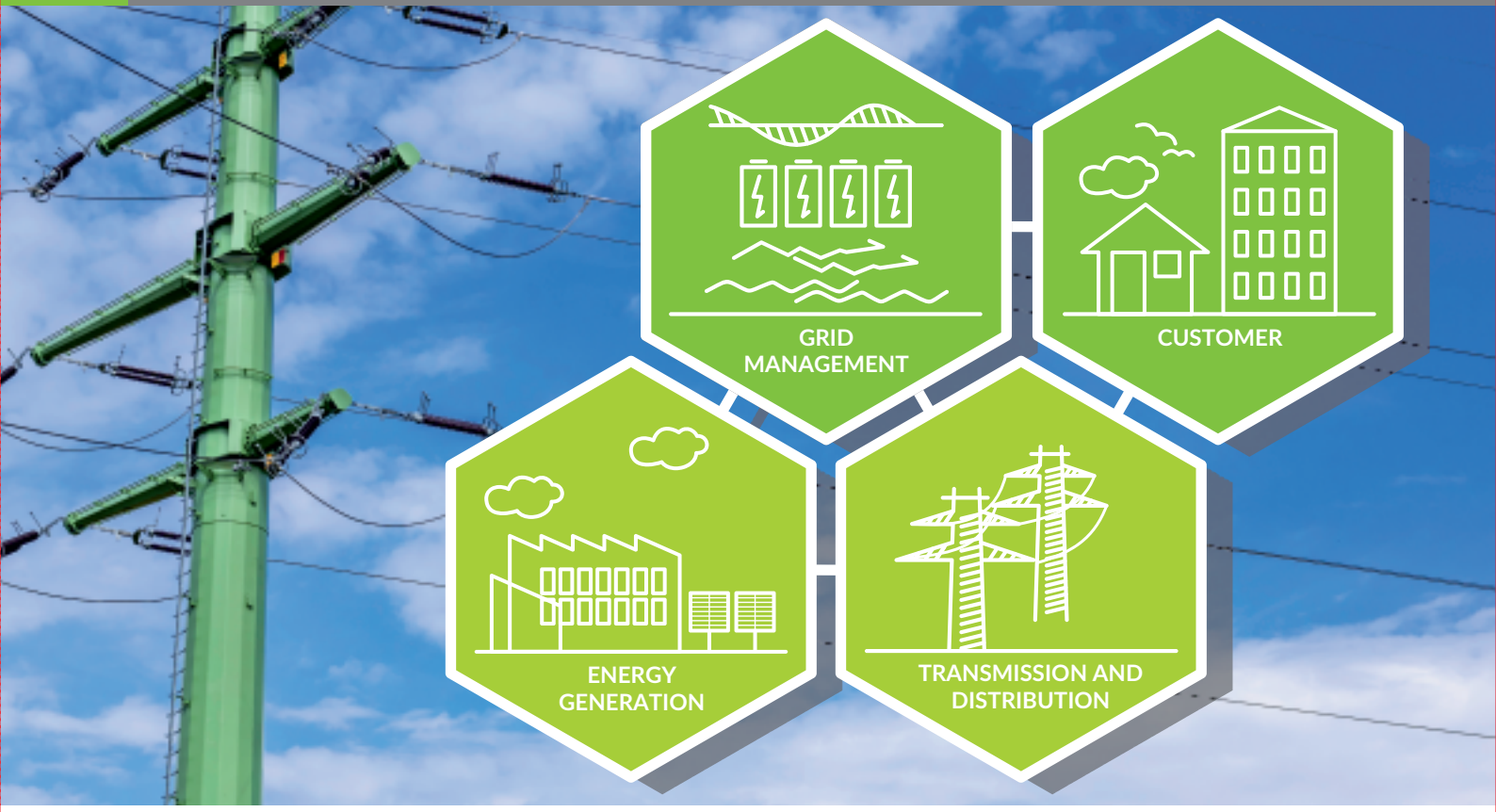
Smart Grids

Development of smart power grids in Poland with support from the Operational Programme Infrastructure and Environment 2014-2020



European Funds
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MINISTRY OF ENERGY

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What is a "smart powergrid"?

The Smart Grid is an intelligent distribution network combined with all related IT and telecommunication technologies that integrate activities of the parties concerned: electric energy producer, distributors and clients. Such grid offers a number of benefits: **more efficient supply, improved energy efficiency and stronger involvement of consumers in production of energy.**

Challenges faced by the industry in the distribution area, including the need for improvement of quality and security of supply, the need for more active involvement on the part of consumers and the possibility of connection small sources of energy including those based on renewable resources have turned development of smart power grids into a must.

The Smart Grid consists of the following components:

>

Infrastructure including transmission and distribution lines, switching stations and consumer supply lines

>

Measuring instruments and automation devices including smart meters

>

Telecommunication infrastructure and data exchange equipment: communication networks and databases

>

IT systems for grid management including methods for minimising power failures and tools for data analysis

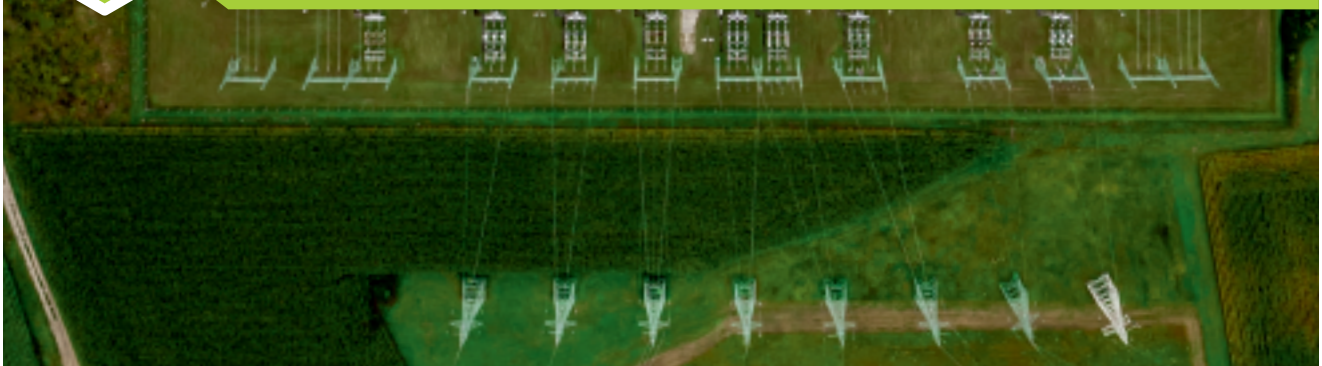
Selected factors stimulating innovation in energy transmission and distribution systems

> Insufficient coverage or poor state of repair of transmission and distribution grids
> Necessity of managing distributed generation
> Necessity of accommodation to the volatility of output of renewable energy sources
> Aggravating economic consequences of failures and power supply interruptions
> Demand for extensive databases for management of the load capacity of the grid
> Demand for up-to-date information from spot measurements of performance of the grid
> Necessityfor dynamic management of the grid
> Development of electromobility
> Enhance of environmental protection standards

Smart Grids as part of the Operational Programme Infrastructure and Environment 2014-2020 (OPIE 2014-2020)

The power engineering industry defines the Smart Grid as a one that:

> Integrates behaviours and activities of all its clients (generators, energy storagefacility operators, consumers and prosumers) cost-effectively and functionally
> Provides an effective and economically sustainable electric energy supply system
> Keeps energy losses low
> Ensures high quality and safety of power supply



Smart Grids – with the benefit for everyone

Benefits for consumers:

>
No need for manual metering
>
Billing based on actual consumption rather than forecasts
>
Possibility of rapid switching between energy suppliers
>
Easier access to information on current consumption, such as through a dedicated Web site
>
New flexible tariffs
>
Two-way communication between consumers and suppliers
>
Adaptation of energy supply to individual requirements
>
Better stability of supply
>
Possibility of connecting prosumers' micro-sources of energy (such as home wind turbines of photovoltaic panels) to the grid for personal use
>
Possibility of installing smart meters

Benefits for distribution system operators:

>
More efficient operation of the grid and smaller energy loss
>
Better quality of supply and minimised number and duration of power failures
>
More efficient utilisation of the existing grid infrastructure including improved capacity for connecting renewable energy sources
>
Availability of more precise estimations of demand for energ

Examples of smart functionalities

Power distribution grid:

>
Charging of electric vehicles
>
Load measurement in real time with visualisation
>
Energy management by the power consumer
>
Grid load monitoring in real time with visualisation
>
Automatic detection (and correction) of errors
>
Active and reactive power flow control
>
Planning for distribution grid development taking account of distributed energy sources
>
Current monitoring and evaluation of devices
>
Power distribution optimisation (local or remote)
>
Automatic (temporary) switching of distributed energy sources to the island mode

Power transmission grid:

>
Dynamic evaluation of load capacities of lines
>
Advanced grid monitoring with visualisation
>
Automatic (temporary) switching of distributed energy sources to the island mode
>
Charging of electric vehicles
>
Load measurement in real time with visualisation
>
Energy management by the power consumer

The Operational Programme Infrastructure and Environment supports the power industry

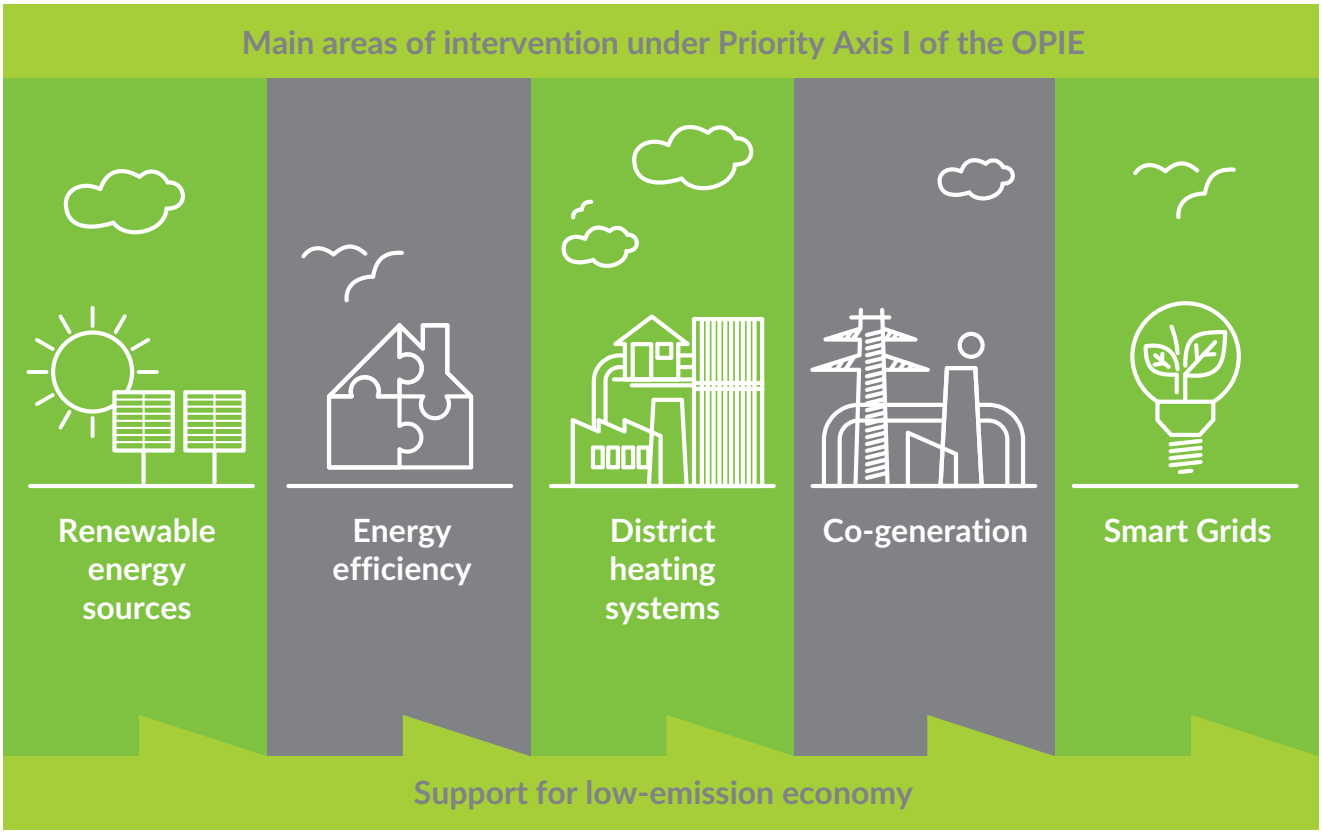
Developing smart grids is an important area of support under the OPIE. The integration of support for the Smart Grids with other measures works for comprehensive and effective achievement of the goals consisting of sustainable management of resources, improvement of the natural environment, improvement of energy efficiency and of providing the economy with safe and competitive sources of energy supply.

Activities in the scope of the First Priority Axis of the Programme taken into consideration projects for development of a system of distribution grids at low and medium voltage and storage and transmission facilities. Also the Seventh Priority Axis supports this development of smart grids.

Priority axes for the power industry

PRIORITY AXIS I: Reduction of emissivity of the economy

The activities under Priority Axis I include **enhancing primary energy efficiency, improving energy efficiency** in the public and residential sectors, **reducing energy consumption** in enterprises and **increasing production of energy derived by renewable sources.** Funds under this Axis have been also allocated to the development of low and medium voltage smart grid systems, to construction or conversion of district heating networks and retrofitting of buildings for improved energy performance. All these measures are aimed to build a **low-emission economy.**



PRIORITY AXIS VII: Energy security of the country

Extension, modification and retrofitting of energy infrastructure, including from implementation of smart solutions, are the main measures intended to improve energy security of the country under Priority Axis VII. The list of specific measures related to assuring energy security of the country includes development, extension and modification of the transmission, distribution and storage infrastructure, expansion of the LNG regasification terminal, construction and modification of the transmission and distribution grids, replacement of transformers and construction, extension and modification of substations.

MEASURE 1.4

Focuses on developing and implementing smart distribution systems that operate at low and medium voltage levels.

Proposed areas of action:

>
Comprehensive projects for implementation of smart solutions in relevant areas and, consequently, for optimisation and/or rationalisation of consumption of energy generated by renewable sources

Project selection mode: Non-competitive

>
Implementing institution: Ministry of Energy
>
Form of support: Subsidy
>
Budget: EUR 100 million

Type of beneficiaries:
- power industry companies

MEASURE 7.1

Aims to develop intelligent storage, transmission and systems for distribution, storage and transmission of gas and electric power.
The goal of Priority Axis VII, consisting of the building of energy security, contributes to development of grids containing smart components.

Areas of action:

>
Transmission, distribution and storage of gas and expansion of the LNG terminal
>
Transmission and distribution of electric energy

Project selection mode: Non-competitive

>
Implementing institution: Oil and Gas Institute - National Research Institute in Krakow
>
Form of support: Subsidy
>
Budget: EUR 1 billion

Type of beneficiaries:
- power industry companies dealing in LNG transmission, distribution and regasification
- power industry companies dealing in electric power transmission and distribution

What is the development status of the Smart Grid?

Energa-Operator SA has been granted more than PLN 166 million under the OPEI for investments in the Smart Grid.

"Modification of the grid to the Smart Grid standards by installation of smart meters and by automation of the grid for mobilisation of clients, for improvement of energy consumption efficiency, for effective electric power system management and for power supply security"

The project consists of installation of smart meters and grid automation devices.The re-engineering project is underway in the licensed area of operations of Energa-Operator SA in theŁódzkie, Wielkopolskie, Zachodniopomorskie, Kujawsko-Pomorskie, Mazowieckie, Pomorskie and Warmińsko-Mazurskie voivodships.

Geographical area of implementation of the project by Energa-Operator SA

The proposed project results include achievement of the smart power grid functionallity, reduction of transmission losses (energy savings) and establishment of an technical conditions for connection of renewable energy sources,

For instance, the feature of automatic identification (and repair) of damaged grid segments will enable automatic resumption of power supply to consumers within less than 3 minutes in medium voltage grid. While the feature of dynamic grid reconfiguration will make it possible to forecast energy generation by renewable sources (wind and solar farms), and the effect of this renewable energy sources on the grid, at least 24 hours in advance.energy consumers connected to smart grids. Other beneficial results of the project include the shortening of the “long interruption” defined as a power failure lasting from 3 minutes up to 12 hours.

8
ismart functionalities

2,980,422
energy consumers connected to smart grids

1,054.11 GJ/year
of primary energy consumption reduction

97.60 MWh/year
of electric energy saved

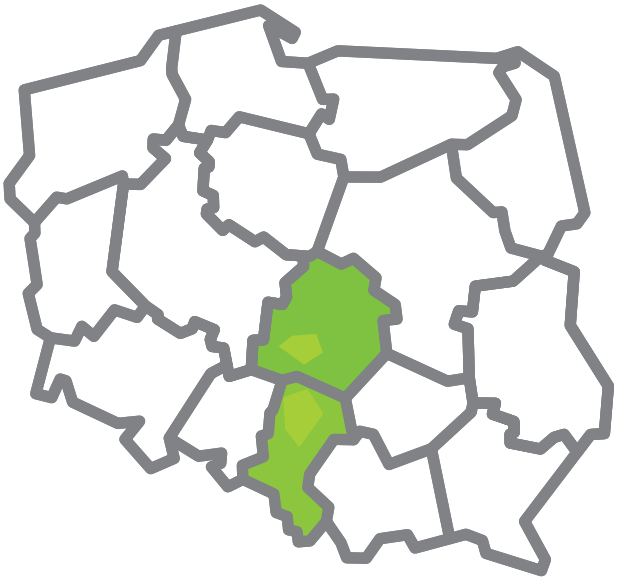
Beneficiary: Energa-Operator SA
Project value: PLN 240 million
EU's contribution: PLN 166 million

"Development and upgrade of MV and LV grids in the Śląskie and Łódzkie provinces for implementation of the smart grid design"

Owing to the EU's contribution of more than PLN 3.9 million under the Operational Programme Infrastructure and Environment, **Tauron Dystrybucja SA** is building its smart grid in the Śląskie and Łódzkie voivodships.

The project consists of 14 sub-project investments related to development and upgrade of medium and low voltage grids in the Lubliniec, Częstochowa, Koziegłowy, Konopiska, Blachownia, Koszęcin, Kochanowice, Panki, Opatów, Żarki and Pajęczno municipalities.

The implementation of the project will provide measurable benefits including grid loss reduction, which results in energy savings, and provision of an technical conditions for connection of new sources including renewable ones to the grid. In addition, the project will improve energy security, quality and continuity of energy supply to consumers.



439.13 MWh/year
of electric energy saved

6,239
additional smart grid users

9
smart functionalities

Beneficiary: Tauron Dystrybucja SA
Project value: PLN 8.2 million
EU's contribution: PLN 3.9 million

"Development and upgrade of the MV and LV grid in the Podbeskidzie region for implementation of the smart grid design"

"Development and upgrade of the MV and LV grid in the Podbeskidzie region for implementation of the smart grid design "Tauron Dystrybucja SA is also implementing its smart grid in the Podbeskidzie region. This development and upgrade of the medium and low voltage grid is co-financed by the European Union under the project titled. The company was granted more than PLN 5 million for this purpose under the OPIE 2014–2020.

Investments related to the implementation of the smart grid design in the Podbeskidzie region will be made in 9 municipalities: Wilkowice, Ślemień, Ustroń, Bielsko-Biała, Zawoja, Mucharz, Andrychów, Stryszawa and Sucha Beskidzka. smart grid functionality.

The project is scheduled to upgrade four MV lines of main power supply stations and one 6 kV station, build two 15 kV lines, install 6 kV overhead line cables and replace transformer stations. In addition, the project provides for installation of two post-mounted transformer stations for the achievement of the smart grid functionality.

127.48 MWh/year
of electric energy saved

2,841
additional smart grid users

6
smart functionalities

Beneficiary: Tauron Dystrybucja SA
Project value: PLN 9 million
EU's contribution: PLN 5.3 million

Conclusion

The development of the smart grid system responds to the current challenges faced by the power industry. Improved stability and security of energy supply, better grid operation efficiency, reduced grid losses and ability to absorb new energy sources including renewable ones are the main benefits offered by development of Smart Grids.

Investments in the power industry are essential for the economic growth of the country and, at the same time, they contribute to conservation of the natural environment and to improving the quality of life for everyone.

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