



# *Smart Grids Building in Poland*



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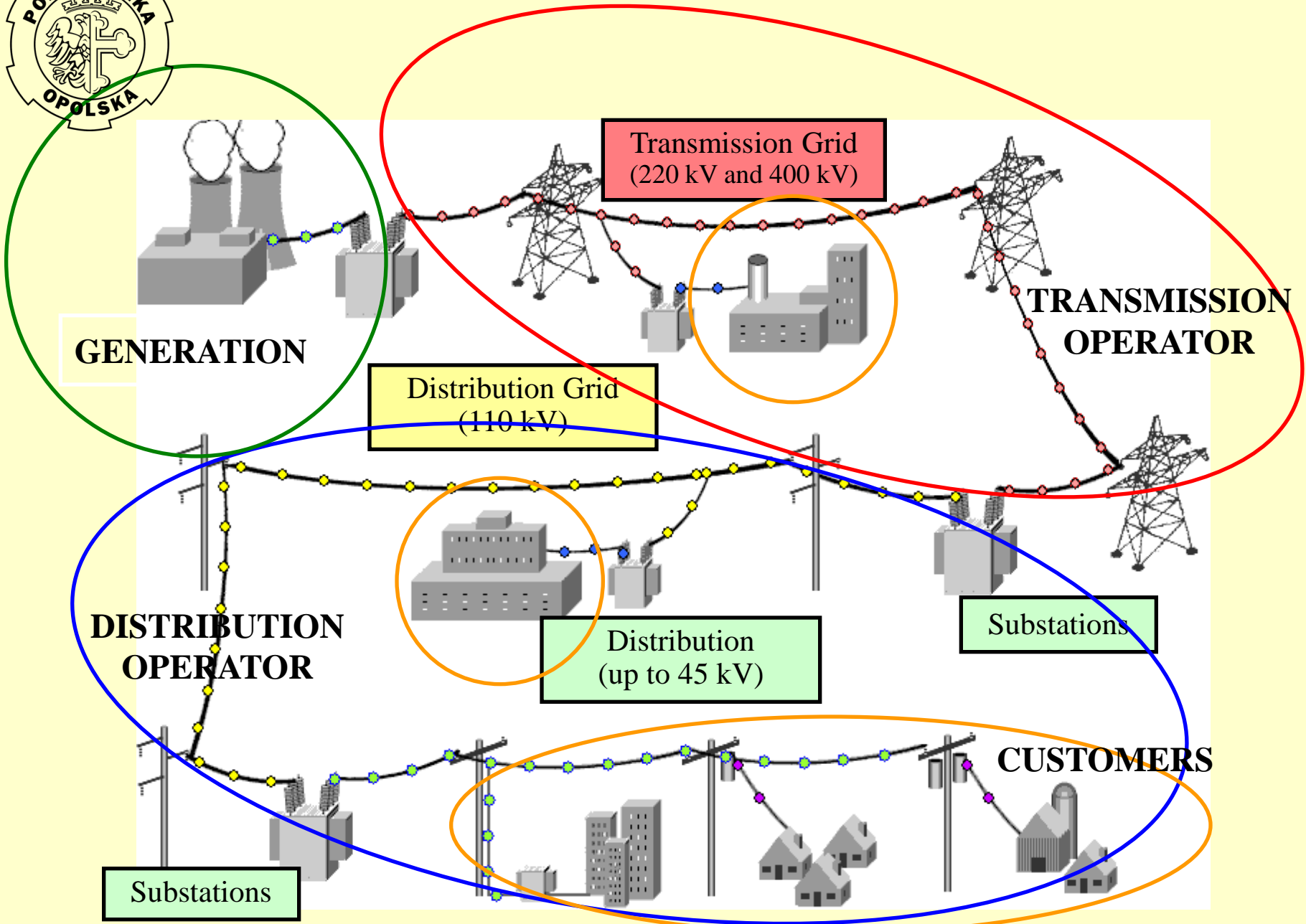


## **Meeting agenda**

- **Today's Electric Grid**
- **Organization of Polish Electricity Sector**
- **Electrical Infrastructure**
- **The Pace of Economic Development in Poland**
- **Smart Grid Framework**
- **Beneficiaries of Smart Grid in Poland**
- **What are we Doing in Poland Now?**
- **Schedule for Implementation of Smart Grids in Poland**
- **Conclusions**



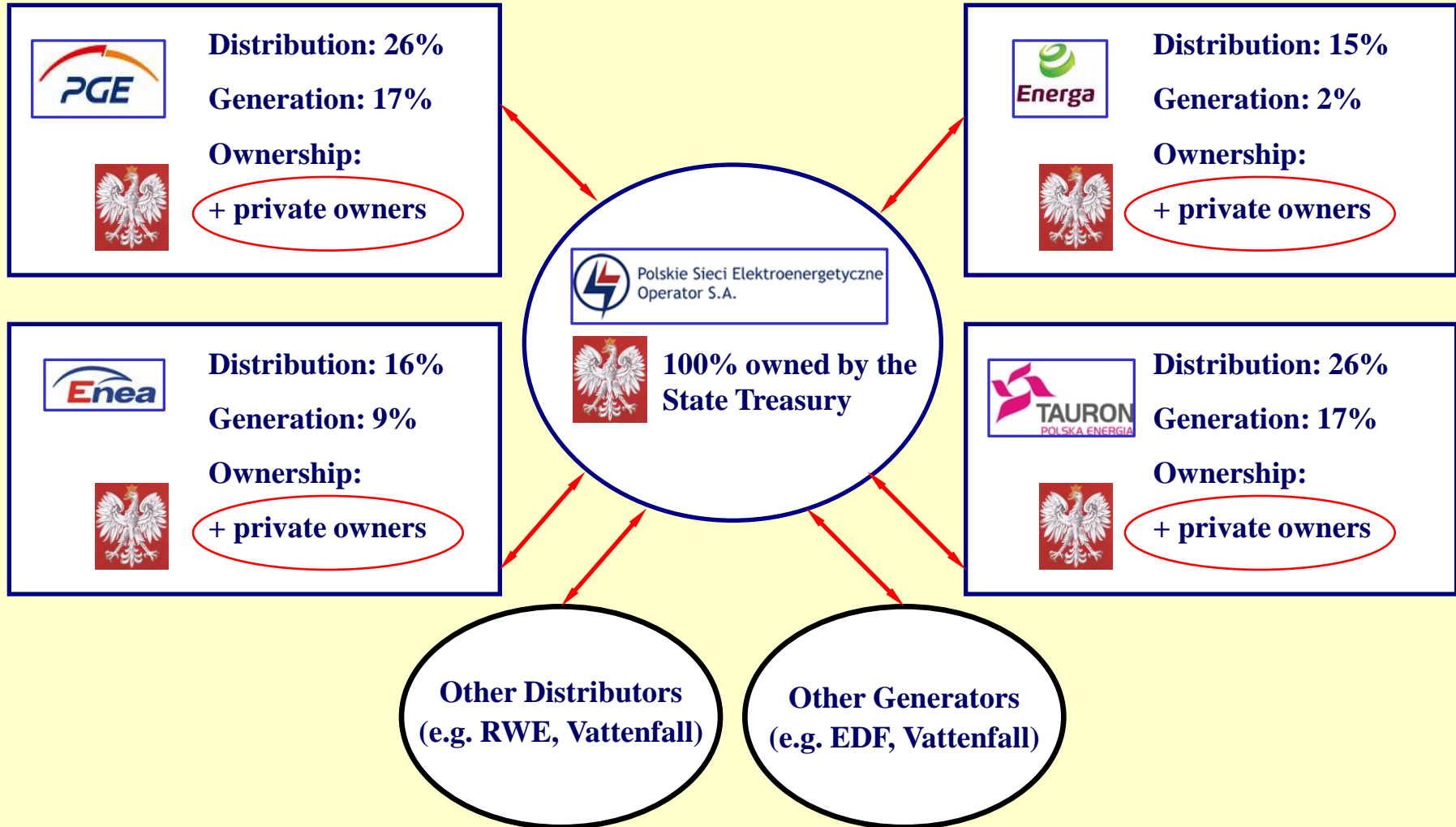
# Today's Electric Grid – Electrical Infrastructure





# Smart Grids Building in Poland

## Organization of Polish Electricity Sector





## Smart Grids Building in Poland

# Electrical Infrastructure - EHV Transmission Grid

**EHV infrastructure consists of following elements:**

- **236 OH lines with total length of 13 053 km, including:**
  - **1 OH line 750 kV, 114 km,**
  - **68 lines 400 kV, 5031 km,**
  - **167 lines 220 kV, 7908 km.**
- **106 EHV substations**





## **The Pace of Economic Development in Poland (1) – Electricity Balance in 2010 Compared to 2009**

**Production of electricity – increase by 3.4%, including:**

- conventional power plants – increase by 2.8%
- water power plants – increase by 19%
- hard coal-fired power plants – increase by 5%
- lignite-fired power plants – increase by 3%
- wind turbines – increase by 48%

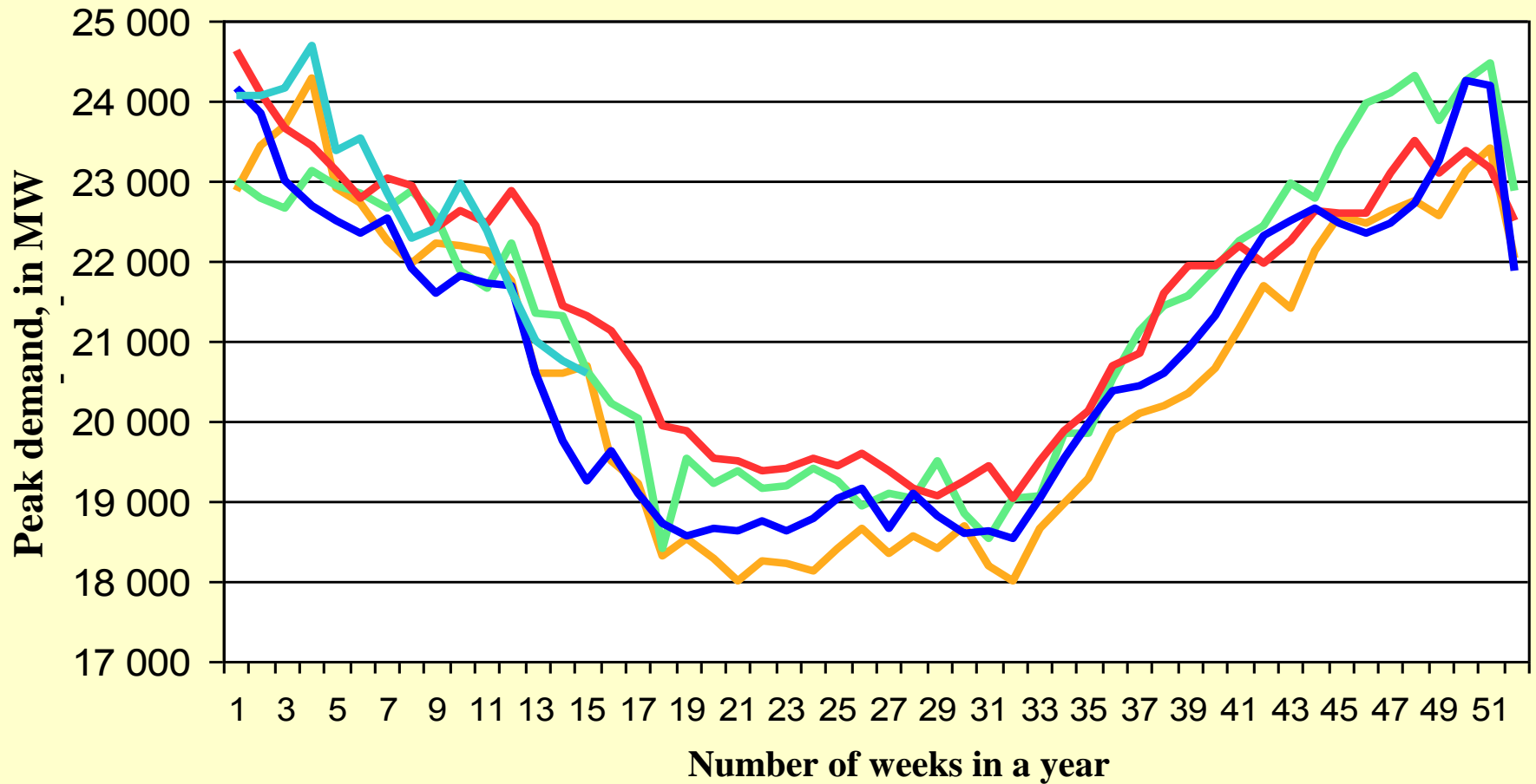
**Total domestic consumption of electricity – increase by over 4%**

**(that is, by 6.2 TWh)**



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## The Pace of Economic Development in Poland (2)



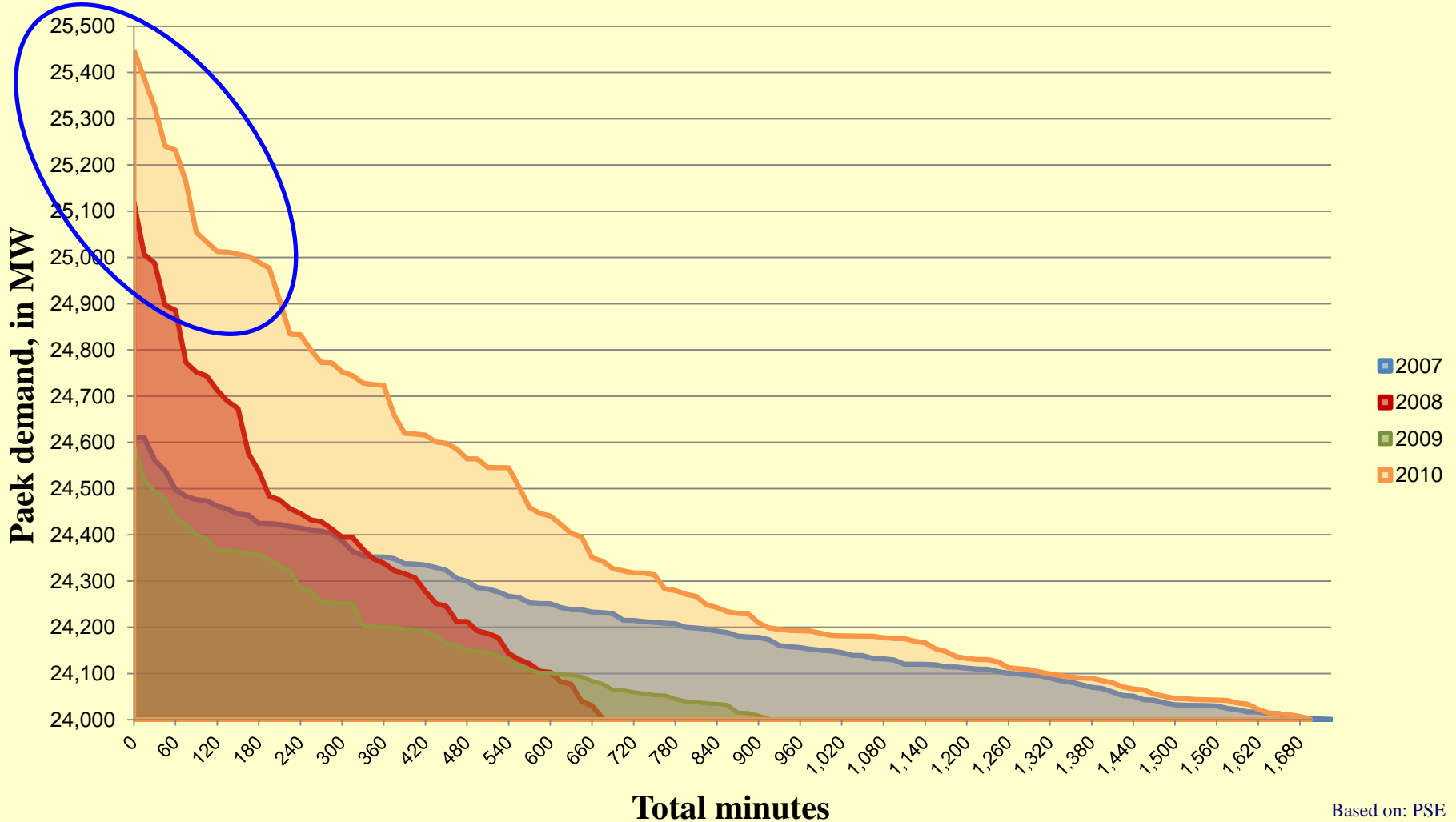
— 2006 — 2007 — 2008 — 2009 — 2010

Based on: PSE  
Operator S.A.



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## The Pace of Economic Development in Poland (3)

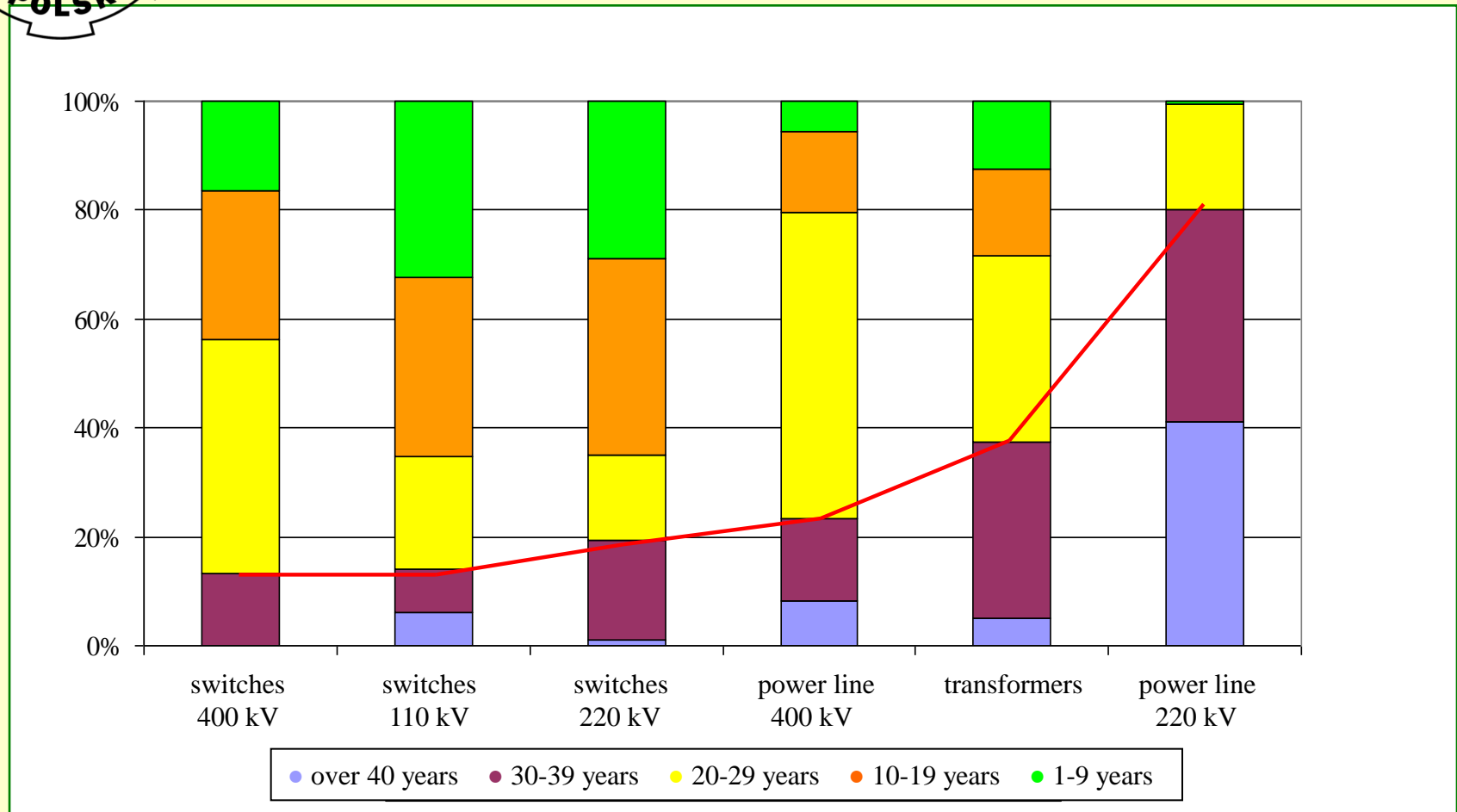






## Smart Grids Building in Poland

# The Pace of Economic Development in Poland (4)



**Age structure of selected components of domestic transmission grid. Red line marks the age tendency of infrastructure over 30 years.**



## **The Pace of Economic Development in Poland (5) – summary**

**In the considerations of the problems of energy security we have to take into account all possible solutions – building new power plant, new power lines, substations, modernizing existing ones – which can increase this security.**

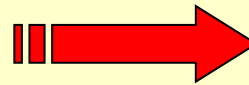
**A solution in this regard it offered by the construction of intelligent grids – Smart Grids.**



## *Smart Grids* Building in Poland

***Smart ...*** – key word, which in the world of power electric, manufacturers of devices and measurement gear indicates up to date technical solutions worth 21st century

**General session CIGRE,  
Paris'2010**



- **Smart Grid**
- **Smart Charging**
- **Smart Building**
- **Smart Breaker**
- **Smart Metering**
- **Smart Electricity**
- **... etc.**



## Smart Grids – What are they?

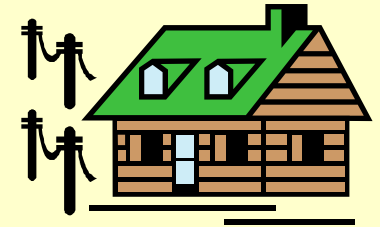
- ▶ **European technological platform of Smart Grids that applies state-of-the-art technologies and concepts**
- ▶ **New quality that is offered into network structures in power engineering**
- ▶ **Supervision of power and energy use**
- ▶ **Building an awareness of energy users, reduction of its cost, increase of the efficiency of electricity flow in the grid, integration of numerous dispersed sources in the system, greater involvement of end-customers in the issues of electricity market**



# Smart Grids Building in Poland

## Smart Grid Framework

**Classical model  
of power supply**



**One-way flow of electricity**

**New model of power  
supply – Smart Grids**

**Decentralized generation,  
intelligent house,  
e-mobility, renewable  
energy sources...**





# Smart Grids Building in Poland

## Customer awareness

### Awareness of consumption

- B** Automatic temperature regulation in a house.
- C** Intelligent appliances: washing machines, dryers, dishwashers connected to the grid and controlled in a way that adapts to profile of electricity tariff

### Communication

- A** Intelligent meter that allows distribution operator to communicate with end-customers in both ways. Through computer/telephone/meter control it allows to use electricity in accordance with selected profile of electricity tariff



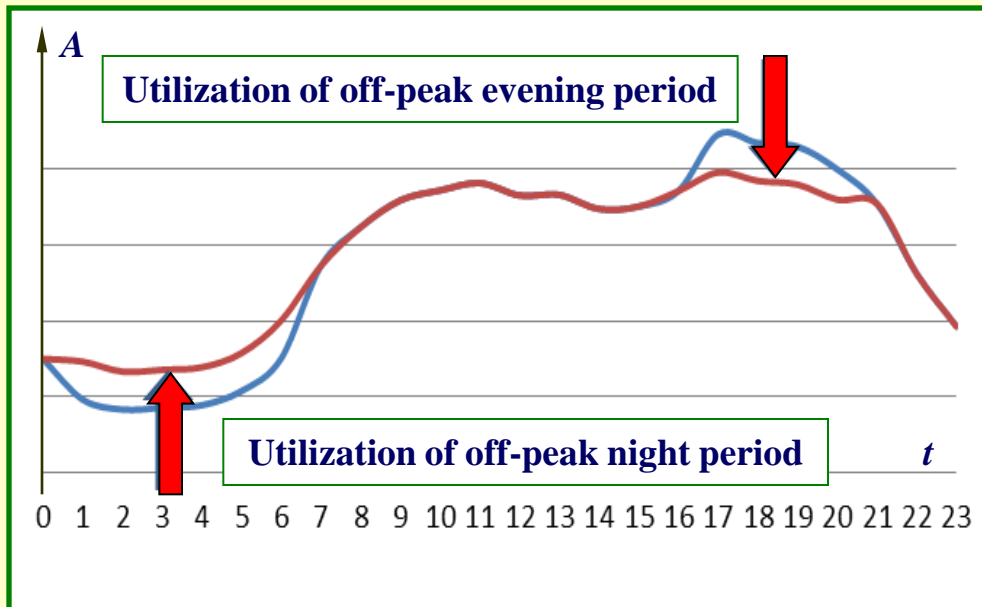
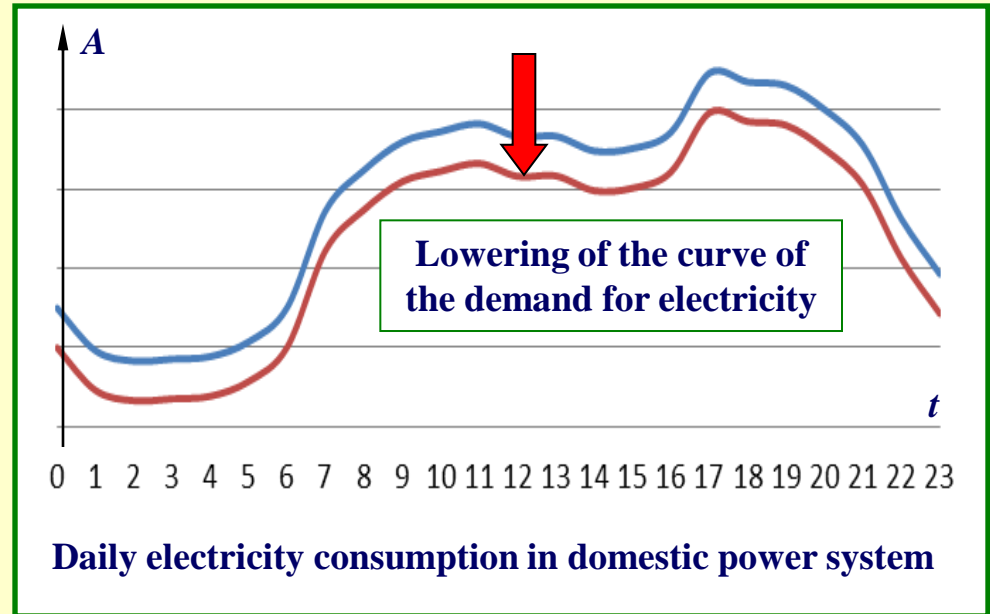
### Increase in turnover

- E** Solar batteries, wind turbines, cogeneration; the customer produces electricity for their needs and can re-sell it to the grid.
- D** E-mobility: reduction of fuel costs through the use of electricity in off-peak period.



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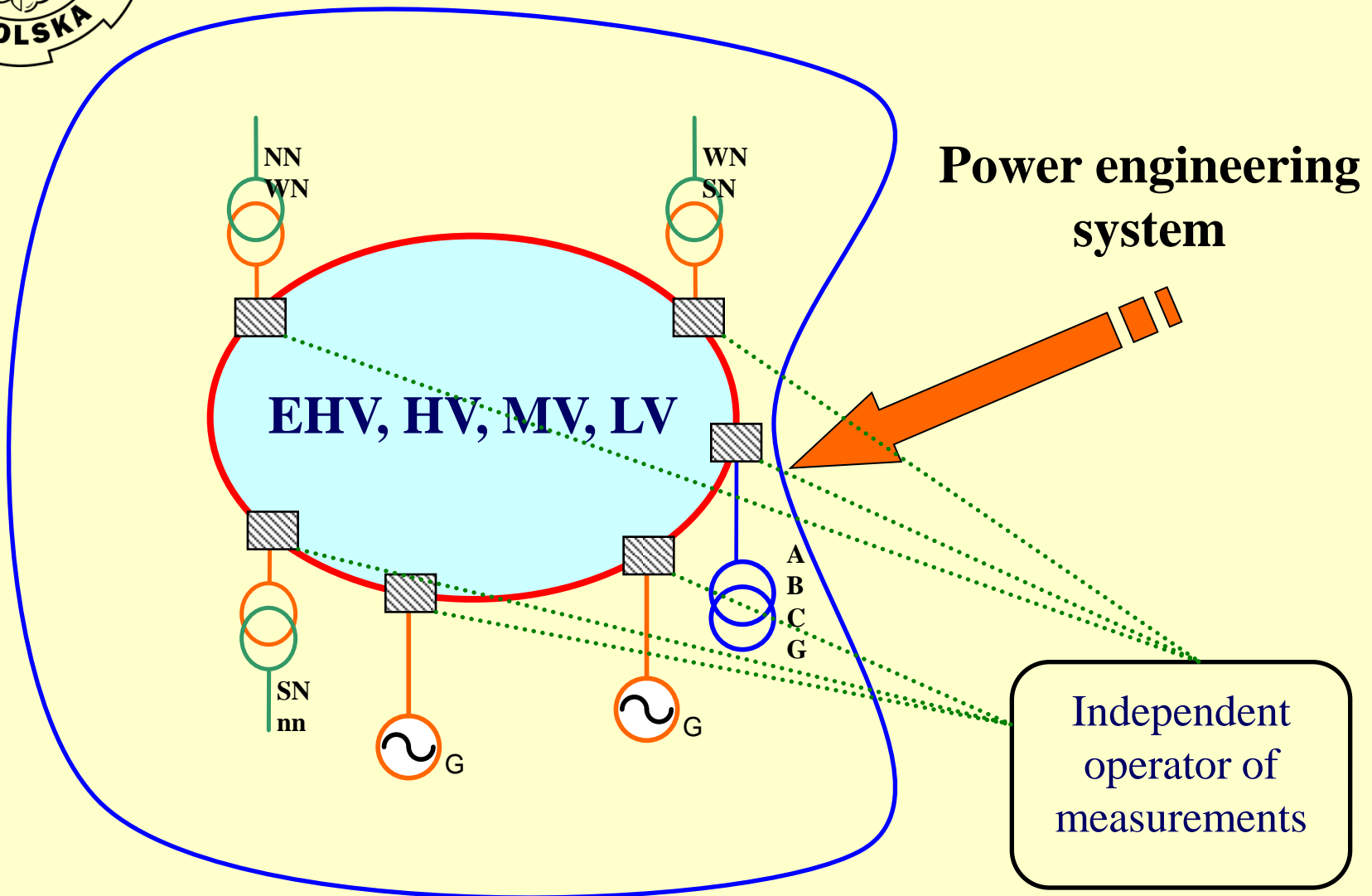
### Improvement of electricity consumption



### Utilization of off-peak night period and evening peak



# Schematic Diagram of Metering System in Smart Grids





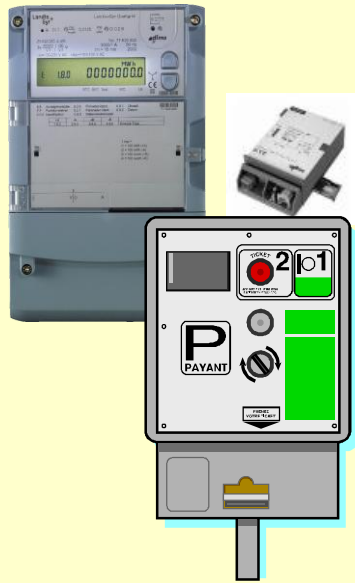


# Smart Grids Building in Poland

## Infrastructure of Smart Grids

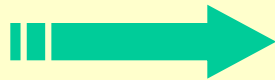
Devices

Meters with GPRS, GSM or PSTN modules

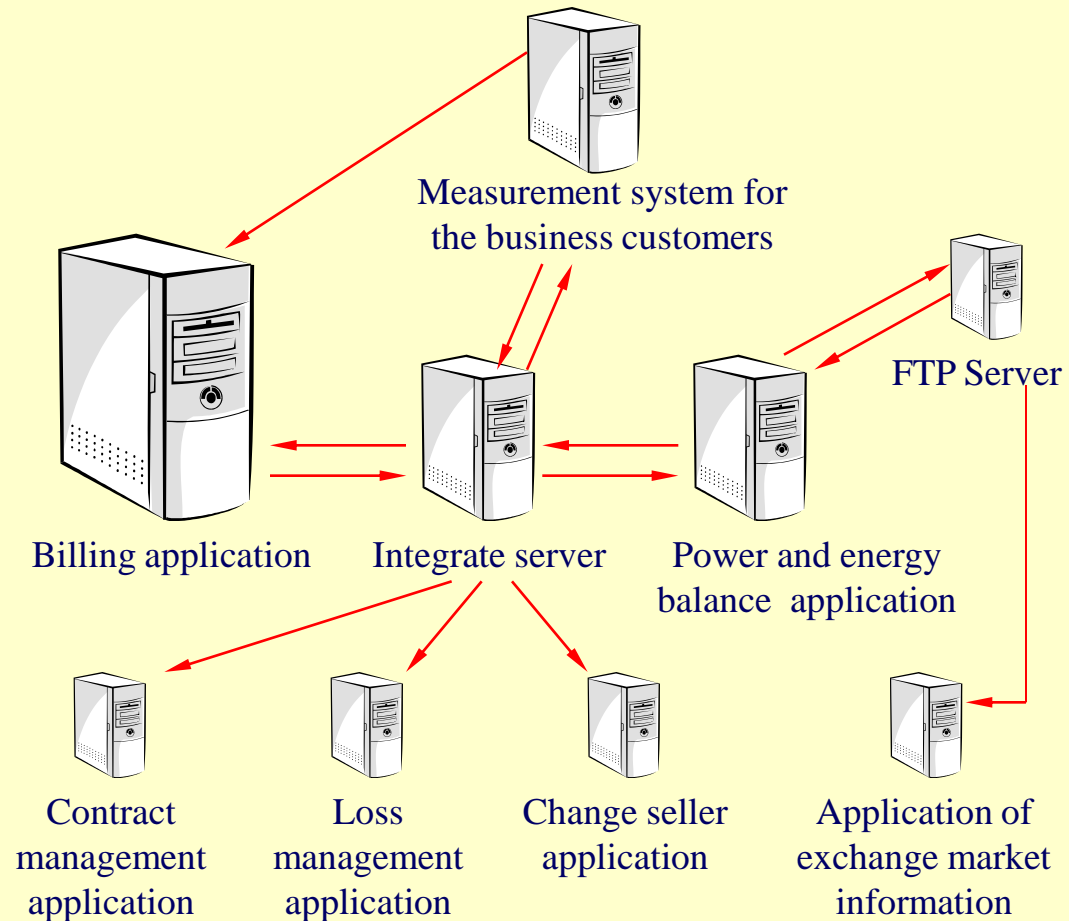


Transmission of measured data

Daily efficiency of readings  $\approx 98\%$



Applications dedicated to this project





## *Smart Grids* Building in Poland

### **Beneficiaries of *Smart Grids* in Poland**

#### **1. Manufacturers of electricity**

- **No need to disconnect power units in off-peak period;**  
**stability of generation levels**
- **Better integration of small manufacturing sources** (e.g. renewable energy sources) in the domestic grid
- **Possibility for developing dispersed sources**

#### **2. Operator of transmission system**

- **Improvement in the security of the domestic grid** (possibility for managing the customer demand)
- **On line information regarding dispersed generation**



## **Beneficiaries of *Smart Grids* in Poland (2)**

### **3. Operators of distribution system**

- **Meeting of the requirements of regulation**
- **Reduction of balance differences** (commercial and technical losses)
- **Reduction of delinquent receivables**
- **Higher quality of electricity supplies**
- **Application of new meters as a marketing and information channel for electricity distributors**
- **Improvement in the quality of planning with regard to maintenance overhaul and investment**
- **Reduction of the cost of reading traditional meters (among others decrease of cost of dealing with customer)**



## **Beneficiaries of *Smart Grids* in Poland**

### **4. End-customers**

- **On-line access to data regarding use of electricity**
- **Charging the customer based on actual consumption**
- **Management of electricity consumption**
- **Adaptation of tariffs to individual needs**
- **Facilitation in the process of changing the distributor**
- **On-line control of the quality of supplies and electricity parameters**
- **Easier comparison of electricity offers available in the market**
- **Potential for the development of microgeneration and grid connections**



## *Smart Grids* building process in Poland

### **Beneficiaries of *Smart Grids* in Poland**

#### **5. Electricity providers**

- **Reduction of delinquent receivables**
- **Precise balancing of sales-purchase portfolio**
- **Reduction of costs and duration of provider changeover**
- **Easier acquisition of new customers**
- **Diversification of the offer and its adaptation to customer needs**
- **Reduction of costs of dealing with customers**
- **Reduction of lost benefits resulting from power outage**



## **What are we Doing in Poland Now?**

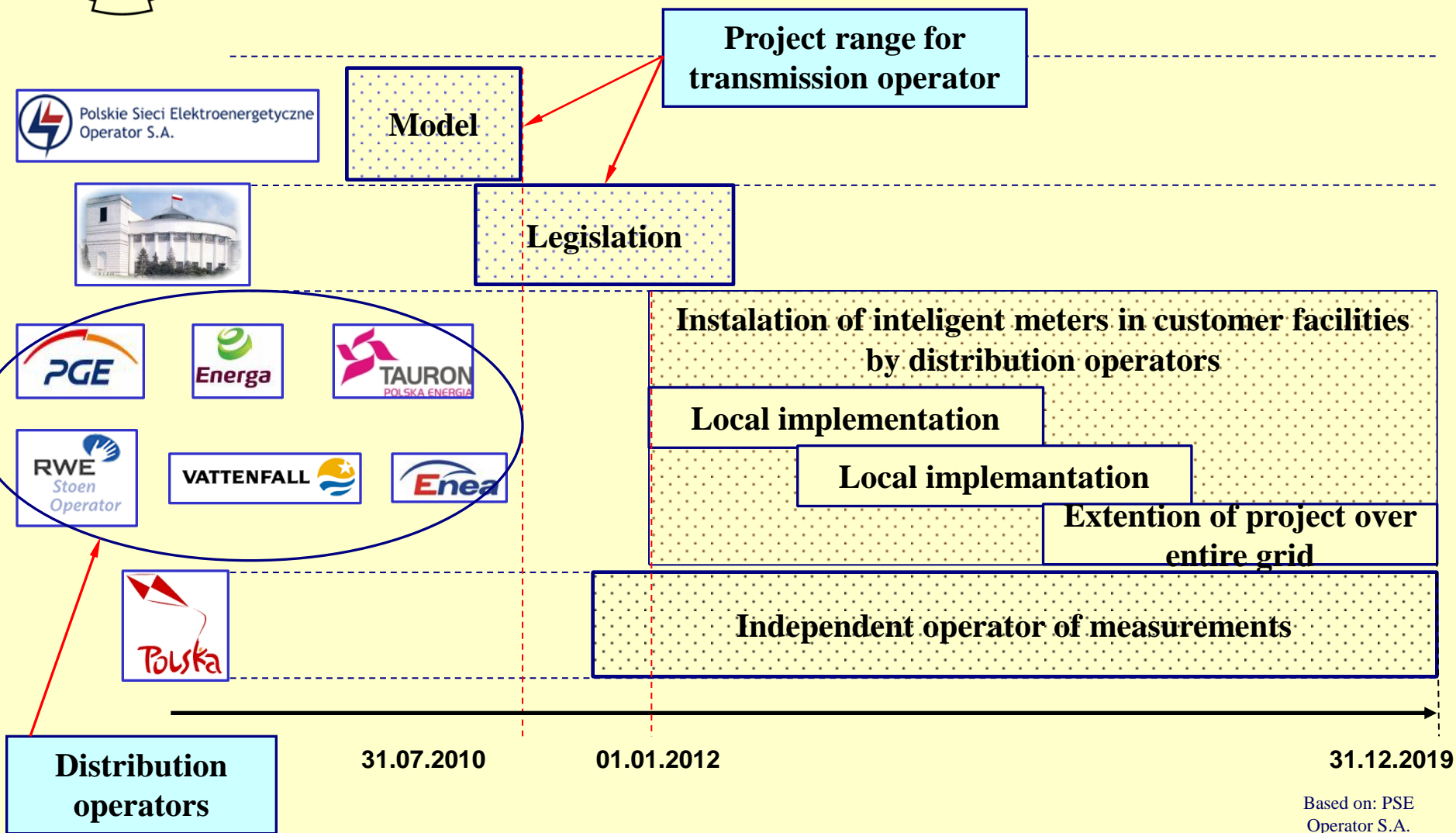
**At present the following distributors declare to install intelligent meters:**

- **ENERGA Operator: this year they are going to install 100,000 intelligent meters (it is the largest project in Poland)**
- **PGE Distributor declare, that in 2011 they will install about 50,000 intelligent meters**
- **TAURON Distributor declare that in the period between 2011-2012 they will install about 30,000 intelligent meters**



# Smart Grids Building in Poland

## Probable project schedule for *Smart Grids*



## Conclusion

Improvement of energy efficiency of domestic economy

Improvement of energy security in the domestic grid (improvement of the quality of market regulation and security of supplies)

Delay in the indispensable investment in new generation power and reduction of indispensable investment in transmission and distribution grid (development of dispersed generation → reduction of CO<sub>2</sub> emission)

Investment → financial resources







## *Smart Grids* Building in Poland

**Thank you for your attention**

## **This presentation applied the following materials:**

1. W. Skomudek: *Building of demand management system in the energy market*. Strategic project by PSE Operator S.A., Warszawa 2008.
2. W. Lubczyński, W. Skomudek: *Benefits of power engineering system associated with implementation of intelligent metering*. Conf. PTPiREE: Advanced measurement systems – smart metering in power and gas engineering. Warszawa 2010.
3. W. Skomudek, M. Wasiluk-Hassa: *The Implementation of Intelligence to Transmission Network Grid in Poland: Smart Grid Building Process*. Poland-USA RoundTable Conference, Washington D.C., USA 2010.
4. W. Lubczyński: *Project of demand management system in the intelligent measurement community dedicated to increase of energy security*. Smart Grid Building Process Conference, Warszawa 2010.