

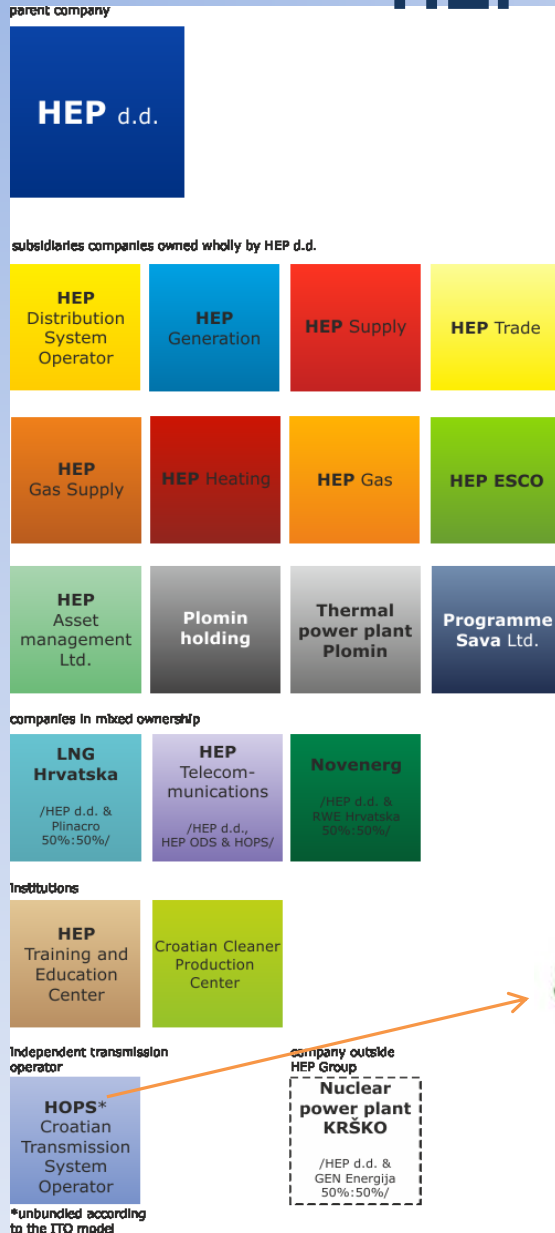
Session 4: Best practices from pilot projects in smart grid development

Case 2 Croatia - project „microGRId Positioning”



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HEP Corporate Structure



Mission

To provide secure and quality energy supply to customers, with a high degree of social responsibility.

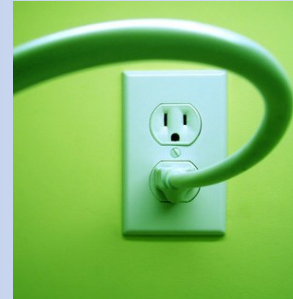
Vision

HEP Group as a strong regional, modern and socially responsible company, recognized as an example of efficient energy generation and supply to customers.

- ### HEP GROUP STRUCTURE
- company with number of daughter companies
 - HEP d.d. as a **parent company** performs a function of corporate management and insures conditions for secure and reliable energy supply to customers



HEP Group at a Glance



Generation

Electricity

- **4,232 MWe** of installed capacity
- 26 hydro PPs (2,214 MWe)
- 8 thermal PPs (1,670 MWe)¹
- 1 nuclear PP² (348 MWe)

Heat

- **1,755 MWth** of installed capacity in 4 TPPs and **382 MWth** in district boiler rooms
- Partially regulated

Transmission

- HOPS, Croatian electricity transmission system operator
- Upon Croatia's accession to the EU, HEP opted for ITO³ model of unbundling of the Group's transmission operations from the generation and supply
- Regulated activity with transmission tariffs approved by the Croatian Energy Regulatory Agency - HERA

Distribution

- The sole distributor of electricity to > 2.3 mn customers
- The largest distributor of thermal energy in the country
- Gas distributor in the retail market
- Regulated activity with distribution tariffs approved by HERA

Supply

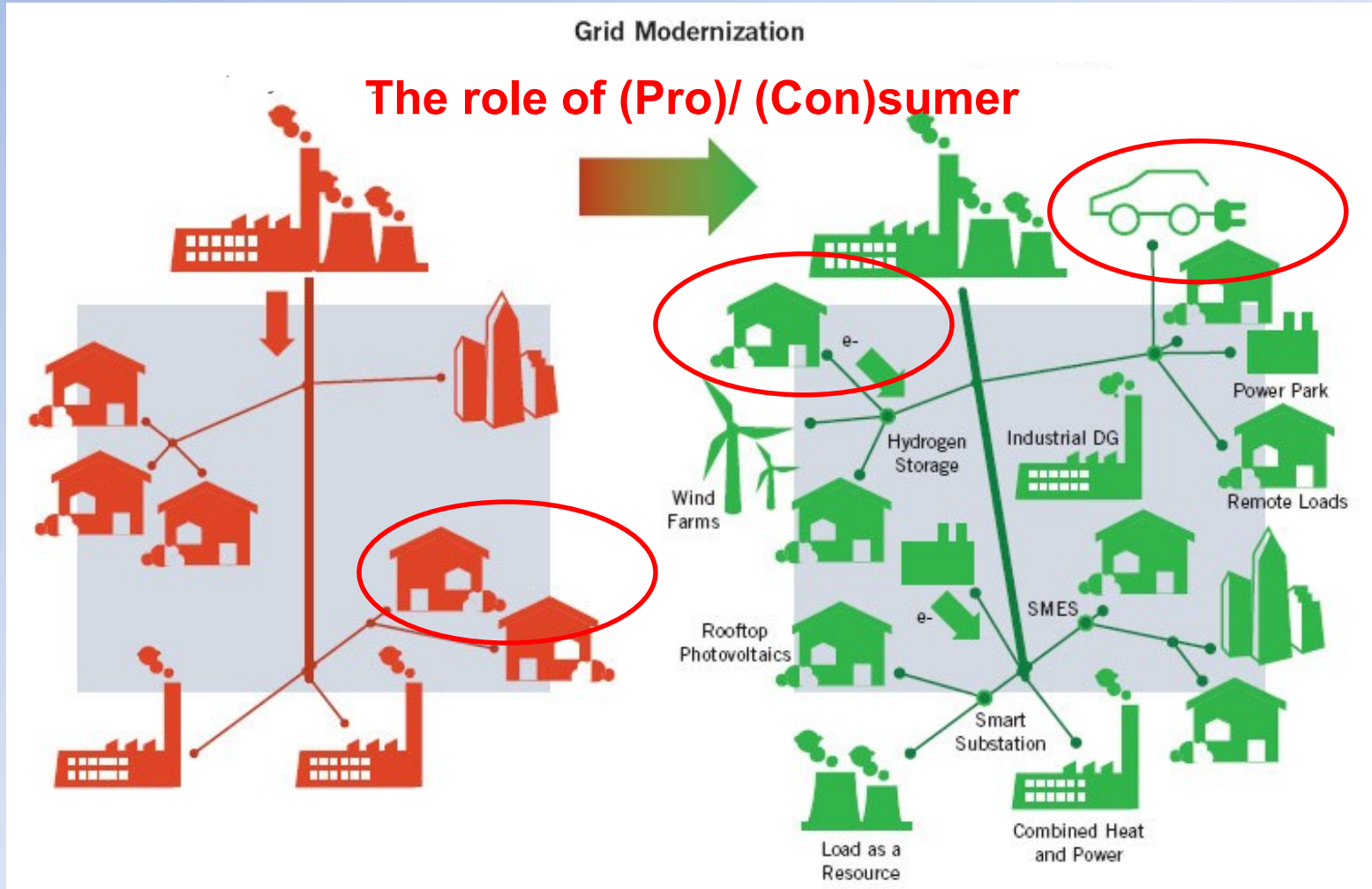
- Sale of electricity, gas and thermal energy
- Sole provider of public supply services to
- 85.1% of electricity sold in Croatia in H1 2015
- HEP-ODS is a public supplier and HEP-Supply supplies c. 74.6% of customers that have opted for a market supplier
- In April 2014 HEP was chosen as a sole supplier to the Croatian wholesale gas market for a 3-year period
- Certain tariff rates approved by HERA

Trading & Other

- Trading in electricity and gas in Croatia and abroad
- Trading platform responsible for optimisation of power plant operation and intermediation in the domestic and international markets
- Other businesses specialise in renewable energy sources, energy efficiency, environmental protection and other

Numerous possibilities for developing new Business models

EPS Yesterday – Today - Tomorrow

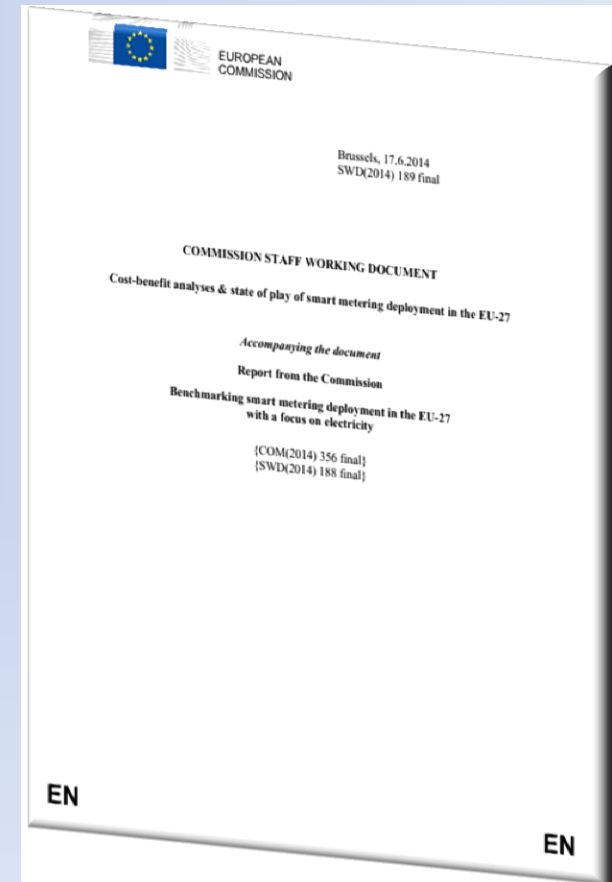
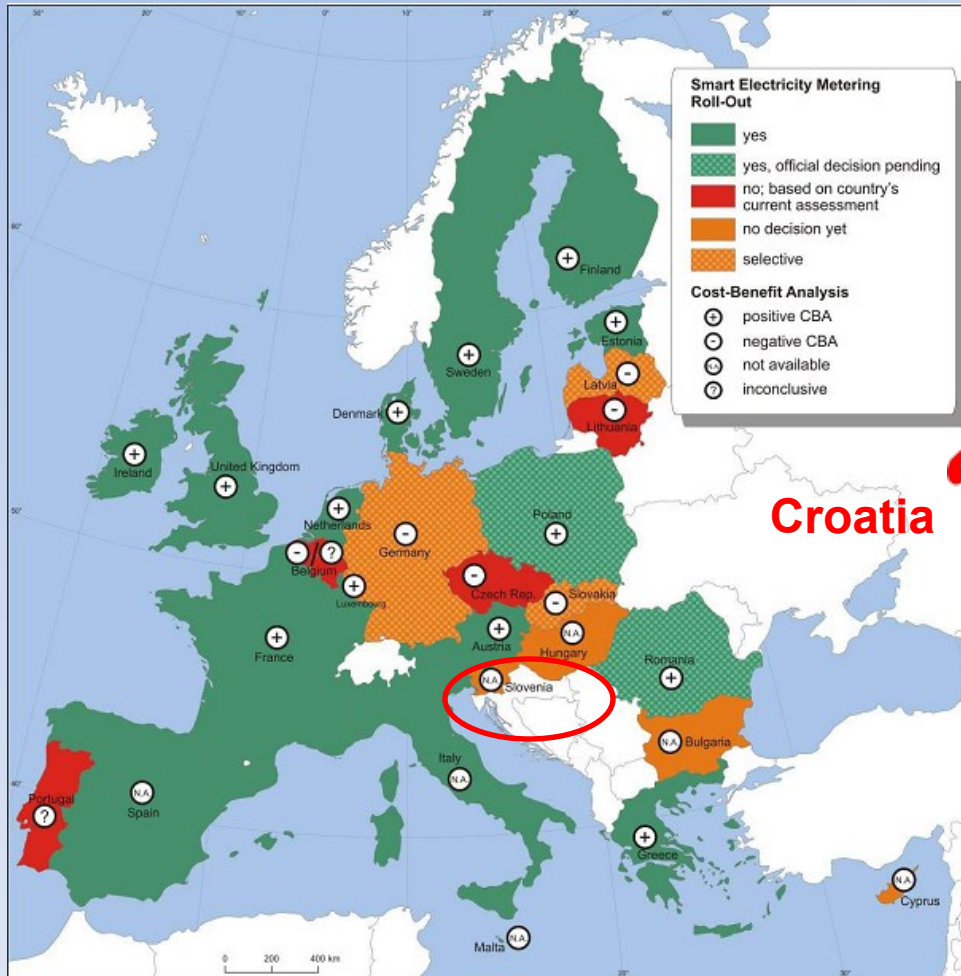


(Source: IEEE)

Smart Metering roll out

The Third Energy Package provides (Annex I.2) that implementation of smart metering may be subject to an economic assessment of long-term costs and benefits to the market and individual consumers. In that case, the CBAs should be performed by 3 September 2012. For electricity, Member States must:

- proceed with the smart metering roll-out to at least 80% of positively assessed cases on their territory by 2020; and
- prepare an implementation timetable over a period of up to ten years.



Smart Grid Projects in Croatia

- DYMASOS <http://www.dymasos.eu/>
- Flex-ChEV <http://flexchev.com/>
- Synchro Grid <http://www.eles.si/en/sincrogrid.aspx>
- EVBASS <http://evbass.fer.hr/en/evbass>
- SIREN <http://siren.fer.hr/en/siren>
- uGRIP



uGRIP (2016-2019)

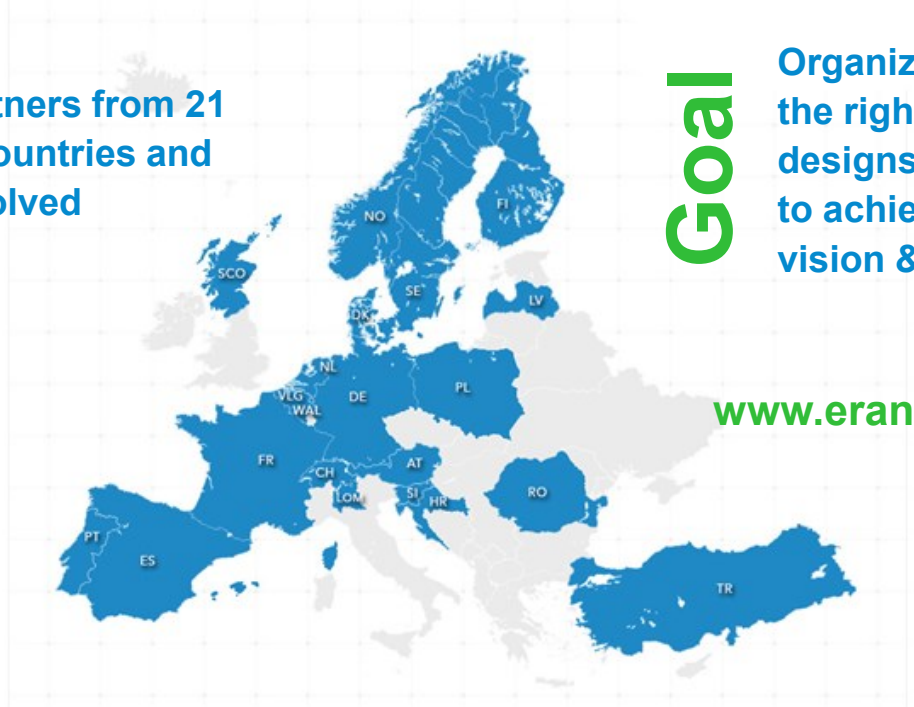
- microGRId Positioning is the most recent smart grid research project
- Funded by the Croatian Environmental Protection and Energy Efficiency Fund through ERA Net Smart Grid + funding scheme
- Budget: 1.11 mil€; 0.77 mil€ funded through ERA Net
- Project coordinator is the Faculty of EE and Comp. Univ. Zagreb
- Partners: DTU (Denmark) and OFFIS (Germany)
- Supporting institutions: HEP d.d. and KONČAR - Power Plant and Electric Traction Engineering Inc.





From Local Trials towards a European Knowledge Community

23 funding partners from 21 European countries and regions involved



Goal

Organize the learning to enable the right technologies, market designs and customer adoption to achieve the Smart Grids vision & goals of Europe

www.eranet-smartgridsplus.eu

Supported by funding from the European Union's Horizon2020 under grant agreement No 64603.



- Network with clear cooperation structure of RDD funding programmes
- Applied research, piloting and demonstration in the field of Smart Grids
- Mutual learning with focus on validation, scaling-up and replication
- Building on past and existing national and regional key projects
- Establishment of European Smart Grids Knowledge Community
- Cooperation with GRID+Storage and JRC
- Contributions to Joint Programming

uGRIP - Objectives

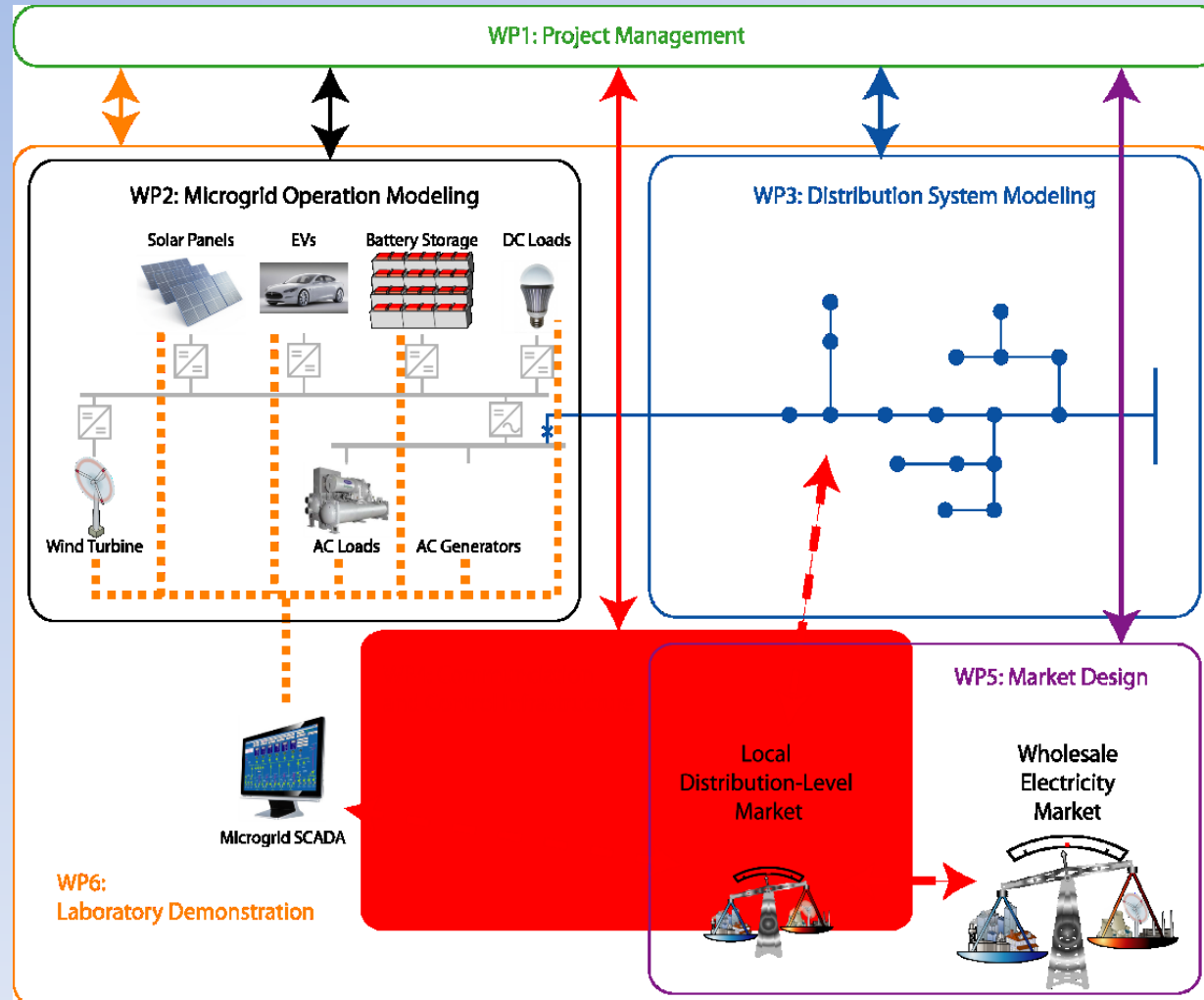
- Assessment of the role of storage and the price responsiveness on the consumer side
- Assessment of microgrid business cases for different countries, i.e. Croatia, Denmark and Germany, based on their respective grid codes and incentive policies
- Development and definition of standardized communication protocols between the microgrid elements and the central computer in charge of the microgrid operation, as well as the microgrid and local (distribution level) electricity markets
- Design and development of a local market to manage the microgrid at the FER-UNIZG laboratory

Development of microgrid at the FER-UNIZG



Miniature power system at FER's laboratory:
1—thermal turbine;
2—hydro turbine;
3—rigid network

Project structure



Local market concept (1/2)

- The objective of the local market is to collect offers and bids (including cost and technical information) from the local DERs (or from the aggregators and/or retailers that represent them)
- These offers and bids are aggregated into a system-wide market bid/offer that can be submitted to the wholesale electricity market
- In the computation of this aggregate market bid, the algorithm to clear the local market may also take into account the technical constraints imposed by the distribution grid: line capacity and voltage limits.

Local market concept (2/2)

- Once the wholesale electricity market is cleared, a wholesale price for the traded electricity is determined, together with the overall power injection from or into the distribution system
- The local market will then allocate this power injection among the various local DERs in an efficient and economical manner, while guaranteeing the feasibility of the power dispatch

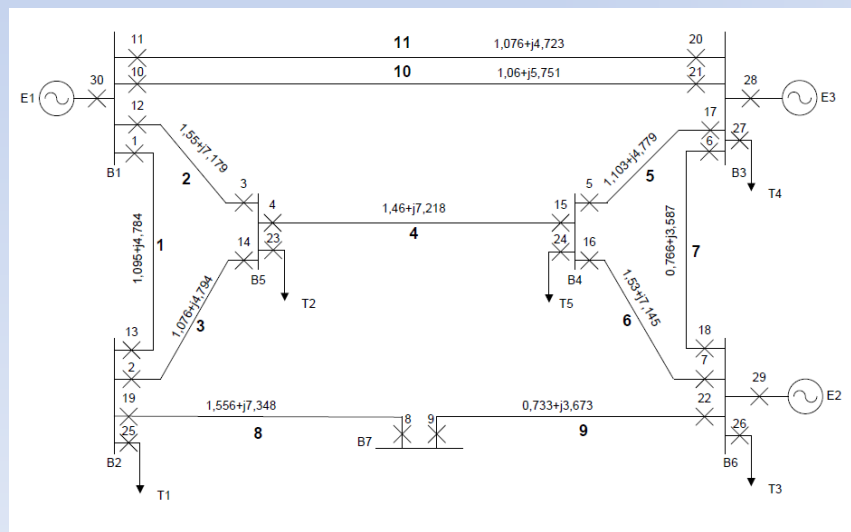
Two folded role of the FER-UNIZG lab

MICROGRID

When operating as a microgrid, the lines at the lab are overridden, resulting in the microgrid elements connected to a single bus, and the microgrid connected to the local distribution network (represented by generator E3 in the figure)

DISTRIBUTION NETWORK

When simulating the distribution network, the lines with corresponding resistance and inductance are added between the seven buses in the figure. The microgrid power injection is then assigned to a specific bus, while the remaining buses are assigned actual loads and/or distributed generation



Key impacts of the project (1/2)

- Securing additional flexible resources within the power system will allow higher penetration of RES.
- Fostering the economic performance of power systems and specifically the economic competitiveness of the EU.
- Increasing the effectiveness of electricity market related policies by bringing electricity markets closer to the prosumers, i.e. to the distribution level.
- Creating consultative multi-stakeholder networks that deliver multi-agency approaches that generate new solutions under the smart grid umbrella.

Key impacts of the project (2/2)

- Providing specific educational and other public events, contributing to knowledge and skills of the community. This will help developing the public understanding of microgrids and increase overall household-level microgrid investments.
- Strengthening international relationships between Croatia, Denmark and Germany.
- Improving the international visibility of all the partners via public presentations, publications, reports and other dissemination efforts.
- Setting the grounds for long-term transnational collaboration between the industry partners and universities involved in the project. After the project ends, the project participants intend to apply to other calls, e.g. Horizon 2020, to continue the development of common ideas and products.

What's Next?

- More smart grid demonstration projects are needed
- An integrating smart grid strategical document needed, otherwise there will have sporadic and overlapping project efforts – this requires stronger role of the EU institutions
- Demonstration projects need better cooperation between MSs, better dissemination of lessons learned (?mandatory dissemination)
- Improve collaboration with international institutions through ERA Net SG+, H2020, INTERREG and other funding schemes
- Active consumer (prosumer) should be recognized as one of the key stakeholders in development of smart grid and new electricity market concept
- Rethinking of incentive network regulation (more innovation oriented)



 HEP is today more than electricity!

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