



The Croatian Smart Grid Experience - building a advanced distribution network

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HEP Group

- group of 15 companies:
 - electricity production, transmission, distribution and supply
 - gas distribution
 - heat supply
- number of employees
13.990
- total operating income
1,7 bil. EUR





Croatian Distribution System Operator

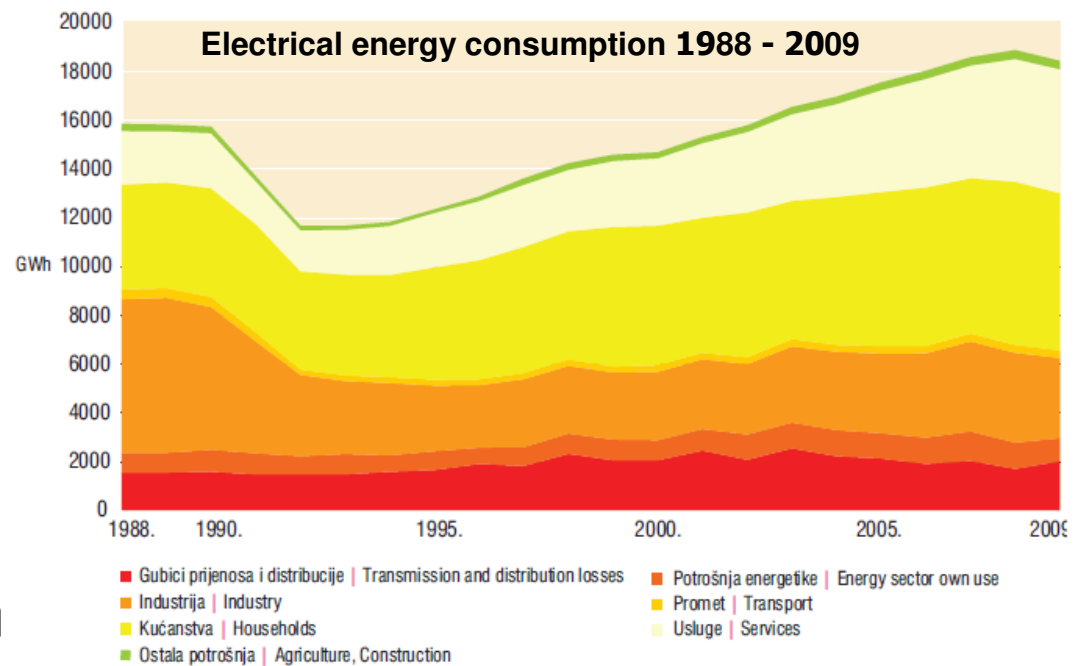
- ODS is responsible for:
 - energy distribution
 - tariff customer supply
- Grid users structure:
 - medium voltage 2.081
 - commercial 188.653
 - public lighting 20.818
 - residential 2.099.133
- number of employees
9.000
- 21 distribution areas



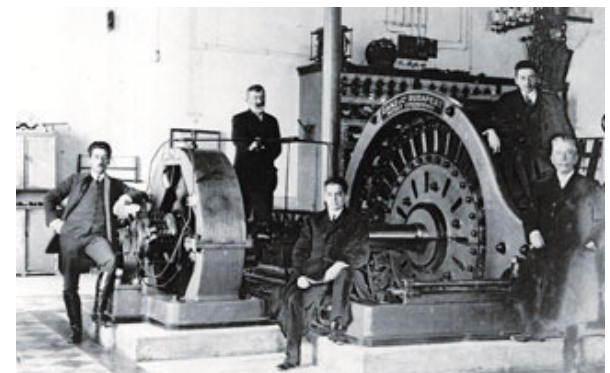
Why Smart Grid?

Reasons for accepting SG ideas in HEP ODS:

- Increase in consumption
- Integration of renewable energy (distributed) sources.
- Creating the preconditions for the active role of customers on electricity market
- Caring for the environment
- Age of transmission and distribution networks (aging infrastructure)
- Increase in price of fossil fuels



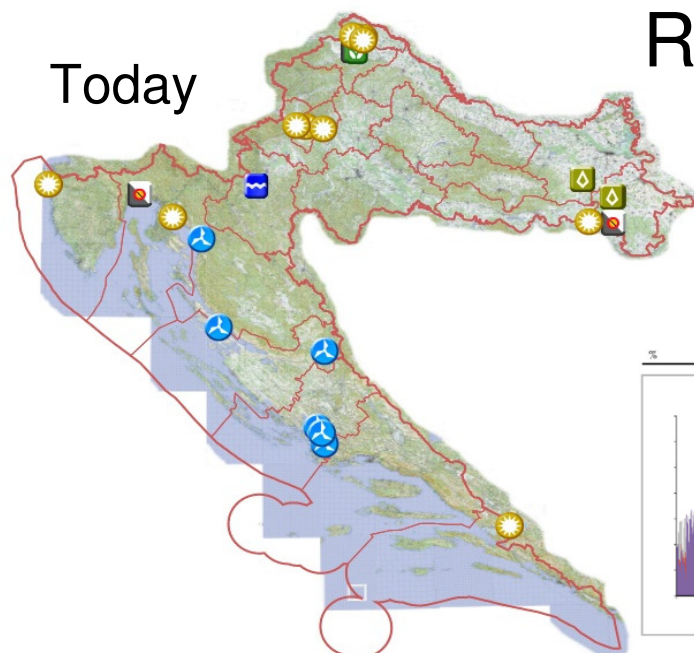
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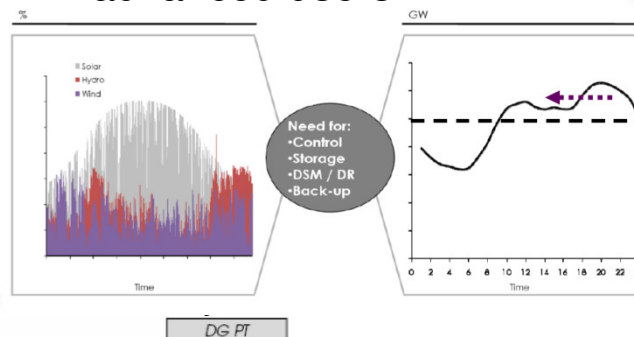
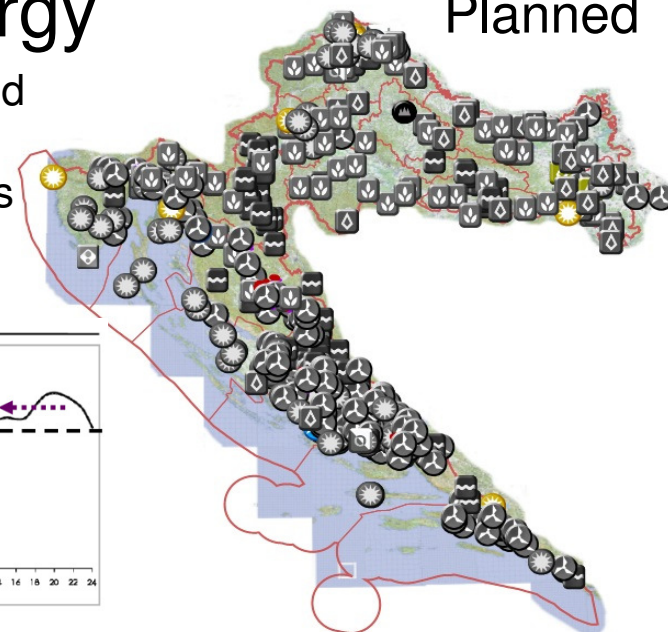
Renewable Energy

Balancing production and consumption in an efficient manner requires advanced network and advanced users

Today



Planned



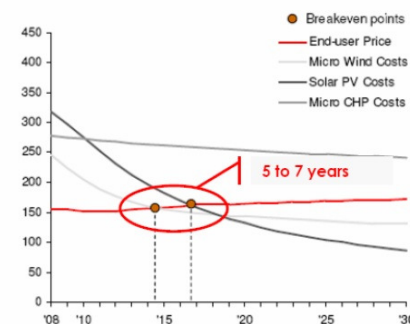
Base assumptions

Technologies	CAPEX 2008 €/kW	O&M €/year	Load Factor %	Capacity kW
• Solar PV	4.500	50	14	3,68
• Wind	2.700	115	15	1,5
• CHP	2.300 ¹	20 ²	7 ³	1

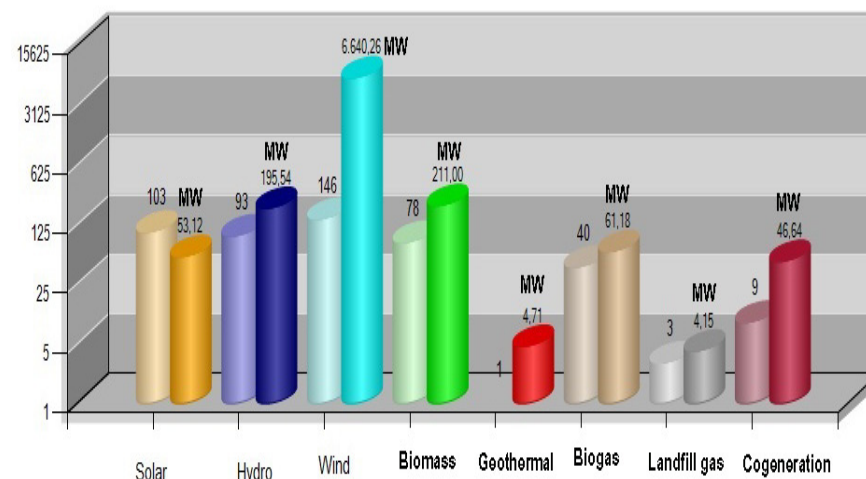
End-user Price

- Pool Price – based on E008
- General use of system – '08 UGS plus 11 €/MWh overcost in '20 due to PT renewables burden sharing and linear growth thereafter
- Grid and Commercial Margin – 53 €/MWh in '08 growing at inflation

DG technologies and End-User cost evolution €/2008/MWh, 2008-2030



Planned projects and max. demand [MW]

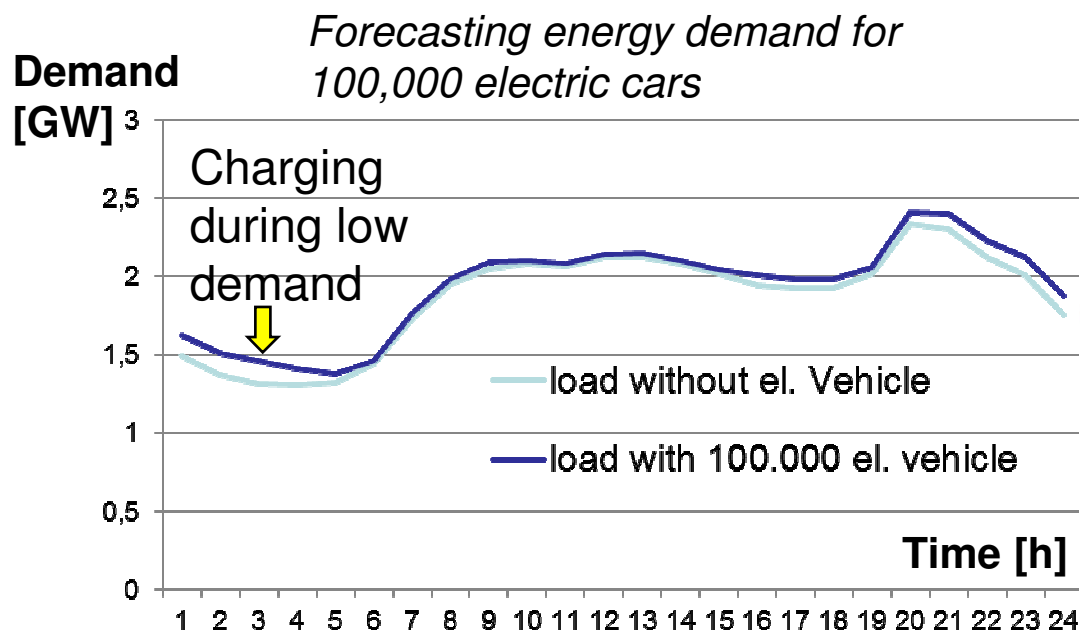


Source: Registar OIEKPP (09/2011) <http://oie.mingorp.hr>

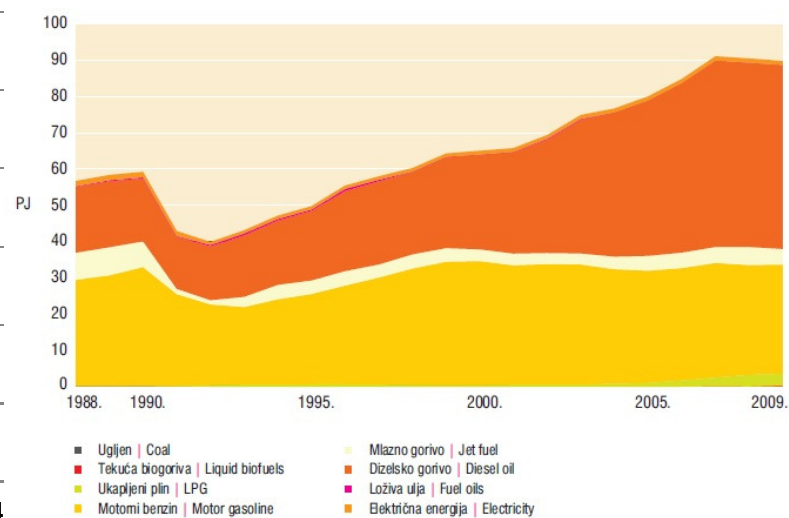
Distributed generation technologies will become competitive before the year 2020 thanks to rapid technological development.

Transport & Tourism

In the record weekend 2011th in Croatia has entered a total of 390,000 vehicles and exit 366,000 vehicles.



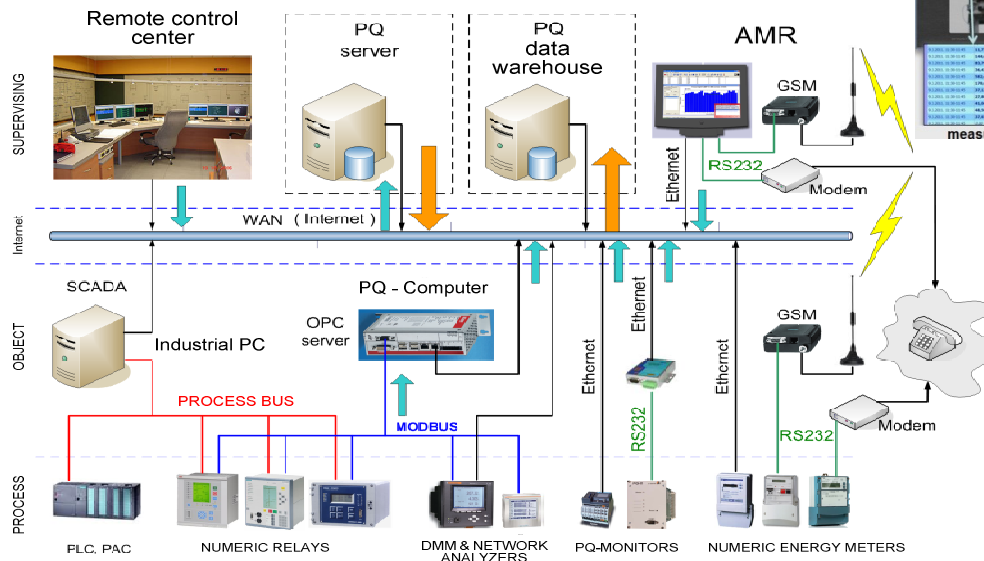
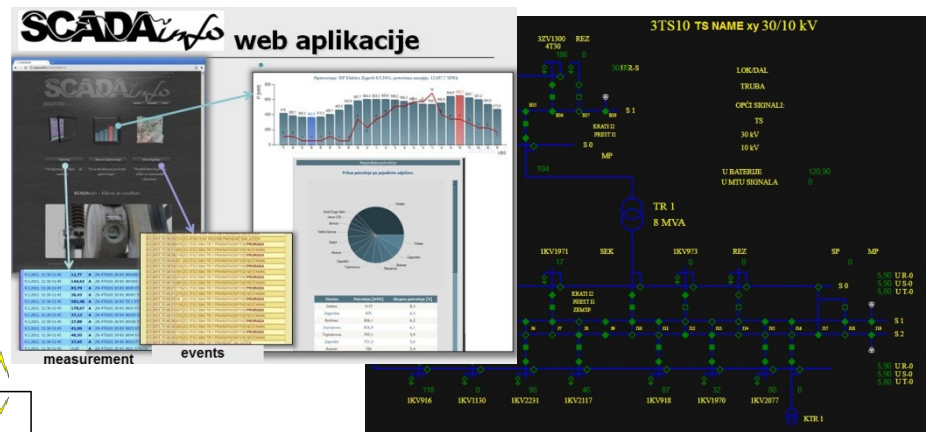
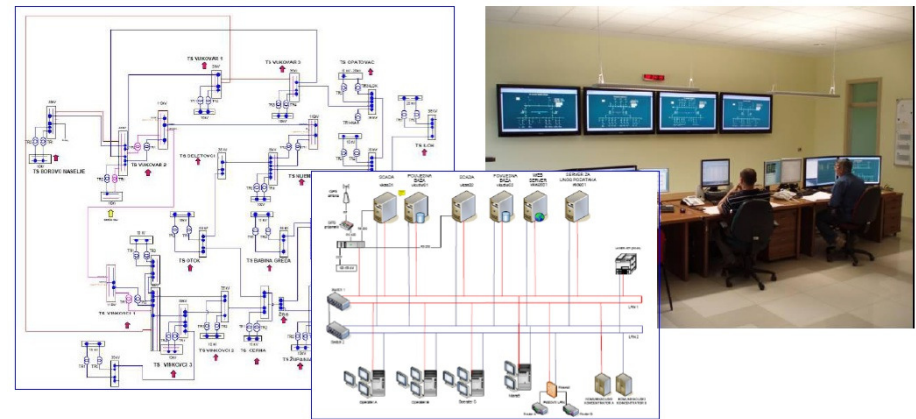
Energy consumption in transport 1988. - 2009.



Current projects – network control and automation

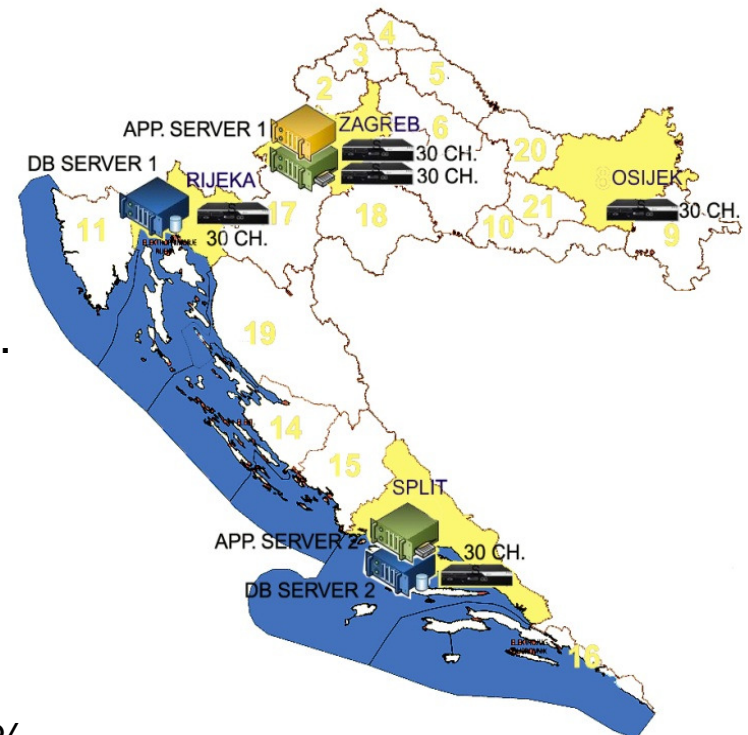
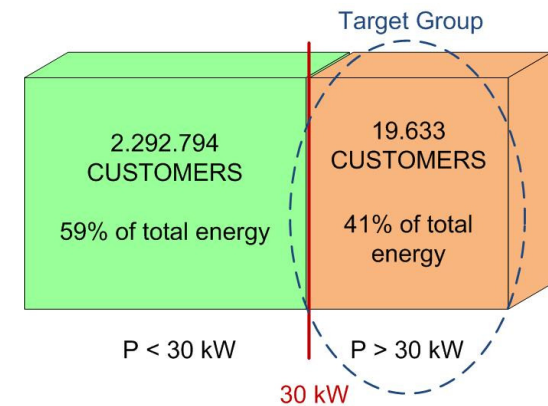
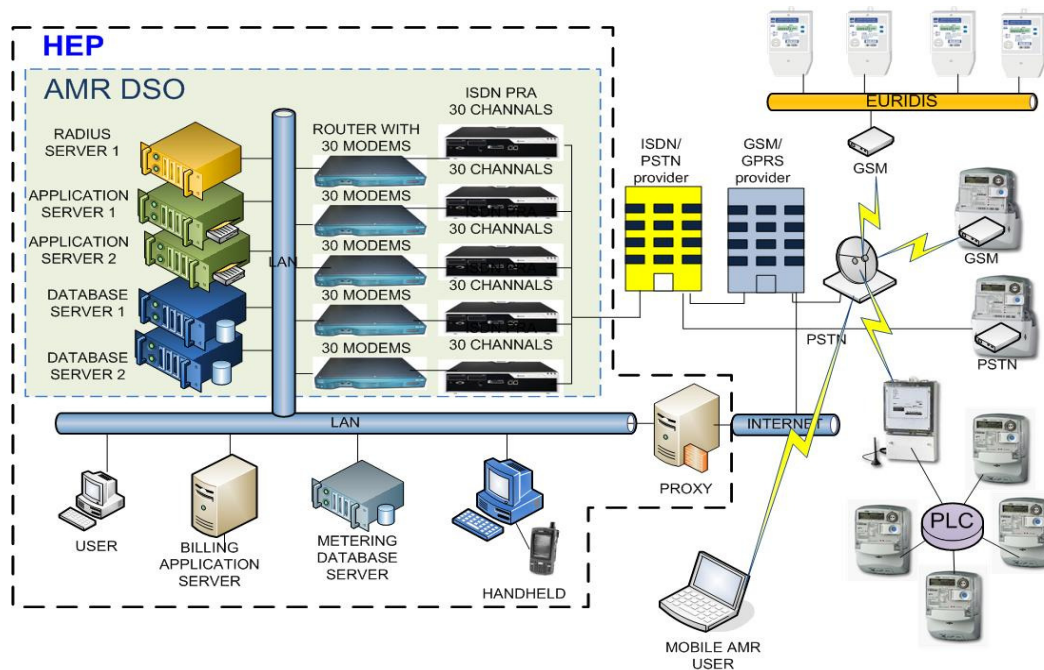
Continued investment in network and involvement of all remotely controlled and monitored facilities in new SCADA system.

SCADA Info - HEP ODS integrated applications to access data in the revived SCADA systems via an internal web portal.



Integration of devices which have a capability to measure power quality parameters (PQ) into the ICT system.

DSO AMR/AMI System



The total number of measurement points 2.3 million.

Electronic meters 11%

Remote meter reading:

Measurement of HV, MV, P> 30kW	100%
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Measurement of Enterprise P $\leq 30\text{kW}$ 1%

Measurement of Household 0.3%

Energy Efficiency

Continuous work on reducing technical and non-technical losses.

Projects for customers:

House in order - Program for energy efficiency in buildings owned by the Croatian Government



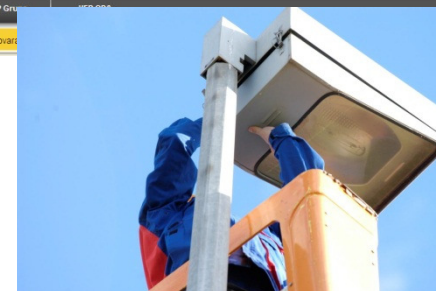
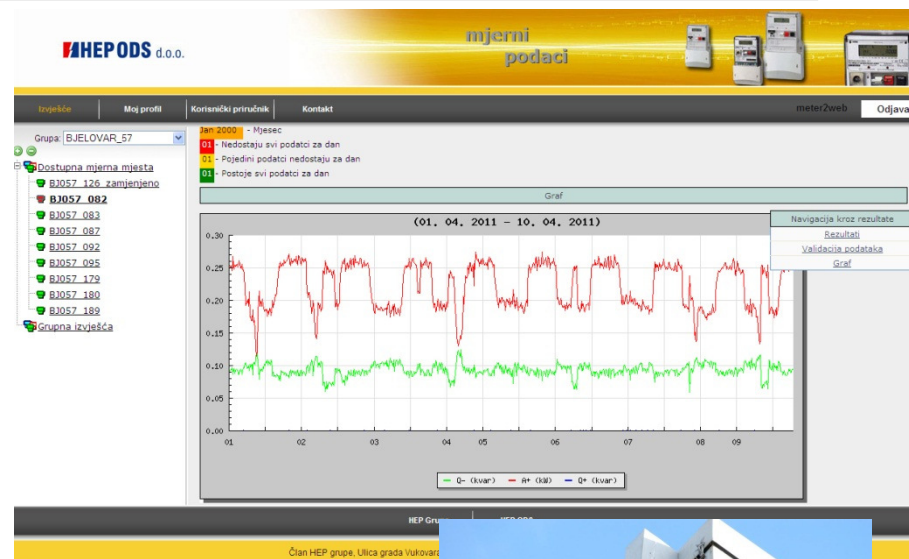
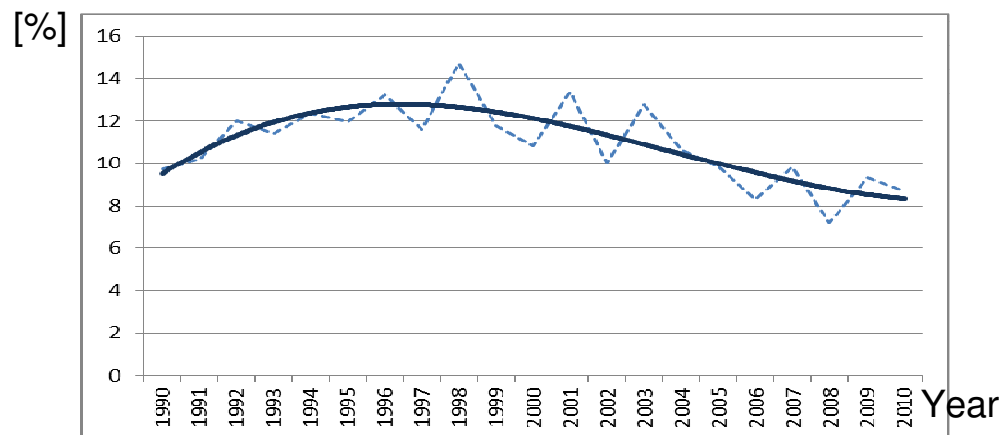
www.mjerenje.hep.hr

Energy efficiency measures in public lighting:

- investments in multiple projects € 4,3 million
- annual savings € 0,37 million



Energy loss in distribution network (trend line) 1990 - 2010

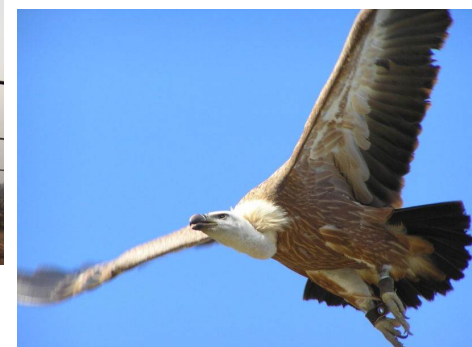
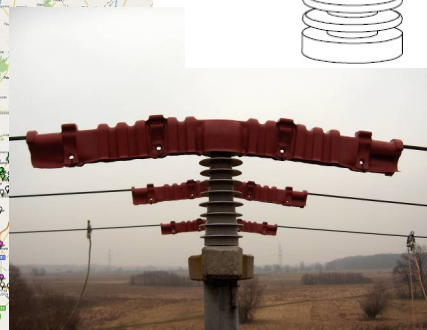
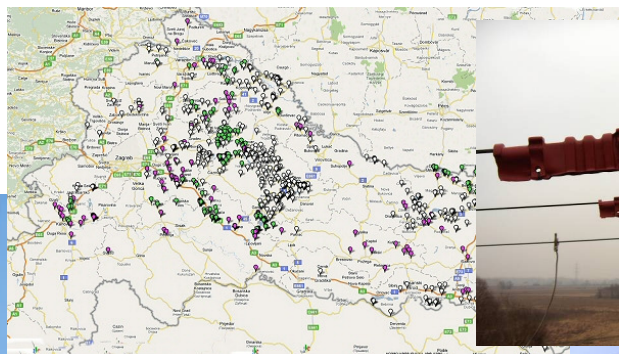
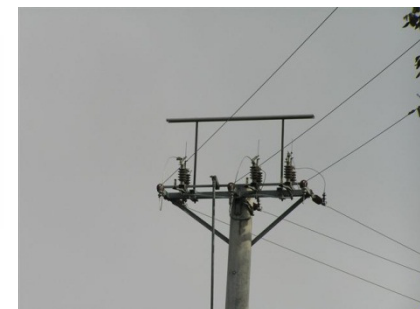
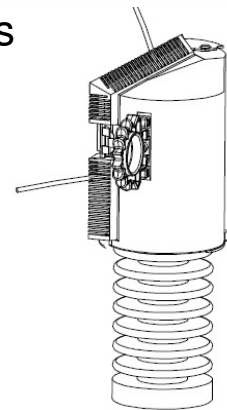
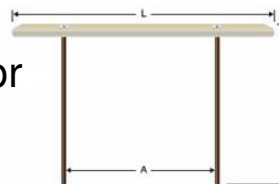


Caring for the environment and network

2007th we started the certification of distribution areas for environmental management system to ISO 14001:2004.

2011th completed important work of removing hazardous substances (PCBs) from old parts of the network.

Annually investment are around € 100,000 in the protection and habitat conservation for birds and small animals.



The next phase of Smart Grid implementation in HEP ODS

Activities of the next phase of SG implementation:

a) increase the level of network automation

TS 110 / x and 35 / x kV from 80% to 100%
TS 10 (20) / 0.4 kV from 1% to 5 %



b) continue to AMR/AMI and power quality projects



c) to define new guidelines for the development of the network in order to accept distributed generation

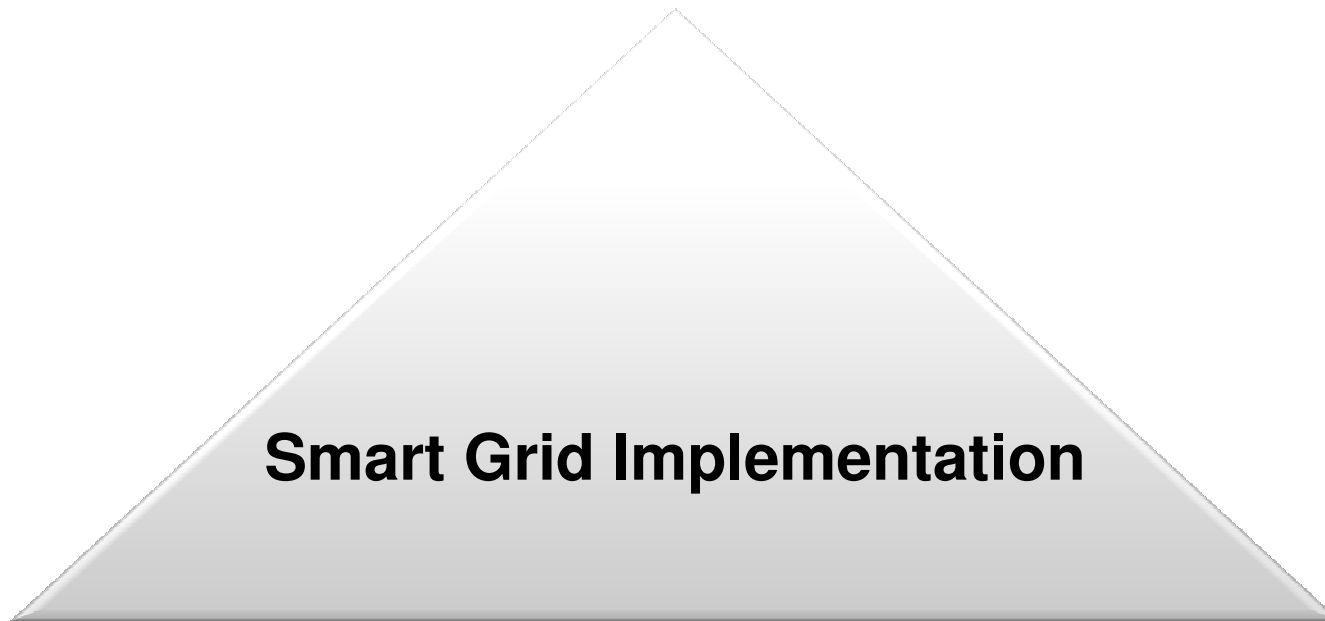


d) develop new services based on already constructed infrastructure (Demand Response, etc.)



Preconditions for successful implementation of the concept of advanced distribution network

Establishing a system of incentives.



Defining the business model (roles and responsibilities of participants) and the model of market.

**Testing and verification technology.
Realization of investments.**

Planned Investments in SG Technology for 2011

Planned investments for 2011 year by basic areas:

- automation of distribution network € 1,3 million
- introduction of advanced metering € 3 million

Sources of funding are the tariff items.

The main drivers of SG technology in HEP ODS are legal obligations, age of infrastructure and reduction of operating costs.



The main barrier for SG investment is the lack of adequate regulatory framework.

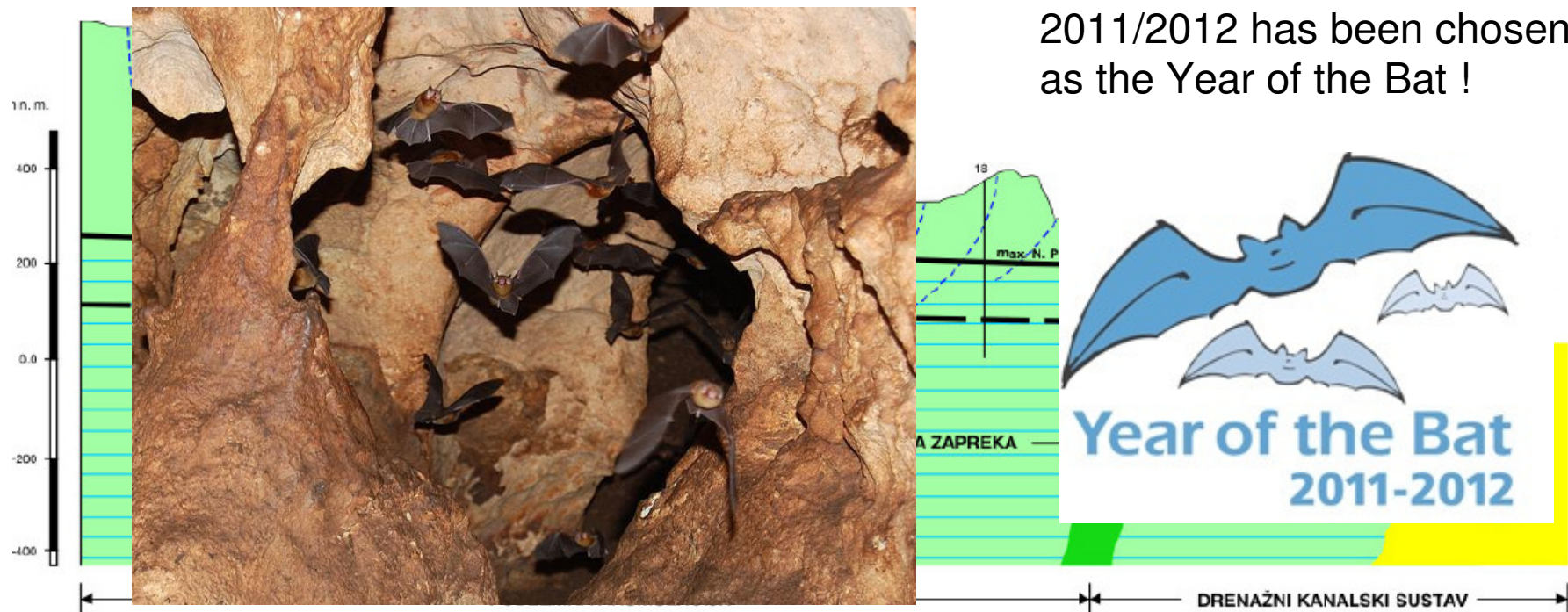
Public presentation of the project hydropower plant Ombla - Dubrovnik

- 68 megawatts of power
- estimated annual production of 225 GWh (for 45,000 households)
- value HE Omble estimated at 152 million euros,
- construction will last 5 years

One of the most important issues in the discussion was that there is a possibility of destroying a colony of bats !



2011/2012 has been chosen as the Year of the Bat !



Smart Network is a network that is designed, used and maintained in a manner that maximally protects the environment.



Thank You for Your Attention!

The Croatia Smart Grid Experience building a advanced smart grid network

Dubrovnik, Croatia
October 7, 2011.



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