



elen:

izvor električne energije

Development project eMOBILITY in HEP Opskrba d.o.o.

Zagreb 02.July 2013.

Content

1. *Project vision*
2. *Project objectives*
3. *Directives and reductions of CO₂ emissions*
4. *RES and EV charging stations*
5. *ELEN - the first Croatian chain of EV charging stations*
6. *ZELEN and recharging from RES*
7. *Communication according to smart grid*
8. *Off-peak load recharging*
9. *The parameters for building infrastructure*
10. *Model input data*
11. *Simulation results*
12. *Future – Plans*

Project vision

- To keep up with EU energy strategy (20/20/20), HEP group wants to be a regional leader in e-mobility in terms of developing the electric vehicle recharging infrastructure, based on an advanced power grid concept.
- This concept enables:
 - integration of a larger amount of distributed electricity sources
 - electric vehicles charging, during periods in which the electric power system load is low
 - recharging during hours of high renewable source production (wind farms, photovoltaic plants etc.)

Project objectives

- Improved quality of city life (lower noise and air pollution)
- Decreased greenhouse gas emissions and the negative effects on environment
- Higher integration of renewable energy sources
- Power system cost reduction
- Increased sales (each vehicle = new customer)
- Increased energy efficiency
- Reduced dependency on other fuel sources

Directives and reductions of CO₂ emissions

Directive [2009/33/EC](#) promotion of clean and energy-efficient road transport vehicles

- The aim is to encourage market to use clean and energy efficient road transport vehicles
- to commit to the appropriate standards of vehicles and infrastructure
- to ensure the required level of demand by various incentive measures with the purpose of reducing the cost of the production of a vehicle

Directive [2009/28/EC](#) on promoting the use of energy from RES - commit to ensuring a share of energy from renewable sources in all types of transportation of at least 10% of the total energy consumed in transport until 2020.

Regulation (EC) No 443/2009 setting emission performance standards for new passenger cars as part of the Community's integrated approach to reduce CO₂ emissions from light-duty **vehicles**

- emissions of new vehicles should not be more than 130 g / km of CO₂ until 2015 and 95 g / km CO₂ until 2020.

RES and EV charging stations

EV charging stations are usually connected to the power grid, which often means that their energy comes from hydropower, fossil fuels, nuclear power plants. Renewable energy sources are also suitable for electric vehicles.

- Solar or wind power station for charging (electric or plug-in hybrid vehicle) that has no need for power from the local power grid.

Technology platform for smart electricity grid was introduced in 2009. Smart grids are key for reducing CO₂ emissions, improving energy efficiency in a way that:

- allow the integration of a large number of renewable energy sources (wind, solar, etc.) in the grid and distributed production (small wind turbines, microcogeneration, etc.)

ELEN - the first Croatian chain of EV charging stations

eLen:



- Designed and trademarked new brand - ELEN
- ELEN - created during development project eMOBILITY
- ELEN - SOURCES OF ELECTRIC POWER is the first Croatian chain of charging stations for EV (short for **electric energy**)



ZELEN and recharging from RES

- Electric energy that drives electric vehicles produced from renewable sources provides the maximum benefit (zero CO₂)
- All HEP's hydropower plants are certified for the production of electricity from renewable sources
- At our rechargeable stations we guarantee that the electrical energy produced is 100% from renewable energy sources. We confirm that with TÜV SÜD certificate
- HEP Opskrba - offers a new ZELEN product which consists of:
 - TÜV SÜD certificate
 - the right to use the logo



zelEn
ZELENA ENERGIJA

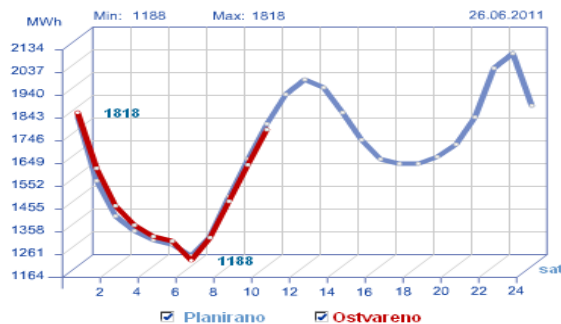
Communication according to smart grid

Powering a large number of electric vehicles batteries, at the same time, overloads the power system. In order to avoid overloads, the charging can be:

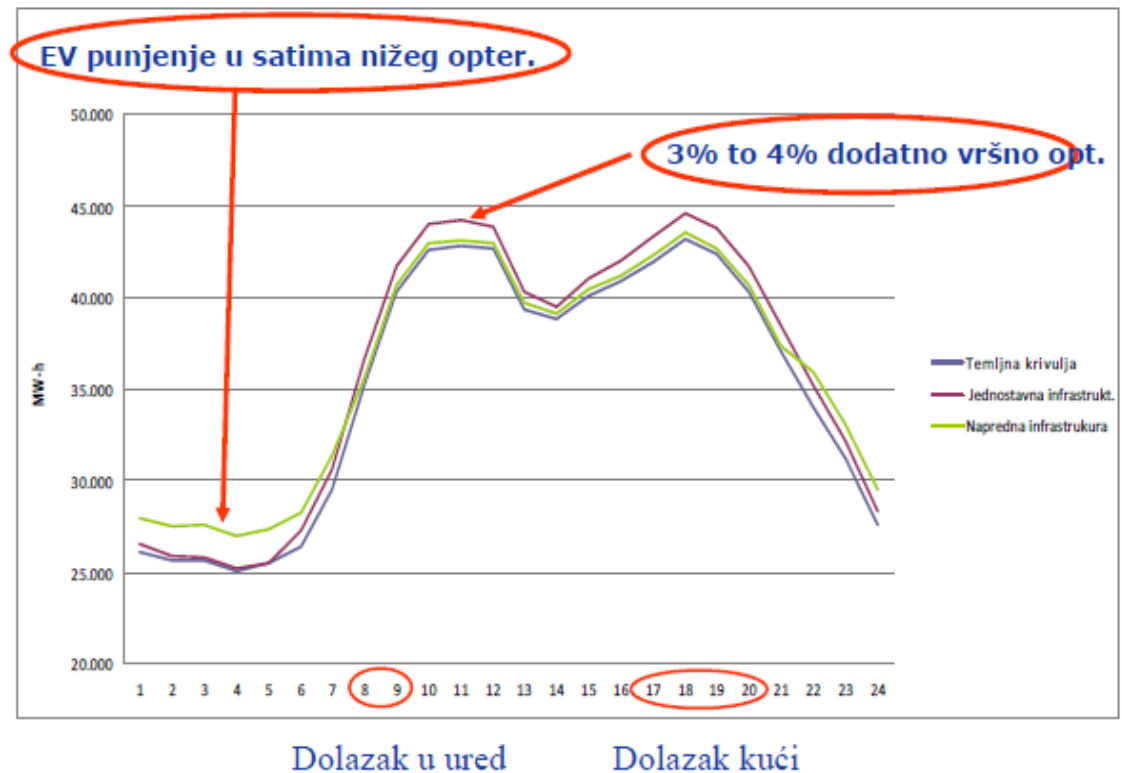
- recharging in the period in which consumption is low or when electricity is cheaper
- For planning and for recharging we need communication between the station and/or electric vehicles and smart-grid (through a web interface or smartphones).
- Car battery can deliver energy to the grid in the periods of high power demand. This requires additional communication between the grid, stations and vehicles.
- SAE International has developed a standard for the transfer of energy between the vehicle and the grid in both directions (SAE J2847 / 1 "Communication between Plug-in Vehicles and the Utility Grid").

Off-peak load recharging

- Smart recharging:
- facilitates the integration of RES into the electricity system
- the ability to manage grid
- avoidance unnecessary investments in network
- optimizing the use of production capacity
- maximizing the recharging time when it suits the customer



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Source: Enel: E-mobility in Italy&G4V and Green eMotion Projects, September, 2010.

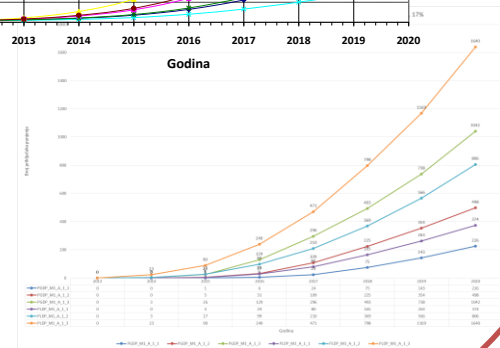
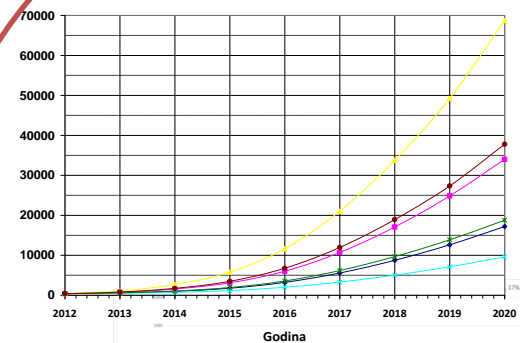
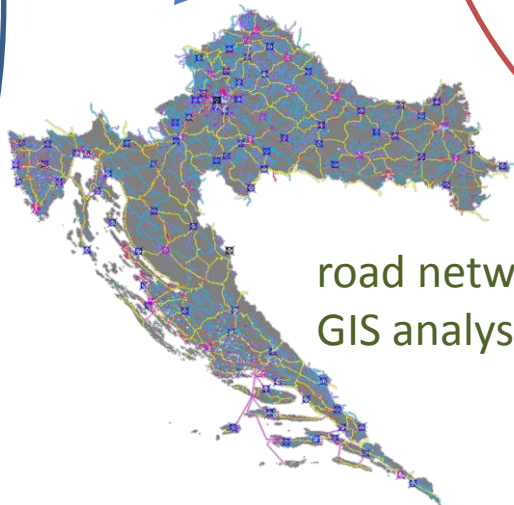
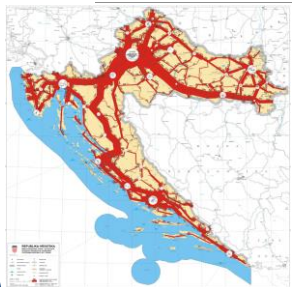
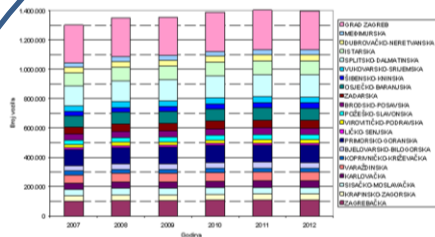
The parameters for building infrastructure

Building of infrastructure depends on :

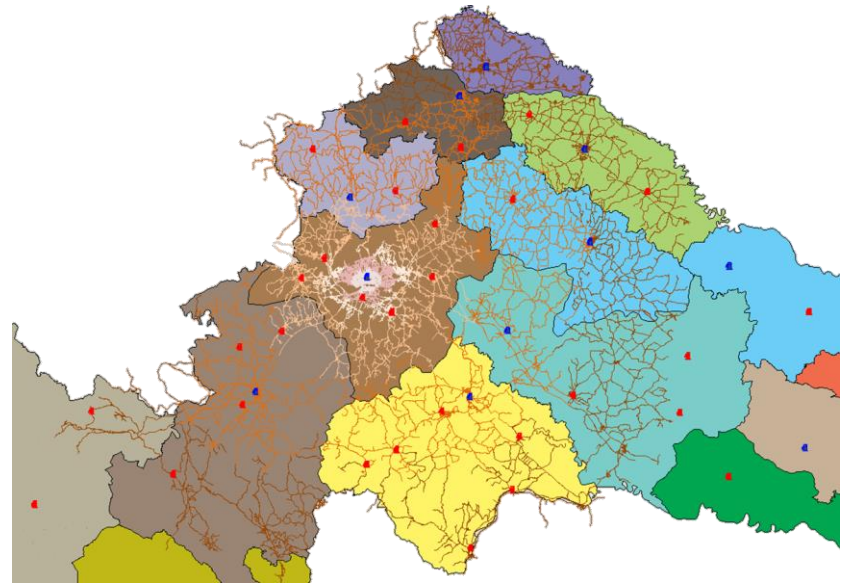
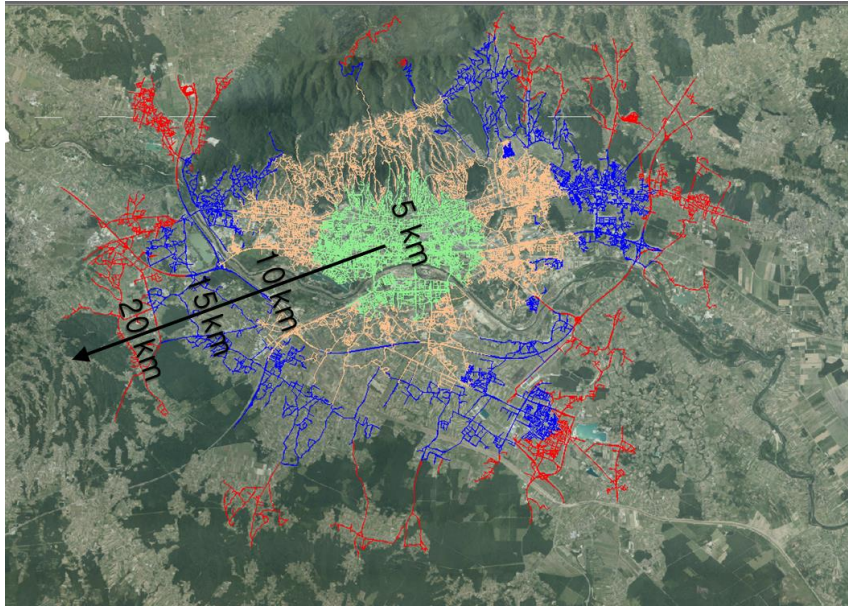
- the number of electric vehicles
- type of connector for recharging the vehicle
- the time customer stays at specific locations (eg, 80% of recharging should be done at home because we spend 14 hours at home)
- type of available chargers (AC 1F, 3F), DC - recharging time is different depending on the voltage and the power of the charger and battery capacity (it should be linked to the time customers stay at the location and price of each station)
- the number of kilometers of highways and local roads

Model input data

statistical data



Simulation results



Future – Plans

- Develop our own infrastructure, which will connect Croatia and rest of Europe to the European energy highway (tourist country has an obligation to ensure charging stations)
- Develop our own infrastructure on public places within the cities for ultra fast DC and AC fast recharging
- Modernize HEP vehicle fleet with procurement of electric vehicles and / or conversion of conventional vehicles to EV

Developing a model to calculate the optimal number of stations in a cost effective way!

Future

- SMART GRID = Decentralization of electricity generation (primarily from renewable sources) + advanced communication systems (monitoring and control of production and consumption of electricity at all levels) + energy storage system (at all levels) + electric vehicle
- Smart grid will solve problems:
 - Balancing energy in the system when there is a surplus of energy in the system,
 - It can be stored and later placed on the market,
 - **'Smart'** electric vehicle recharging to occur without impact to the system.
- EU objectives to reduce greenhouse gas emissions (by 85-90% usage of renewable resources by the year 2050) will only be achieved with SMART GRID



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Thank you for your attention!