Renewable Energy Resources in Croatia

Experience of a Croatian electricity company – HEP in renewable energy sector

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About Croatia
Energy system development

- The fundamental act governing country’s energy policy and energy system planning is the **Energy Sector Development Strategy**
- The Croatian Parliament, on the proposal of the Government of the Republic of Croatia, passes the **Energy Sector Development Strategy** for a **ten-year period**
- On the basis of Energy Sector Development Strategy, the Government of the Republic of Croatia passes the **Implementation Program** of Energy Sector Development Strategy for a period of at least three years
- The Government of the Republic of Croatia issues **long-term and annual energy balances** that define total requirements for energy, energy resources and methods and measures for meeting such requirements
Structure of the energy system in Croatia

Total energy consumption ~ 410 PJ
Average annual growth rate 1.5% 1999-2006.

Share of import ~ 50%

Structure of energy consumption:
- Natural gas ~ 24%
- Liquid fuel ~ 45%
- Hydropower ~ 14%
- Other ~ 17%

Total energy consumption ~ 410 PJ
Average annual growth rate 1.5% 1999-2006.
Share of domestic production of energy in total energy demand
Electricity sector in Croatia

Production, transmission, distribution and supply of electricity. Trading domestic and regional
Electricity Market model

Generators → Traders → Suppliers

Eligible customers → HEP-OPS → HROTE

Tariff customers → HEP-ODS

Tariff customer supplier → HROTE

RES & Cog. within the system of incentives

MARKET PLAN

SYSTEM OPERATION PLAN

Electricity Sales Agreement
Agreement on the use of network
Supply Agreement
Submission of agreements and schedules
About HEP

- HEP
  - State owned company
  - Currently single player on Croatian electricity market

- Electricity consumption in 2007: 17,6 TWh
- Generation capacity in 2007: 4.054 MW
HEP in Croatian economy

- HEP is one of the **largest** Croatian companies
- HEP has **14 535 employees**

In 2007:
- Income: above 1,5 billion €
- Capacity: 4000 MW
- Peak load: 3100 MW
Structure of HEP Group

Operator Tržišta d.o.o.

HEP d.d.

HEP Proizvodnja d.o.o.

HEP OPS d.o.o.

HEP ODS d.o.o.

HEP Opskrba d.o.o.

HEP Trgovina d.o.o.

TE Plomin d.o.o.

HEP Toplinarstvo d.o.o.

HEP Plin d.o.o.

HEP ESCO d.o.o.

APO d.o.o.

HEP Obnovljivi izvori energije d.o.o.

HEP NOC

NE Krško d.o.o. *

* - company outside HEP Group in co-ownership
About HEP OIE

Daughter company of HEP, founded in October 2006 in order to group and support renewable energy projects.

Long term Company strategy is to **integrate RES electricity** production technologies in a profitable way to the core HEP business area.
HEP – OIE Objectives

1. Delivering **profit** from selling RES electricity (small hydro <10 MWe, wind, geothermal, biomass...) at feed-in tariff

2. Development of **new competencies** and improving the image of HEP Group

3. Improving total balance of **CO₂ emissions**, which can help in planning and construction of basic fossil fuel plants

4. Contribution to the **diversification** of primary energy sources and reducing the risk of oil and gas prices fluctuation
HEP and renewables

1994 – July 1st 2007
HEP buys electricity from wind PPs and small PPs (<5 MW) at privileged prices
- HEP is a buyer!

July 1st 2007
New renewable electricity legislation –
feed – in tariffs.

2007 – ...
HEP – Obnovljivi izvori energije d.o.o. develops renewable electricity projects
- HEP is an investor!

1994 – July 1st 2007

2007 – ...
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Croatian renewable electricity policy and legislation

July 1st 2007 – Feed-in tariff system regulated by five sublaws:

1. Regulation on **incentive fees** for promoting electricity production from renewable energy sources and cogeneration

2. Regulation on the **minimum share of electricity** produced from renewable energy sources and cogeneration whose production is incentivised

3. **Tariff system** for the production of electricity from renewable energy sources and cogeneration

4. Regulation on **use of renewable energy sources**

5. Regulation on becoming **eligible producer**
Incentive fees for electricity consumers

Each consumer pays extra RES fee for every kWh spent:

- For 2008: 0.0089 kn/kWh (0.12 c€)

- Monthly increase in electricity bill for an average household: 0.27 – 0.55 €
Targets for minimum share of RES-E

- Minimum share of RES electricity in total electricity consumption in 2010: 5.8%*
- Share in 2007: 1.8%*
- Total electricity consumption in 2007: 17.6 TWh

*not including large scale hydro
# Tariff system

<table>
<thead>
<tr>
<th>RES</th>
<th>Tariff (kn)*</th>
<th>Installed Capacity</th>
<th>Installed Capacity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>below 1MW</td>
<td>above 1MW</td>
</tr>
<tr>
<td>PV</td>
<td>2,10 - 3,40</td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>Small Hydro</td>
<td>0,69</td>
<td>0,42 – 0,69</td>
<td></td>
</tr>
<tr>
<td>Wind</td>
<td>0,64</td>
<td>0,65</td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td>0,95 – 1,20</td>
<td>0,83 – 1,04</td>
<td></td>
</tr>
<tr>
<td>Geothermal</td>
<td>1,26</td>
<td>1,26</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>0,60</td>
<td>0,50</td>
<td></td>
</tr>
</tbody>
</table>

* 1 kn ≈ 0,13 €
Regulation on use of renewable energy sources & Regulation on becoming eligible producer

- Types of RES technologies
- Registry of RES projects
- Documentation for entering the Registry
- Documentation for becoming eligible producer

Process of obtaining permits

PEO  EO  PR_pp  ED  UKM  R_pp  UOEE
SUO  LD  GD  UD
Part of electricity market related to RES and cogeneration

Market operator (HROTE)
Incentive collection and distribution

Other sources

Receipt for supplied electricity from RES&C

Payment for supplied electricity from RES&C

Calculation of compensation for supplied electricity

Payment for supplied electricity from RES&C

Eligible producer which uses RES&C in incentive system

Electricity supplier

Compensation

Customer
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Investment Priorities

- Wind
- Biomass
- Small hydro
- Geothermal
- Photovoltaic (solar)
- Other
Wind

- Signed MoU with Austrian companies Verbund and BEWAG
- Signed MoU with Dalekovod
- Few MoUs in preparation with Croatian companies
- Start of measurement campaign on several locations
**Biomass**

- Several locations:
  - Slavonija
  - Banovina
  - Lika
  - Gorski kotar

- Installed capacities from 5 to 25 MW

- Signed MOU with Hrvatske šume (Croatian forestry company)
Small hydro

- Reconstruction and modernization of old HEP small HPPs facilities
- Planning and development of new sites for small HPPs
- Environmental compliance is critical to licensing
Geothermal

- Lunjkovec – Kutnjak (close to Koprivnica) – 2.5 MW
- Velika Ciglena (close to Bjelovar) – 2x4.7 MW
Development and realization of projects

[Not to scale]

- Asset Value
- Development Risk
- Development Costs

<table>
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<tr>
<th>Stage</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Screening &amp; Feasibility</td>
<td>6 – 12 months</td>
</tr>
<tr>
<td>Site Selection &amp; Due Diligence</td>
<td>3 – 6 months</td>
</tr>
<tr>
<td>Site Control &amp; Partnering</td>
<td>0 – 3 months</td>
</tr>
<tr>
<td>Site Development</td>
<td>18 – 24 months</td>
</tr>
<tr>
<td>Development Close Out &amp; Project Financing</td>
<td>6 – 12 months</td>
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Local partner

Financial cooperation

Technical cooperation