Is there room for renewables in 2030?  
– analysing the effects of a new nuclear power plant in Hungary

Fanni Sáfián  
ENERGIAKLUB | ELTE | Hungary
Introduction – Hungarian energy mix

30 TWh prod. + 12 TWh imp. = 42 TWh total supply

PP capacities:
- Oil & other
- RES
- Coal
- Nuclear
- Natural gas

Gross electricity production:
- 30 TWh (2013)
- Paks (nuclear) 55%
- Mátra (coal) 19%
- Other large PPs (coal, ngas) 10%
- Small PPs 16%

International Conference on Smart Energy Systems and 4th Generation District Heating, Copenhagen, 25-26 August 2015
- 14-01-2014: Rosatom builds new nuclear PP in Paks
- 2400 MW, 12,5 billion EUR (10 bill EUR Russian loan)
- No tender, no background analyses available, contracts are secret for 30 years
- Economics: not feasible (Romhányi 2014, Felsmann 2015)
- Fixing centralised system, hindering RES and EE?
- Between 2026-2032 4400 MW nuclear capacity working together (Paks I + Paks II)
ENERGIAKLUB’s Energy Vision

- Decentralised energy system, small-scaled units
- Use of local renewable energy sources
- Sufficiency and Efficiency are fundamental aims
- Opportunity for community energy production
- Provide complex solutions through local economical and societal benefits
Modelling with EnergyPLAN

International Conference on Smart Energy Systems and 4th Generation District Heating, Copenhagen, 25-26 August 2015
3 models compared

<table>
<thead>
<tr>
<th></th>
<th>EK2030</th>
<th>MAVIR</th>
<th>HYBRID</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Nuclear capacity</strong></td>
<td>MW</td>
<td>2 000</td>
<td>4 400</td>
</tr>
<tr>
<td><strong>Wind</strong></td>
<td>MW</td>
<td>2 800</td>
<td>850</td>
</tr>
<tr>
<td><strong>Solar</strong></td>
<td>MW</td>
<td>1 400</td>
<td>90</td>
</tr>
<tr>
<td><strong>New peak PP</strong></td>
<td>MW</td>
<td>500</td>
<td>1200</td>
</tr>
<tr>
<td><strong>Total capacity</strong></td>
<td>MW</td>
<td>12 008</td>
<td>10 840</td>
</tr>
<tr>
<td><strong>Electricity demand</strong></td>
<td>TWh</td>
<td>47,1</td>
<td>47,1</td>
</tr>
</tbody>
</table>

International Conference on Smart Energy Systems and 4th Generation District Heating, Copenhagen, 25-26 August 2015
## Main results

<table>
<thead>
<tr>
<th></th>
<th>EK2030</th>
<th>MAVIR</th>
<th>HYBRID</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fuel Total</td>
<td>TWh</td>
<td>252,18</td>
<td>272,91</td>
</tr>
<tr>
<td>RES PES share</td>
<td>%</td>
<td>13,40</td>
<td>6,90</td>
</tr>
<tr>
<td>RES electr. share</td>
<td>%</td>
<td>27,10</td>
<td>10,30</td>
</tr>
<tr>
<td>Import</td>
<td>TWh</td>
<td>0,47</td>
<td>0</td>
</tr>
<tr>
<td>Export</td>
<td>TWh</td>
<td>0,02</td>
<td>0,53</td>
</tr>
<tr>
<td>CO₂ corr.</td>
<td>Mt</td>
<td>40,79</td>
<td>35,2</td>
</tr>
</tbody>
</table>
CEEP analysis

CEEP as part of RES production

Utilized RES production

CEEP
Hypothesis 1: CEEP appears when wind production is high.
What happens in details?

EK2030 at maximum wind power production

- Nuclear
- CHP
- Wind
- Hydro
- PV
- PP
- PP2
- Geother.
- Import
- CEEP

International Conference on Smart Energy Systems and 4th Generation District Heating, Copenhagen, 25-26 August 2015
What happens in details?

Hypothesis 2: CEEP appears when electricity demand is low.

MAVIR at maximum CEEP
Possible solutions – 3+1 ways

A. Regulation of CHP, PP and PP2 (current)  
   Problem: shutting down power plants

B. Regulation of nuclear power plant  
   Problem: not feasible investment

C. Regulation of RES  
   Problem: answers our main question

D. Export excess electricity 
   Problem: there is night at neighbours as well
Conclusions

- The new nuclear power plant is too large for the current/future Hungarian energy system
- The regulation method of the energy system is unknown for 6 years – not only renewable energy production, but all power plants are endangered
- Utilization of local energy sources, renewables, energy efficiency investments etc. will be hindered for 60-80 years
THANK YOU FOR YOUR ATTENTION!