NUCLEAR SPOTLIGHT POLAND

NUCLEAR PERSPECTIVES
IN THE CZECH REPUBLIC

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NUCLEAR PERSPECTIVES IN THE CZECH REPUBLIC

CONTENT

- Current situation and options for the Czech Republic
- ČEZ - nuclear projects - status
CZECH ENERGY POLICY - GOALS

- Security of supply
- Competitiveness
- Sustainability
CO2 EMISSIONS
STATE ENERGY POLICY HAS BEEN APPROVED IN 2015

Electricity consumption

Gas scenario with limited self sufficiency
- High consum. scenario
- NPP Dukovany till 2027
- Keeping limits at ČSA
- Low scenario of renewables
- Natural gas
- Import of electricity

Green scenario with limited self sufficiency
- Low consum. scenario
- NPP Dukovany till 2027
- Keeping limits at ČSA
- High scenario of renewables
- Renewables
- Import of electricity

Optimized scenario according to SEP
- Reference scenario
- NPP Dukovany till 2037
- Keeping limits at ČSA
- Realistic RES scenario
- Nuclear
- Full self sufficiency

Secure and self sufficient
- Reference scenario
- NPP Dukovany beyond 2040
- Breaking mining limits
- Realistic RES scenario
- Combination
- Export remainder
- Full self sufficiency

Conventional and Economical
- Reference scenario
- NPP Dukovany beyond 2040
- Breaking mining limits
- Low scenario of renewables
- Conventional sources
- Possible Import
- Full self sufficiency

Decarburization scenario
- Low consum. scenario
- NPP Dukovany till 2034
- Keeping limits at ČSA
- High PV, wind
- Low carbon sources

NPP Decom.

New Nuclear

Lignite mining limits

Renewables development

Key source

Energy balance

STATE ENERGY POLICY HAS BEEN APPROVED IN 2015
DETERMINATION OF GOAL CORRIDORS OF FUTURE POWER GENERATION ACCORDING TO SEP

Nuclear: 46%
Coal (hard and lignite): 11%
Natural Gas: 5%
Renewables: 18%

Relative minimum

Relative maximum

* Source: State Energy Policy
STATE ENERGY POLICY - CHANGES IN ENERGY MIX
SIGNIFICANT ENERGY DEFICIT MIGHT OCCUR IN 2035
(EVEN WITH EXPECTATION OF STRONG DEVELOPMENT OF RES)

- **Nuclear**: growth by 37% till 2040 with respect to 2015
  \((31.5 \text{TWh} \rightarrow 43.2 \text{TWh})\)

- **RES**: growth by 49% till 2030 and 99% till 2040 with respect to 2015
  \((> 20 \text{TWh} \text{ in 2040})\)

- **GAS**: doubled production till 2040 with respect to 2015
  \((3.6 \text{TWh} \rightarrow 7.1 \text{TWh} \text{ in 2040})\)

- **COAL**: decline by 33% till 2030 and by 66% till 2040
  \((46.2 \text{TWh} \text{ in 2015} \rightarrow 30.8 \text{TWh} \text{ in 2030}, \text{resp.} 15.5 \text{TWh} \text{ in 2040})\)

- **Demand**: moderate increase (annually by 0.7%),

  Including savings commitment
  2020 – EED 2030 goals will force additional request for savings and will involve the growth of demand

* Optimised scenario of Czech energy strategy
SIGNIFICANT PART OF LIGNITE CAPACITY WILL BE DECOMMISSIONED IN NEXT TWO DECADES

- Low cost of domestic lignite
- Thermal power plants next to mines – only costs of internal logistics
- Replacement of old units with more efficient new technology (20% lower CO₂ emissions, from 1 t CO₂/MWh to 0.8 CO₂/MWh)
- Secured lignite supplies for the investment lifetime
- Majority of coal fired power plants will disappeared from the electricity market till 2035
- Additional 1410 MW to be decommissioned till 2040
- Furthermore it is expected that NPP Dukovany 1-4 (2000 MW) will be decommissioned between 2035 - 37

ČEZ - lignite (brown coal) capacity (MW)

<table>
<thead>
<tr>
<th>Current capacity of lignite fired PP</th>
<th>Expected capacity in 2035</th>
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<tbody>
<tr>
<td>5400</td>
<td></td>
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<tr>
<td>- 3190 MW</td>
<td></td>
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<tr>
<td>To be decommissioned before 2035</td>
<td></td>
</tr>
<tr>
<td>+ NPP Dukovany (50 years of operation)</td>
<td>- 2000 MW</td>
</tr>
<tr>
<td>Prunéřov (till 2040)</td>
<td></td>
</tr>
<tr>
<td>Ledvice (till 2055)</td>
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<tr>
<td>Tušimice (till 2037)</td>
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Electricity production from power plants of approx. 7 GW shall be replaced by new build power plants.
## NEW EU CLIMATIC 2030 GOALS

<table>
<thead>
<tr>
<th>GHG reduction with regard to 1990</th>
<th>2020</th>
<th>2030*</th>
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<tbody>
<tr>
<td></td>
<td>20%</td>
<td>min. 40%</td>
</tr>
<tr>
<td></td>
<td>▪ Mandatory at EU level</td>
<td>▪ Mandatory at EU level</td>
</tr>
<tr>
<td></td>
<td>▪ Reached because of economical crisis, RES growth and cheap gas</td>
<td>▪ Possible to reach as bypass effect of next goals</td>
</tr>
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</table>

<table>
<thead>
<tr>
<th>RES ratioo at final energy consumption**</th>
<th>20 %</th>
<th>min 32 %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>▪ Mandatory at national level as a specific goals</td>
<td>▪ Mandatory at EU level, national goals</td>
</tr>
<tr>
<td></td>
<td>▪ Good chance to reach at EU level</td>
<td>▪ Heat, electricity and transport</td>
</tr>
<tr>
<td></td>
<td></td>
<td>▪ EU RES electricity should increase to 55% (34% in 2020)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Energy savings (EED***), with regard to business-as-usual predictions 2007</th>
<th>20 %</th>
<th>min 32,5 %</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>▪ Indicative at national level</td>
<td>▪ Indicative at EU level</td>
</tr>
<tr>
<td></td>
<td>▪ Obligatory savings in final consumption</td>
<td>▪ Mandatory annual savings 0,8% at national level</td>
</tr>
<tr>
<td></td>
<td>▪ EC low attention in past years</td>
<td>▪ Slight energy consumption decrease till 2030</td>
</tr>
</tbody>
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* 2030 goals might be revised (increased) in 2023  
** RES – valid for general energy production (not only electricity)  
*** EED – Energy Efficiency Directive
NEW NUCLEAR BUILD
CONTENT

- Current situation and possibilities
- ČEZ - nuclear projects - status
ČEZ IS OPERATING 6 NUCLEAR UNITS ON 2 SITES

**DUKOVANY NPP 4 x 500 MWe (VVER 440 type V213)**
- In operation since 1985
- Power uprate from 440 MW to 500 MW
- Operational licence renewal 2015-2917
- Safe long time operation (LTO) program since 2016
- LTO +20/ +30 (50/ 60 years of operation)

**TEMELÍN NPP 2 x 1000 MWe (VVER 1000 type V320)**
- In operation since 2000
- Power uprate from 982 MW to 1082 MW
- Temelín NPP is built and designed at the highest level of safety, last NPP in Europe
- LTO +30 (60 years of operation)
NUCLEAR NEW BUILDS STATUS

- SPV (Special Purpose Vehicle) established, feasibility studies approved
- Temelin: EIA, Initial Safety Report, Nuclear siting license
  Dukovany: EIA assessment expected
- Other preparatory works and related investments in progress (grid connection, transport routes, etc.)

Next steps:
- Investment arrangements, state involvement
- Financing arrangements
- Tender preparation – out of the Public procurement law
NEW BUILDS AFTER EU ENERGY MARKET CHANGES

Nuclear new build cannot be pure investment in current EU environment

To realize state energy policy, the state has to:

1. Realize the new build as state investment, or
2. Ensure the preconditions to realize the project under clear conditions and defined risks

Ad 2) Vital preconditions (in general valid also for state investment):

- Ensure the profitability
- State responsibility for risks out of investor control (national legislation, state administration)
- Legislation to allow project preparation and realization in a real time (law unambiguity)
- State administration (keeping the time limits, capabilities, resources, etc.).
- National energy policy promotion in EU environment
ČEZ’S GROUP NUCLEAR COMPETENCIES

- The first research reactor was put into operation in the Czechoslovakia in 60’, making the country the 7th in the world in peaceful use of the Nuclear energy (reactor installed at NRI Řež).
- ČEZ safely operates 6 nuclear units (4×VVER440 Dukovany, 2 × VVER1000 Temelin)
- ČEZ prepares three new nuclear project (Temelín 3&4, Dukovany 5&6, New unit at Jaslovske Bohunice NPP – Slovakia).
- Škoda Praha was the original general supplier of the technology for all nuclear units in Czechoslovakia including Temelín 1&2 NPP; Škoda Praha is also an EPC supplier of the conventional plants (coal, gas).
- Energoprojekt (currently a division of NRI Řež) was the general designer of all nuclear units in Czechoslovakia including Temelín 1&2.
- NRI Řež is active not only in support of currently operating plant (especially research for life time extension) but also in generation IV. Research (for example Allegro) as well as partially in Small modular reactors.
MODERATE GROWTH OF NUCLEAR PUBLIC ACCEPTANCE

Q4) Do you personally support nuclear in Czech? (Nr of respondents =500)
THANK YOU FOR YOUR ATTENTION