Trends on Coal Fired Power Plants in Europe
Dr. Thomas Eck, 30 November 2018, New Delhi
1. Europe’s Energy Targets / Consequences for Thermal Power Plants

2. VGB Performance Data Base KISSY – latest Availability Assessments

3. R&D Initiatives of VGB
1. EU’s Targets for Renewables

EU-targets for RES till 2020:

- 20% share of renewable energy in gross final energy consumption
- 10% share of energy from renewable sources in transport

Source: Eurostat 2018 (data base: 2016)
## 1. Coal Phase out in Europe

<table>
<thead>
<tr>
<th>Country</th>
<th>Capacity coal-fired power plant as of 2016</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>15 GW</td>
<td>Exit announced until 2025</td>
</tr>
<tr>
<td>France</td>
<td>~ 3 GW</td>
<td>Exit announced until 2022</td>
</tr>
<tr>
<td>Finland</td>
<td>~ 3 GW</td>
<td>Exit announced until 2030</td>
</tr>
<tr>
<td>Denmark</td>
<td>&lt; 3 GW</td>
<td>Exit announced until 2025</td>
</tr>
<tr>
<td>Portugal</td>
<td>&lt; 2 GW</td>
<td>Exit announced until 2025</td>
</tr>
<tr>
<td>Ireland</td>
<td>~ 1 GW</td>
<td>Exit announced until 2025</td>
</tr>
<tr>
<td>Austria</td>
<td>&lt; 1 GW</td>
<td>Exit announced until 2025</td>
</tr>
<tr>
<td>Sweden</td>
<td>&lt; 0.5 GW</td>
<td>Exit announced until 2025</td>
</tr>
<tr>
<td>Germany</td>
<td>~ 48 GW</td>
<td>Exit from coal or shut down under discussion</td>
</tr>
<tr>
<td>Spain</td>
<td>~ 10 GW</td>
<td>Exit from coal or shut down under discussion</td>
</tr>
<tr>
<td>Italy</td>
<td>~ 8 GW</td>
<td>Exit from coal or shut down under discussion</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>&lt; 6 GW</td>
<td>Exit from coal or shut down under discussion</td>
</tr>
</tbody>
</table>
1. Capacity Development of Nuclear and Thermal Power Plants in Germany

A significant shutdown of dispatchable conventional generation will not be covered by capacity additions except on basis of variable renewables (mainly wind and PV). This drives storage solutions such as Power-to-X.

* Subject to decision of Bundesnetzagentur on system relevance, Source: BNetzA
Agenda

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2. Analysis of performance and availability with the database KISSY

**Target:** Optimization of power plants in a competitive and harsh market environment

1. Collection of **availability data** and determination of **performance indicators**,
2. Recording of **unavailability incidents** for individual power plant components,
3. Analysis of **reliability indicators** of components,
4. **Benchmarking** of a power plant with a peer group of similar plants,
5. Definition basis: VGB-Standard „Technical and commercial Indicators of Power Plants“ *(VGB-S002-03 2016)*
   
   free download from www.vgb.org

**Products:**
- annual VGB report TW 103 V „Availability of Power Plants“,  
- individual analysis,  
- Special reports, e.g. VGB/WEC availability report for WEC Istanbul Summit 2016

KISSY is the leading performance database for power plants and renewable-based generating facilities and delivers strategic important KPIs based on internationally recognised definitions and methods for more than 40 years.
2. Development of Availability and Utilization of HC plants

Energy availability of European power plants

- Energy availability, coal
- Energy availability, natural gas

Year: 1998 to 2016
Energy availability in %
2. Trend Analysis of Unavailability in HC plants

Unavailability (UA) of European power plants

- UA planned, coal
- UA disposable, coal
- UA not disposable, coal
- UA planned, nat. gas
- UA disposable, nat. gas
- UA not disposable, nat. gas.

Unavailability in %

12
10
8
6
4
2
0


Year
The majority of incidents is caused by coal handling devices and the evaporator. Lost generation is mainly caused by systems with extensive repairs (evaporator) and/or long-lead items (turbine, generator).
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Wear investigation model for thermal power plants at supply of control power

Scope:
- Determination of component stresses on the basis of pressure and temperature gradients from the simulation calculations
- Transient thermodynamic power plant models for 3 reference power plants:
  - Lignite-fired power plant Jänschwalde
  - Coal-fired power plant Rostock
  - Combined-cycle plant Mainz-Wiesbaden
- Inclusive emulation of original control technology for showing of primary and secondary control processes
- Damage mechanism, stress and lifetime consumption
- Wear of control valves at primary control
3. R&D results: Wear investigation model (VGB632)

Main results

- Rising number of startups and shutdowns, load gradients and load change -> Operation beyond original design
- Impact of primary and secondary control regarding fatigue limit according to DIN EN 12952 for defined components in the water-steam-cycle uncritical (approach: investigation of components free of cracks)

- Continous primary control (by throttling) leads to reduced operation duration of turbine control valve by at least 20%
- Small and frequent load changes through primary and secondary control lead to an increased crack growth failure at single components
Thank you for your interest!

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