DEMAND RESPONSE AN OPTION FOR RESERVE POWER / REDISPATCH?

DR. R. ENZENHÖFER, V. DÜTSCH
08.04.2016
**Thesis**

**DEMAND RESPONSE IS AN OPTION …**

<table>
<thead>
<tr>
<th>Thesis 1</th>
<th>... for short and small redispatch calls!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis 2</td>
<td>... for just-in-time redispatch calls!</td>
</tr>
<tr>
<td>Thesis 3</td>
<td>... to reduce power reserve calls!</td>
</tr>
<tr>
<td>Thesis 4</td>
<td>... to re-organise the calling order according to EnWG!</td>
</tr>
</tbody>
</table>
Current consequences at TransnetBW of the German Energiewende

INCREASING CHALLENGE

Days with measures (§13 (1), §13(2) EnWG) @ TransnetBW

- Grid-related
- Market-related for partner-TSO
- Market-related
- Total sum

Bar chart showing the number of days per year with measures from 2010 to 2015:
- 2010: 37 days
- 2011: 73 days
- 2012: 147 days
- 2013: 199 days
- 2014: 261 days (market-related)
- 2015: 290 days (market-related for partner-TSO, total sum)
Products and Tools for Redispatch

LOAD SHEDDING UNITS WITHIN ABLAV

/ 50 MW minimum load
/ >= 110 kV connection point
/ product: SOL (seconds) / SNL (minutes)
/ 3 call duration options (A, B, C)
/ 4 partners (6 contracts)
/ Business branch: aluminium & chemistry

Source: intern
Products and Tools for Redispatch

NATIONAL RESERVE POWER IN THE SOUTH

- Combined heat and power Heilbronn (EnBW) 250 MW
  - Units 5/6 since 04/2015 (1965-1966*)

- Power plant Walheim (EnBW) 244 MW
  - Units WAL1, WAL2 since 07/2014 (1964-1967*)

- Power plant Marbach (EnBW) 424 MW
  - Units GT II/GT III/DT III (1971-1975*)

- Power Plant Mainz-Wiesbaden AG KW 2 (1977*)
- Kraftwerk Staudinger (E.ON) Unit 4 (1977*)

- ∑ Net power: 3.0 GW
- ∑ TransnetBW: 0.9 GW
- Irsching, Block 3 (E.ON) (1974*)
- Ingolstadt, Units 3/4 (E.ON) (1973-1974*)

*start of commercial power production

source: BNetzA
Products and Tools for Redispatch

INTERNATIONAL POWER RESERVE

/ ca. 4 GW for Winter 2016/17 (*under contractual development)
/ Italy
/ Austria
/ Switzerland
/ France

RD demand international reserve power in Germany

<table>
<thead>
<tr>
<th>Period</th>
<th>RD Demand [MW]</th>
</tr>
</thead>
<tbody>
<tr>
<td>winter 13/14</td>
<td>183</td>
</tr>
<tr>
<td>winter 14/15</td>
<td>64</td>
</tr>
<tr>
<td>Q1/2015</td>
<td>545</td>
</tr>
<tr>
<td>winter 15/16</td>
<td>3735</td>
</tr>
<tr>
<td>winter 16/17</td>
<td>3924</td>
</tr>
<tr>
<td>winter 17/18</td>
<td>3096</td>
</tr>
</tbody>
</table>

source: intern
Products and Tools for Redispatch

CHALLENGES BY TOOLS/PRODUCTS

/ Loads
  / smaller in size (MW)
  / lower availability (hours/day)

/ Reserve power plants
  / slow in starting
  / long-term order (capacities)

/ Market power plants
  / delayed reaction to DACF
  / quality of schedule information
Thesis 1: ... for short and small redispatch calls!

Thesis 2: ... for just-in-time redispatch calls!

Thesis 3: ... to reduce power reserve calls!

Thesis 4: ... to re-organise the calling order according to EnWG!
Thesis 1: Demand response is an option for short and small redispatch calls!

Is ABLA suitable for short and small?

**Congestion Management**
- Total number: 24 calls
- Total time: ~37 h
- Mean call duration: ~1h

**Balancing Purposes**
- Total number: 66 calls
- Total time: ~40 h
- Call duration: 7 min. to 1h

<table>
<thead>
<tr>
<th>SNL</th>
<th>PQ MW</th>
<th>Work MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type A</td>
<td>858</td>
<td>858</td>
</tr>
<tr>
<td>Type B</td>
<td>117</td>
<td>468</td>
</tr>
<tr>
<td>Type C</td>
<td>50</td>
<td>400</td>
</tr>
</tbody>
</table>

Type A (1h), B (4h) and C (8h)

Statsitic from 01.02.2014 to 15.09.2015
Thesis 1: Demand response is an option for short and small redispatch calls!

**IS THERE SMALL AND SHORT REDISPATCH?**

- Mean work: 108 MWh for “< 200 MW Calls” with std. dev. 61 MWh
- Mean work: 289 MWh for “< 400 MW Calls” with std. dev. 244 MWh

![Graph showing redispatch calls in 2015](image)

- \(\sum 400\text{MW: } 693 \times (2015)\)
- \(\sum 200\text{MW: } 333 \times (2015)\)

14-fold resp. 29-fold chance to increase redispatch use
Thesis 2: Demand response is an option for just-in-time redispatch calls!

**DSR A „BRIDGING“ TOOL**

- quick starting product in DACF process
- unforeseen power plants unavailability
- ramping period for slow starting plants
- peak demand due to weather changes
- +/- 3h reserve power hold due to weather changes
Thesis 3: Demand response is an option to reduce power reserve calls!

**FULL AND PARTIAL SUBSTITUTION**

Reserve power use in Germany

<table>
<thead>
<tr>
<th>Days per Year</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2015</td>
<td>36</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2016*</td>
<td>32</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* national reserves ø131 MW units
international reserves 2 of 4 <= 100MW portfolio

Reserve power < 2000MWh winter 15/16

<table>
<thead>
<tr>
<th>Date</th>
<th>MWh</th>
</tr>
</thead>
<tbody>
<tr>
<td>09.11.2015</td>
<td>1000</td>
</tr>
<tr>
<td>15.11.2015</td>
<td>1950</td>
</tr>
<tr>
<td>19.01.2016</td>
<td>495</td>
</tr>
<tr>
<td>06.02.2016</td>
<td>1050</td>
</tr>
<tr>
<td>11.02.2016</td>
<td>1108</td>
</tr>
<tr>
<td>19.02.2016</td>
<td>50</td>
</tr>
<tr>
<td>25.02.2016</td>
<td>908</td>
</tr>
<tr>
<td>26.02.2016</td>
<td>1005</td>
</tr>
<tr>
<td>29.02.2016</td>
<td>50</td>
</tr>
<tr>
<td>01.03.2016</td>
<td>380</td>
</tr>
</tbody>
</table>

13% (6%) chance of reserve power use reduction in 2016*

*independent of geographical location
Thesis 4: Demand response is an option to re-organise the calling order according to EnWG!

MERIT-ORDER AND TIMELY CALLS

- XBID-1 intraday auction IT-CH reduced ATC
- 45% time: capacity < portfolio (Nov. 15)
- Afternoon mostly: < 1GW resp. 0MW

Examples:
- 13.11.2015: 17MW missing in 1h of 7h
- 24.11.2015: 523MW missing in 2h of 8h

- d-2 international power reserve order to guarantee capacity

DSR as a bridging tool to re-organise the merit-order
Conclusion

DEMAND RESPONSE IS AN OPTION ...

Thesis 1 … for short and small redispatch calls! ✓
/ 14-times / 29-times redispatch use potential

Thesis 2 … for just-in-time redispatch calls! ✓
/ DSR is a bridging tool (unforeseen events, weather changes)

Thesis 3 … to reduce power reserve calls! ✓
/ 13% (6%) full substitution chance in 2016

Thesis 4 … to re-organise the calling order according to EnWG! ✓
What is needed besides the HVDC powerline projects?

OUTLOOK TO STRENGTHEN DSR AS ONE FLEXIBILITY OPTION

/ Concept for system operation
  / combined merit-order of all redispatch products with geographical info
  / objective-decision making tool considering unavailabilities of loads
  / Case scenarios (e.g. CACM and loads as a “bridging” product)

/ Larger load portfolio
  / more frequent, longer and larger calls
  / smooth ramping as load is a block product
  / load shedding units in southern Germany
  / additional load units in northern Germany

>> New load shedding guideline (AbLaV) might address some aspects!
THANK YOU!

Dr. R. Enzenhöfer
TransnetBW
Products & Principles / NNP
>> Smart System, AbLaV
renzenhoefer@transnetbw.de
Tel.: 0711 – 21858 – 3104

Herr V. Dütsch
TransnetBW
Products & Principles / NNP
>> Redisptach, black start
v.duetsch@transnetbw.de
Tel.: 0711 – 21858 – 3086

We always have a need for ambitious student workers! Please contact us!