Learning ML-based representations of dispatchable assets

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RES penetration changes the way dispatchable assets are operated, stressing the need for on-demand flexibility.

Can we use ML to better model dispatchable assets?

In particular, we want to derive plant-specific:

- Techno-economic characteristics
- Strategic behaviour.

Figure: Gas plant Lichterfelde, Berlin (Source: Wikimedia Commons)
Figure: ML-pipeline to derive unit-level parameters.
Operational data on EU generation units $\geq 100$ MWp in compliance with REMIT and Transparency.

- **Hourly generation**
- **Unavailability events.**

<table>
<thead>
<tr>
<th>Unit type</th>
<th>Number of units</th>
<th>% of capacity</th>
<th>% of generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lignite</td>
<td>28</td>
<td>83.1%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Fossil gas</td>
<td>56</td>
<td>53.8%</td>
<td>80.4%</td>
</tr>
<tr>
<td>Hard coal</td>
<td>42</td>
<td>87.5%</td>
<td>89.5%</td>
</tr>
<tr>
<td>Hydro (storage)</td>
<td>38</td>
<td>73.4%</td>
<td>77.0%</td>
</tr>
<tr>
<td>Hydro (other)</td>
<td>6</td>
<td>18.9%</td>
<td>12.8%</td>
</tr>
<tr>
<td>Nuclear</td>
<td>6</td>
<td>100.0%</td>
<td>99.9%</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>16.8%</td>
<td>14.1%</td>
</tr>
</tbody>
</table>

**Table:** Reporting generation units for Germany in 2021.
Urgent Market Messages (UMMs) must be brought into a time series form.

Data presents several issues:

- **Data availability**
- **Message overloading**
- **Overlapping events**.
Preliminary steps (2)

Agglomerative interval clustering

1. [Graph showing interval clustering]

Step-wise cleaning

2. [Graph showing step-wise cleaning of data]

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Preliminary results

Key findings:

- Deviations from literature assumptions
- Unclear data generation and pipeline
- Heterogeneity in the data quality.

<table>
<thead>
<tr>
<th>Unit type</th>
<th>Method 1</th>
<th>Method 2</th>
<th>Method 3</th>
<th>Literature¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lignite</td>
<td>83.2%</td>
<td>87.0%</td>
<td>87.1%</td>
<td>85.6%</td>
</tr>
<tr>
<td>Fossil gas</td>
<td>73.7%</td>
<td>76.7%</td>
<td>74.6%</td>
<td>88 - 98%</td>
</tr>
<tr>
<td>Fossil oil</td>
<td>73.1%</td>
<td>73.1%</td>
<td>73.2%</td>
<td>93 - 95%</td>
</tr>
<tr>
<td>Hard coal</td>
<td>63.5%</td>
<td>71.2%</td>
<td>75.5%</td>
<td>85.6%</td>
</tr>
</tbody>
</table>

Table: Average available capacity (h/a %) for Germany in 2021.

Thank you for your time and attention!
Feedback and questions at: c.fusarbassini@hertie-school.org.