Investor Group Lunch

London, 12 July 2011

Stefan Judisch, CEO

RWE Supply & Trading GmbH
In Central Europe, the Biedermeier era refers to the middle-class sensibilities of the historical period between 1815, the year of the Congress of Vienna at the end of the Napoleonic Wars, and 1848, the year of the European revolutions.

Biedermeier can be associated with two phases in early 19th-century German history:

- The first is the growing urbanisation and industrialisation leading to a new urban middle class, and with it a new kind of audience.

- The second is the growing political oppression following the end of the Napoleonic Wars, prompting people to concentrate on the domestic and the non-political (at least in public). Due to the strict control of publication and official censorship, Biedermeier writers primarily concerned themselves with non-political subjects such as historical fiction and country life. Political discussion was usually confined to the home, in the presence of close friends.
17 March 2011, Germany
…on the edge of nuclear hysteria

You are provisionally arrested!

If in a highly developed country like Japan, a country with high safety standards and safety requirements, nuclear consequences from an earthquake and a tsunami can't be prevented, this has consequences for the whole world, it has consequences for Europe and it has consequences for us in Germany.

Angela Merkel (German Chancellor)

The executive branch cannot override laws.

Norbert Lammert (President of the Bundestag)
The German nuke shutdown makes the CWE power markets much more vulnerable to tight supply/demand situations especially in Q4 2011

1. **Tighter German system**
The nuke shutdown removed 8.5 GW of baseload nuclear capacity, reducing supply surplus.

2. **Delays in new build commissioning**
For Q3, there were 3 new builds scheduled to come online in Germany. Boxberg (675 MW, lignite) has just been postponed to the beginning of 2013. The two other remaining new builds, Walsum 10 (750 MW, hard coal, T24 steel problems) and Neurath G (1,050 MW lignite), also suffer commissioning delays. This will further stress the German power system.

3. **Increasing cross border dependency**
Germany will be more exposed to net imports and thus, weather and availability effects from neighbouring countries. This also means Germany will not be able to mitigate price spikes in the same way as it did before. Even worse, Germany will rather amplify spike risk due to its import requirements.

4. **Higher spike potential in tight supply-demand situations**
Further upside is provided by delays in French nuke revisions or strike actions and cold weather with low wind in Q4 2011. The stronger dependency on French imports also justifies a higher risk premium due to the steepness of the French stack and the higher weather sensitivity of the southern region of France (“rich Brits and Russians effect”). This leads to higher spike potential in tight supply/demand situations (as in Q4 2010).

5. **Alpine and Nordic hydro situation**
There is an increasing risk that an Alpine and Nordic hydro deficit as in the first five months of 2011 will limit power imports to Germany over the course of this year.
The nuke shutdown reduced base load nuclear capacity in Germany by 6.3 GW*

> Further planned nuke revisions lead to an additional tightening of 6.6 GW**

> Volatile wind and solar power production cannot substitute reliable nuke power production

**Excludes Brunsbüttel and Krümmel (2 GW in total) as these plants were offline since 2007**

**Emsland, Grafenrheinfeld, Grohnde, Gundremmingen B, Philippsburg II**
Compared to 2010, there is a significant lack of reliable baseload capacity in Germany for 2011.
Due to the nuke shutdown Germany becomes a net power importer

> Until 17 March, Germany was a net power exporter of ~ 3,800 MW; since the nuke moratorium, Germany imports ~ 1,800 MW power

> Power imports from France and the Czech Republic have doubled. In particular, France has become a net power exporter to Germany; after the German nuke moratorium France cannot count on German imports any longer

![Total German Cross Border Nominations](chart)
With an increase in power imports, Germany is more exposed to weather and availability effects from abroad

> Increased import dependency due to the nuke shutdown, especially towards France as largest swing border

> Import of further sensitivity towards French nuclear unavailability in addition to domestic revisions in Germany

> Import of further weather sensitivity in addition to large domestic wind, solar and temperature sensitivity
  
  – French temperature sensitivity
  
  – Nordic and Alpine hydro sensitivity

Source: www.entsoe.eu
An example: In Q4 2010, a combination of high load and low nuke plant availability in France resulted in...

- France was facing a first cold snap in October 2010 and an extremely cold December 2010, resulting in increasing load (2.3 GW/°C)

- Nuke production was still reduced due to delays in revisions

French Load vs Power Production

- French load < power production
- French load > power production

Diagram showing the relationship between French temperature (mean) and power production over time.
...high import requirements of France and…

What happened?

> Strong French power imports from Germany (about 3 GW)

> French power exports to Italy (via CH) dropped to zero or even flipped; France imported power from Italy

Cross border nominations France

Nuke moratorium

(Germany became net importer of French power)
...high French prices, which were coupled to and even exceeded Italian price levels

> Power imports from Italy to France caused an increase in prices at Powernext and in extreme cases as in Dec 2010 as well at the EEX

> After the nuke moratorium, Germany is no longer able to export power to France. French and German prices will link much earlier to the Italian price levels

> As a net importer, Germany will be exposed to price spikes in neighbouring countries

Italian GME prices are set by marginal costs of oil-fired power stations in tight peak hours
Ceteris paribus simulation of EEX hourly spot prices for winter 2010/2011 in Germany with supply reduced by 6.3 GW
Ceteris paribus simulation of EEX hourly spot prices for winter 2010/2011 in Germany with supply reduced by 6.3 GW for the most expensive day in October 2010 (19.10.)
Ceteris paribus simulation of EEX hourly spot prices for winter 2010/2011 in Germany with supply reduced by 6.3 GW for the most expensive day in November 2010 (10.11.)

<table>
<thead>
<tr>
<th>hour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX price</td>
<td>39.25</td>
<td>36.74</td>
<td>35.09</td>
<td>34.29</td>
<td>33.59</td>
<td>39.27</td>
<td>46.91</td>
<td>55.55</td>
<td>56.30</td>
<td>57.97</td>
<td>58.37</td>
<td>60.03</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>63.53</td>
<td>67.52</td>
<td>67.57</td>
<td>61.66</td>
<td>58.93</td>
<td>62.84</td>
<td>74.10</td>
<td>500.02</td>
<td>1469.47</td>
<td>3000.00</td>
<td>3000.00</td>
<td>2731.68</td>
</tr>
<tr>
<td>price increase in %</td>
<td>62%</td>
<td>84%</td>
<td>93%</td>
<td>80%</td>
<td>75%</td>
<td>60%</td>
<td>58%</td>
<td>800%</td>
<td>2510%</td>
<td>5075%</td>
<td>5040%</td>
<td>4451%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>hour</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX price</td>
<td>58.06</td>
<td>56.91</td>
<td>53.17</td>
<td>52.54</td>
<td>56.00</td>
<td>66.26</td>
<td>75.06</td>
<td>66.33</td>
<td>56.19</td>
<td>46.42</td>
<td>46.94</td>
<td>41.90</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>2645.28</td>
<td>1810.35</td>
<td>752.67</td>
<td>500.01</td>
<td>288.91</td>
<td>2412.24</td>
<td>3000.00</td>
<td>3000.00</td>
<td>181.60</td>
<td>67.53</td>
<td>67.52</td>
<td>61.16</td>
</tr>
<tr>
<td>price increase in %</td>
<td>4456%</td>
<td>3081%</td>
<td>1316%</td>
<td>852%</td>
<td>416%</td>
<td>3541%</td>
<td>3897%</td>
<td>4423%</td>
<td>223%</td>
<td>45%</td>
<td>44%</td>
<td>46%</td>
</tr>
</tbody>
</table>
Ceteris paribus simulation of EEX hourly spot prices for winter 2010/2011 in Germany with supply reduced by 6.3 GW for the most expensive day in December 2010 (14.12.)

<table>
<thead>
<tr>
<th>hour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX price</td>
<td>50.80</td>
<td>45.25</td>
<td>45.72</td>
<td>44.05</td>
<td>44.18</td>
<td>47.93</td>
<td>57.05</td>
<td>84.99</td>
<td>79.51</td>
<td>78.92</td>
<td>79.45</td>
<td>78.04</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>73.65</td>
<td>65.20</td>
<td>65.50</td>
<td>63.06</td>
<td>64.67</td>
<td>68.27</td>
<td>89.95</td>
<td>1271.49</td>
<td>1353.96</td>
<td>1179.61</td>
<td>1601.08</td>
<td>1098.55</td>
</tr>
<tr>
<td>price increase in %</td>
<td>45%</td>
<td>44%</td>
<td>43%</td>
<td>43%</td>
<td>46%</td>
<td>42%</td>
<td>58%</td>
<td>1396%</td>
<td>1603%</td>
<td>1395%</td>
<td>1915%</td>
<td>1308%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>hour</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX price</td>
<td>72.72</td>
<td>74.93</td>
<td>73.27</td>
<td>73.04</td>
<td>78.32</td>
<td>103.48</td>
<td>92.75</td>
<td>77.55</td>
<td>71.86</td>
<td>54.99</td>
<td>52.91</td>
<td>47.79</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>313.33</td>
<td>479.83</td>
<td>499.99</td>
<td>530.07</td>
<td>479.82</td>
<td>3000.00</td>
<td>2757.52</td>
<td>1078.70</td>
<td>276.09</td>
<td>87.74</td>
<td>79.53</td>
<td>71.99</td>
</tr>
<tr>
<td>price increase in %</td>
<td>331%</td>
<td>540%</td>
<td>582%</td>
<td>626%</td>
<td>513%</td>
<td>2799%</td>
<td>2873%</td>
<td>1291%</td>
<td>284%</td>
<td>60%</td>
<td>50%</td>
<td>51%</td>
</tr>
</tbody>
</table>
Ceteris paribus simulation of EEX hourly spot prices for winter 2010/2011 in Germany with supply reduced by 6.3 GW for the most expensive day in January 2011 (24.01.)

<table>
<thead>
<tr>
<th>hour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX</td>
<td>48.15</td>
<td>47.47</td>
<td>45.82</td>
<td>43.54</td>
<td>42.39</td>
<td>44.91</td>
<td>57.17</td>
<td>67.83</td>
<td>66.76</td>
<td>66.37</td>
<td>66.12</td>
<td>65.71</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>83.85</td>
<td>77.16</td>
<td>72.80</td>
<td>68.60</td>
<td>65.94</td>
<td>72.92</td>
<td>114.45</td>
<td>500.08</td>
<td>1390.75</td>
<td>1851.28</td>
<td>1856.34</td>
<td>1516.15</td>
</tr>
<tr>
<td>price increase in %</td>
<td>74%</td>
<td>63%</td>
<td>59%</td>
<td>58%</td>
<td>56%</td>
<td>62%</td>
<td>100%</td>
<td>637%</td>
<td>1983%</td>
<td>2689%</td>
<td>2708%</td>
<td>2207%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>hour</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX</td>
<td>64.99</td>
<td>64.72</td>
<td>63.89</td>
<td>63.05</td>
<td>63.11</td>
<td>66.42</td>
<td>67.32</td>
<td>64.88</td>
<td>61.09</td>
<td>54.54</td>
<td>52.76</td>
<td>47.00</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>1754.22</td>
<td>1667.95</td>
<td>1297.38</td>
<td>500.10</td>
<td>826.07</td>
<td>2151.64</td>
<td>2000.08</td>
<td>1737.62</td>
<td>247.92</td>
<td>89.02</td>
<td>80.08</td>
<td>69.17</td>
</tr>
<tr>
<td>price increase in %</td>
<td>2599%</td>
<td>2477%</td>
<td>1931%</td>
<td>693%</td>
<td>1209%</td>
<td>3139%</td>
<td>2871%</td>
<td>2578%</td>
<td>306%</td>
<td>63%</td>
<td>52%</td>
<td>47%</td>
</tr>
</tbody>
</table>
Ceteris paribus simulation of EEX hourly spot prices for winter 2010/2011 in Germany with supply reduced by 6.3 GW for the most expensive day in February 2011 (28.02.)
Ceteris paribus simulation of EEX hourly spot prices for winter 2010/2011 in Germany with supply reduced by 6.3 GW for the most expensive day in March 2011 (14.03.)

<table>
<thead>
<tr>
<th>hour</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX</td>
<td>49.73</td>
<td>47.66</td>
<td>44.84</td>
<td>41.95</td>
<td>42.07</td>
<td>45.94</td>
<td>63.62</td>
<td>64.91</td>
<td>69.72</td>
<td>70.33</td>
<td>67.17</td>
<td>66.42</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>89.52</td>
<td>65.97</td>
<td>64.53</td>
<td>61.52</td>
<td>61.43</td>
<td>67.24</td>
<td>299.98</td>
<td>713.64</td>
<td>3000.00</td>
<td>3000.00</td>
<td>2854.56</td>
<td>2562.45</td>
</tr>
<tr>
<td>price increase in %</td>
<td>80%</td>
<td>38%</td>
<td>44%</td>
<td>47%</td>
<td>46%</td>
<td>46%</td>
<td>372%</td>
<td>999%</td>
<td>4203%</td>
<td>4166%</td>
<td>4150%</td>
<td>3758%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>hour</th>
<th>13</th>
<th>14</th>
<th>15</th>
<th>16</th>
<th>17</th>
<th>18</th>
<th>19</th>
<th>20</th>
<th>21</th>
<th>22</th>
<th>23</th>
<th>24</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEX</td>
<td>65.61</td>
<td>65.15</td>
<td>63.67</td>
<td>62.91</td>
<td>61.19</td>
<td>61.99</td>
<td>67.66</td>
<td>77.08</td>
<td>63.99</td>
<td>55.02</td>
<td>54.31</td>
<td>48.18</td>
</tr>
<tr>
<td>EEX price -6.3 GW</td>
<td>1478.31</td>
<td>1406.26</td>
<td>1132.79</td>
<td>300.02</td>
<td>576.32</td>
<td>500.02</td>
<td>3000.00</td>
<td>3000.00</td>
<td>359.36</td>
<td>86.40</td>
<td>89.29</td>
<td>72.68</td>
</tr>
<tr>
<td>price increase in %</td>
<td>2153%</td>
<td>2059%</td>
<td>1679%</td>
<td>377%</td>
<td>842%</td>
<td>707%</td>
<td>4334%</td>
<td>3792%</td>
<td>462%</td>
<td>57%</td>
<td>64%</td>
<td>51%</td>
</tr>
</tbody>
</table>
French nuke unavailability in Q4 2011 could further stress the supply situation

- Availability in France for Q4 2011 looks challenging due to a back loaded revision programme in 2011

- Subsequent delays of French nuke revisions together with cold weather conditions will significantly increase the spike potential as Germany will rather amplify than mitigate the spike potential due to the nuke shutdown.

- In 2011, nine 10-year-inspections of nuke power plants leading to a 100-day outage period are planned. This number is three 10-year inspections above the long-term average.

- Aging French nuclear fleet and possible strike actions could further increase availability problems.

**Unavailable Nuclear Capacity**

![Graph showing unavailable nuclear capacity with actual and forecasted data.](image-url)
Import of weather sensitivity
Alpine and Nordic hydro situation

> There is an increasing risk that the Alpine and Nordic hydro deficit will limit power imports to Germany over the course of this year

> The Alpine hydro situation was severe in first five months of 2011:
  
  – Bodensee/Lake Constance water levels close to 150-year minimum

> The Nordic hydro deficit in first five months of 2011 was due to the following reasons:
  
  – Beginning of snow melt began one month earlier than usual

  – Low snow pack might lead to flatter seasonal filling shape unless high precipitation amounts in summer fill the gap

Reservoir Content for Norway

Source: www.nordpoolspot.com
Current developments put further pressure on the CWE power markets
Decision to phase out nuclear power by 2022

On 30 June 2011, the „Federal Legislative Body (Bundestag)“ voted for a shutdown timeframe of all nuke power plants in Germany; the plants provisionally off-line before the vote will now permanently shut down and the remaining 13 GW will be phased out progressively over 2015-2022.

### Comparison of 2009 and Current Shutdown Timeframe

<table>
<thead>
<tr>
<th>Year</th>
<th>Capacity in GW</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>22</td>
</tr>
<tr>
<td>2011</td>
<td>20</td>
</tr>
<tr>
<td>2012</td>
<td>18</td>
</tr>
<tr>
<td>2013</td>
<td>16</td>
</tr>
<tr>
<td>2014</td>
<td>14</td>
</tr>
<tr>
<td>2015</td>
<td>12</td>
</tr>
<tr>
<td>2016</td>
<td>10</td>
</tr>
<tr>
<td>2017</td>
<td>8</td>
</tr>
<tr>
<td>2018</td>
<td>6</td>
</tr>
<tr>
<td>2019</td>
<td>4</td>
</tr>
<tr>
<td>2020</td>
<td>2</td>
</tr>
<tr>
<td>2021</td>
<td></td>
</tr>
<tr>
<td>2022</td>
<td></td>
</tr>
<tr>
<td>2023</td>
<td></td>
</tr>
</tbody>
</table>

- **March 2011**
  - Biblis A
  - Biblis B
  - Brunsbüttel
  - Isar 1
  - Krümmel
  - Neckarwestheim 1
  - Philippsburg 1
  - Unterweser

- **End of 2015** Grafenrheinfeld
- **End of 2017** Gundremmingen B
- **End of 2019** Philippsburg 2
  - Grohnde
  - Brokdorf
  - Gundremmingen C
- **End of 2021**
  - Isar 2
  - Neckarwestheim 2
  - Emsland
- **End of 2022**
  - Isar 2
  - Neckarwestheim 2
  - Emsland
- **End of 2023**
Current developments put further pressure on the CWE power markets

Carbon price crash

![Graph showing the development of Carbon and Power prices from Jan 2009 to Jul 2011. The graph illustrates the decline in Carbon price (Dec 2012) with a significant drop of 20% from Jan 2009 to early 2011. The blue line represents the German power price base load (2012), while the red line shows the Carbon price (Dec 2012).]
Current developments put further pressure on the CWE power markets

Carbon price crash

> Carbon prices fell to lowest level since the recession in 2009 within the last four weeks

> What are the reasons?


  – Supply and demand balance is sensitive to assumptions regarding emissions, banking, CER’s, NER* 300, aviation

  – EU is planning to impose new energy efficiency legislation on the same sectors that are included in the ETS. This lowers emissions from these sectors and demand decreases

  – Poland does not intend to restrict the supply of emissions allowances

  – International pressure to exclude airlines from ETS

> Currently, carbon prices do not provide an investment signal for renewable technology

* New Entrants Reserve
Germany needs to guard against a serious tight supply/demand situation in Q4 2011 with an expected significant increase in power prices.

- Tighter German system
- Delays in new build commissioning
- Increasing cross border dependency
- Risk of Alpine and Nordic hydro deficit
- Higher spike potential in tight supply-demand situations
The German power grid regulator is already preparing for a severe supply shortage in Q4 2011

> German power grid regulator is considering **several scenarios to stabilise the grid in Q4 2011** to make up for the nuke shutdown

> Scenarios include reactivating idle fossil-fuel power plants or keeping one of the eight reactors taken off the grid in March on standby (“cold reserve“)

> Peak demand in Germany may more than double to about 80 GW on a cold day in December

“If wind does not blow and the sun does not shine, southern Germany with large industries is most at risk of experiencing grid instabilities.“

“Our storage capacities will be depleted within a few hours and we won’t be able to import from France because they need their power themselves.“