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   4.3 Biomass 47
   4.4 Hydro 52
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   4.6 Venture Capital 66
5. Political Framework 69
RWE Group
Renewables within RWE's capacity and generation mix
(as of December 31th, 2011)

### Power plant capacity by primary energy source
(as of 12/2011, under IFRS)

<table>
<thead>
<tr>
<th>Primary Energy Source</th>
<th>Capacity (MW)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard coal</td>
<td>13,993</td>
<td>28.4</td>
</tr>
<tr>
<td>Lignite</td>
<td>10,581</td>
<td>21.5</td>
</tr>
<tr>
<td>Gas</td>
<td>11,873</td>
<td>24.1</td>
</tr>
<tr>
<td>Renewable energies</td>
<td>3,744</td>
<td>7.6</td>
</tr>
<tr>
<td>Pumped storage, oil, other</td>
<td>5,146</td>
<td>10.5</td>
</tr>
<tr>
<td>Nuclear</td>
<td>3,901</td>
<td>7.9</td>
</tr>
<tr>
<td>Total</td>
<td>49,238</td>
<td>100</td>
</tr>
</tbody>
</table>

### Electricity production by primary energy source
(as of 12/2011, under IFRS)

<table>
<thead>
<tr>
<th>Primary Energy Source</th>
<th>Production (TWh)</th>
<th>Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hard coal</td>
<td>47.8</td>
<td>23.2</td>
</tr>
<tr>
<td>Lignite</td>
<td>74.1</td>
<td>36.0</td>
</tr>
<tr>
<td>Gas</td>
<td>38.5</td>
<td>18.7</td>
</tr>
<tr>
<td>Renewable energies</td>
<td>8.8</td>
<td>4.3</td>
</tr>
<tr>
<td>Pumped storage, oil, other</td>
<td>2.2</td>
<td>1.1</td>
</tr>
<tr>
<td>Nuclear</td>
<td>34.3</td>
<td>16.7</td>
</tr>
<tr>
<td>Total</td>
<td>205.7</td>
<td>100</td>
</tr>
</tbody>
</table>
Renewable energy in RWE Group today: A leading renewables generation position in Europe

> **3.7 GW operational renewables assets** (December 2011) account for roughly

- 8% of the Group’s **generation capacity** and
- 4% of **electricity generation**.

> **2.4 GW is operated by RWE Innogy**, in which RWE pooled its renewable energy activities.

> On a RWE Group-wide level we intend to increase the share of RWE’s generation capacity accounted for by renewables to at least 20% by 2020.

---

1) Capacity with <50% RWE Innogy ownership is consolidated to 0 MW, capacity with 50% is consolidated to 50% of capacity, and capacity with >50% RWE Innogy ownership is consolidated to 100% of capacity.

2) Biomass generation is split between RWE Innogy, Essent and RWE npower. While RWE Innogy is mainly focused on smaller dedicated biomass plants Essent und RWE npower also run co-fired and converted coal stations.

3) RWE Group renewables capacity, of which 2.4 GW are operated by RWE Innogy (December 2011).
Focus on wind, hydro and biomass while also supporting new technologies

### Overview
- Established in February 2008
- Bundling renewables activities and competencies across RWE Group
  - Focus on capacity growth in commercially mature renewable technologies, i.e. wind, biomass and hydro
  - Research & Development and Venture Capital to drive the development of emerging technologies, e.g. solar, geothermal, marine
- European focus
- Asset portfolio of 2.4 GW in operation and 1.3 GW under construction mainly located in United Kingdom, Germany, Spain, Netherlands, Poland and Italy (Accounting view + PPA as at Q1 2012)
- Project pipeline of 13.7 GW consisting mainly of wind, hydro and biomass (Accounting view + PPA as at Q1 2012)

### Business Area

<table>
<thead>
<tr>
<th>Business Area</th>
<th>Wind onshore</th>
<th>Wind offshore</th>
<th>Hydro</th>
<th>Biomass</th>
<th>New technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Focus and Strategy</strong></td>
<td>Key technology for capacity growth</td>
<td>Key technology for capacity growth</td>
<td>Key technology for capacity growth</td>
<td>Optimisation of existing plants &amp; assets under construction</td>
<td>Driving innovative renewable technologies to commercial applications through Venture Capital, demonstration plants and R&amp;D</td>
</tr>
<tr>
<td></td>
<td>Focus on organic growth</td>
<td>Organic growth strategy leveraging strong position in UK</td>
<td>Development of hydro run-of-river and storage projects</td>
<td>Development of large scale upstream pellet positions in the USA</td>
<td>Development of large scale dedicated biomass options in the midterm</td>
</tr>
<tr>
<td></td>
<td>Focus markets include UK, Germany, Spain, Netherlands, Italy and Central- and South-Eastern Europe</td>
<td>Focus markets include UK, Germany and Netherlands</td>
<td>Focus area for new projects is South-Eastern Europe</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RWE Innogy
RWE Innogy management team: experienced – well connected – international

Dr. Hans Bünting
CEO
- Hydro Power & New Applications
- Human Resources
- Communications
- Strategy
- Markets & Political Affairs/CR
- Legal & Compliance
- Innogy Venture Capital GmbH*

Dirk Simons
CFO
- Controlling
- Procurement
- Tax, Accounts & Treasury
- M&A and Corporate Development
- Organisation and Information Management

Paul Coffey
COO
- Wind Onshore
- Wind Offshore
- Biomass
- Operational Safety
- Commercial

Education
- Degree in business administration
- Doctorate in business administration
- Degree in economics
- Degree in business and finance

Career Milestones
- 2008 – 12 RWE Innogy GmbH, CFO
- 2004 – 08 RWE AG, Head of risk management
- 2000 – 04 RWE Trading GmbH, various management positions in finance and risk controlling
- 1995 – 00 RWE Energie AG, various positions in finance and risk controlling
- 1990 – 95 Ruhr University Bochum, research associate
- 2011 – 12 RWE East, Head of Finance
- 2007 – 12 RWE Transgas, Vice-Chairman of the Board, CFO
- 2006 – 07 RWE Key Account Contracting GmbH (today RWE Innogy GmbH), CFO
- 2005 – 07 RWE Key Account GmbH (today part of RWE Supply & Trading GmbH business), CFO
- 1997 – 03 Diverse positions at RWE in finance and controlling
- 1995 – 97 Main-Kraftwerke AG, Specialist Controlling
- 2008 – 09 Managing Director Operations & Technology, Generation, at RWE npower plc
- 2007 – 08 Managing Director npower Business, Retail, at RWE npower plc
- 2005 – 07 Director Commercial Asset Management, Generation, at RWE npower plc
- 2002 – 05 Head of Commercial Development, European Wholesale Origination at RWE Trading GmbH
- 1999 – 02 Diverse range of positions at Northern Electric Plc including: energy retailing, trading & risk management and power generation

* Independent company
## Strong European footprint with focus on wind and hydro

### RWE Innogy operational capacities: Accounting view¹ + power purchase agreements, Q1 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Onshore Wind</th>
<th>Hydro</th>
<th>Offshore Wind</th>
<th>Biomass</th>
<th>Biogas</th>
<th>Solar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>450</td>
<td>376</td>
<td>110</td>
<td>1⁴</td>
<td>1</td>
<td></td>
<td>938</td>
</tr>
<tr>
<td>UK</td>
<td>335²</td>
<td>70</td>
<td>150²</td>
<td></td>
<td></td>
<td></td>
<td>555</td>
</tr>
<tr>
<td>Spain</td>
<td>447</td>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>459</td>
</tr>
<tr>
<td>Netherlands</td>
<td>201</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>201</td>
</tr>
<tr>
<td>Poland</td>
<td>108</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>108</td>
</tr>
<tr>
<td>Italy</td>
<td>66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>66</td>
</tr>
<tr>
<td>France</td>
<td>45</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>Switzerland</td>
<td>23</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>23</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Total RWE Innogy</td>
<td>1,607</td>
<td>542</td>
<td>150</td>
<td>110³</td>
<td>1</td>
<td>1</td>
<td>2,411</td>
</tr>
</tbody>
</table>

### RWE Innogy operational capacities: Pro rata view² + power purchase agreements, Q1 2012

<table>
<thead>
<tr>
<th>Country</th>
<th>Onshore Wind</th>
<th>Hydro</th>
<th>Offshore Wind</th>
<th>Biomass</th>
<th>Biogas</th>
<th>Solar</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>448</td>
<td>355</td>
<td>104</td>
<td>1⁴</td>
<td>1</td>
<td></td>
<td>909</td>
</tr>
<tr>
<td>UK</td>
<td>380²</td>
<td>69</td>
<td>150²</td>
<td></td>
<td></td>
<td></td>
<td>599</td>
</tr>
<tr>
<td>Spain</td>
<td>443</td>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>460</td>
</tr>
<tr>
<td>Netherlands</td>
<td>201</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>201</td>
</tr>
<tr>
<td>Poland</td>
<td>92</td>
<td></td>
<td></td>
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<td></td>
<td>92</td>
</tr>
<tr>
<td>France</td>
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<td>45</td>
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<tr>
<td>Italy</td>
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<td>Switzerland</td>
<td>23</td>
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<td></td>
<td>23</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>158</td>
<td>517</td>
<td>104³</td>
<td>1</td>
<td>8</td>
<td></td>
<td>2,389</td>
</tr>
</tbody>
</table>

---

¹ Capacity with <50% RWEI ownership is consolidated to 0 MW, capacity with 50% is consolidated to 50% of capacity, and capacity with >50% RWEI ownership is consolidated to 100% of capacity.

² 335 (380 pro rata view) MW onshore = 120MW RWE Innogy wholly owned assets + 196 (241 pro rata view) MW of Zephyr assets + 19MW of Green GECCO assets. RWE Innogy operates 620MW of UK wind capacity, of which 391MW (331 MW onshore/ 60 MW offshore) is owned by Zephyr Investments Ltd (1/3 owned by RWE Innogy). Of the 331MW onshore, 196MW is 100% contracted to RWE npower through PPAs (power purchase agreements). An additional 135MW is contracted to the NFPA (Non-Fossil Fuel Purchasing Agency). Of the offshore capacity of 150MW, 90MW is wholly owned by RWE Innogy. 60MW offshore capacity is owned by Zephyr and is 100% contracted to RWE npower through a PPA. Of the onshore capacity, 19MW is owned by Green GECCO GmbH & Co KG (51% owned by RWE Innogy) and is contracted to RWE Npower Renewables Ltd through a PPA.

³ Including 32MW of Biomass/fossil mix, 14MW of fossil capacity.

⁴ Includes only Biogas used directly in power generation.

⁵ Capacity equal to share of ownership.
RWE Innogy has a significant pipeline of 13.7 GW wind, hydro and biomass projects (Accounting view + PPA as at Q1 2012)

### Project pipeline by technology / status (electricity generation capacity in GW)

**Accounting View + Power Purchase Agreements**

1. **Pipeline by Technology and Status**
   - **New Technologies**: 4.8 GW (Status 3, 8.7 GW)
   - **Hydro**: 0.1 GW (Status 1, 0.1 GW)
   - **Biomass**: 13.7 GW (Status 1, 13.7 GW)
   - **Offshore wind**: 2.4 GW (Status 3, 2.4 GW)
   - **Onshore wind**: 1.3 GW (Status 2, 1.3 GW)

**Summary**

- **Total Pipeline**: 15.0 GW
- **Under Construction**: 10.0 GW
- **In Operation**: 2.4 GW

**Note:**
- Pipeline status 1 – Permitted projects: all permits (including grid) in place, but not yet under construction.
- Pipeline status 2 – Unconsented projects: RWE Innogy has rights to the project, e.g. land agreements.
- Pipeline status 3 – Prospects: identified sites with a known MW capacity, initial discussion on agreements, some exceptional projects are excluded.

**For pipeline projects no power purchase agreement (PPA) is assumed. Therefore, pipeline projects with ≤50% RWE Innogy ownership are consolidated to 0 MW and pipeline projects with >50% are consolidated to 100% of capacity (with certain exceptions e.g. UJVs).**

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**Pro Rata View + Power Purchase Agreements**

1. **Pipeline by Technology and Status**
   - **New Technologies**: 4.8 GW (Status 3, 4.8 GW)
   - **Hydro**: 0.2 GW (Status 1, 0.2 GW)
   - **Biomass**: 10.0 GW (Status 1, 10.0 GW)
   - **Offshore wind**: 2.4 GW (Status 3, 2.4 GW)
   - **Onshore wind**: 1.3 GW (Status 2, 1.3 GW)

**Summary**

- **Total Pipeline**: 15.0 GW
- **Under Construction**: 10.0 GW
- **In Operation**: 2.4 GW

**Note:**
- Pipeline status 1 – Permitted projects: all permits (including grid) in place, but not yet under construction.
- Pipeline status 2 – Unconsented projects: RWE Innogy has rights to the project, e.g. land agreements.
- Pipeline status 3 – Prospects: identified sites with a known MW capacity, initial discussion on agreements, some exceptional projects are excluded.

**For pipeline projects no power purchase agreement (PPA) is assumed. Pipeline capacity equal to share of ownership.**
RWE Innogy continues with its ambitious investment programme

- Clear commitment to expand our renewable business.
- More than €1 billion invested per annum in our renewables activities actually focusing mainly on offshore and onshore wind projects.
- Earnings development is back-end loaded due to several large scale offshore projects under construction.
- We confirm our capacity target of 4.5 GW in operation or under construction by 2014 as well as our operating earnings target of €500 million for the same year.

1) Consolidated capacity in operation or under construction.
Currently more than 1.475\(^1\) staff is employed under a RWE Innogy contract.

1) As of 30.04.2012.
Note: Activities beyond Europe: Georgia Biomass LLC with 85 employees is an associated company of RWE Innogy GmbH in USA.
Germany plays an important role both in today's asset base and growth ambitions

RWE Innogy activities in Germany

- RWE Innogy's headquarter located in Essen; offices in Hamburg, Dortmund, Berlin
- Leading German onshore wind farm operator
- First offshore wind park under construction
- 45 run-of-river and storage plants along the rivers Mosel, Saar and Ruhr
- Biomass and fossil CHP plants operated or under construction
- First biogas plants in Grevenbroich and Güterglück

RWE Innogy assets Germany

<table>
<thead>
<tr>
<th>Hydro plants</th>
<th>Biomass plants</th>
<th>Biogas plants</th>
<th>Solar sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nordsee Ost</td>
<td>Bartelsdorf</td>
<td>Schmarloh</td>
<td>Steemweide</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Barbecke</td>
</tr>
<tr>
<td></td>
<td>Schlarphol</td>
<td></td>
<td>Berlin</td>
</tr>
<tr>
<td></td>
<td>Bergkamen</td>
<td>Grevenbroich</td>
<td>Goch</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Paffendorf</td>
</tr>
<tr>
<td></td>
<td>Titz</td>
<td>Grevenbroich –</td>
<td>Neurath</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mosel/Eifel/Saar/Nahe/Rur (27 plants)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Bingen</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>RADAG</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Capacity (MW&lt;sub&gt;e&lt;/sub&gt;)&lt;sup&gt;1)&lt;/sup&gt;</th>
<th>In operation</th>
<th>Under construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind onshore</td>
<td>450</td>
<td>57</td>
</tr>
<tr>
<td>Wind offshore</td>
<td></td>
<td>295</td>
</tr>
<tr>
<td>Biomass</td>
<td>110</td>
<td>8</td>
</tr>
<tr>
<td>Biogas</td>
<td></td>
<td>1&lt;sup&gt;2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>Hydro</td>
<td>376</td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

(Accounting view + PPA as at Q1 2012)

1) Table shows electrical capacity respectively equivalent electrical capacity only.
2) Includes only Biogas used directly in power generation.
RWE Innogy has a significant track record and a strong position in the UK

RWE Innogy activities in UK
> Operational wind and hydro power assets of RWE npower renewables and the company’s share of the Zephyr portfolio wind farm projects
> Significant pipeline of onshore wind, offshore wind and small scale hydro projects at various stages of development and construction
> Markinch biomass project under construction; Stallingborough biomass project in development
> RWE Innogy UK headquarters based in Swindon

<table>
<thead>
<tr>
<th>Capacity (MWₑ)</th>
<th>In operation</th>
<th>Under construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind onshore</td>
<td>335¹</td>
<td>157</td>
</tr>
<tr>
<td>Wind offshore</td>
<td>150²</td>
<td>598</td>
</tr>
<tr>
<td>Biomass</td>
<td></td>
<td>50³</td>
</tr>
<tr>
<td>Biogas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>Solar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Accounting view + PPA as at Q1 2012)

¹ Of the onshore capacity of 335 MW, 120 MW Innogy wholly owned assets and 196 MW of Zephyr assets and 19 MW of Green GECCO assets.
² Of the offshore capacity of 150 MW, 90 MW is wholly owned by RWE Innogy. 60 MW offshore capacity is owned by Zephyr and is 100% contracted to RWE npower through a PPA.
³ The capacity has been rounded up from 49.9 MWₑ.
RWE Innogy is present on the Iberian Peninsula

RWE Innogy is present in Spain and Portugal through its subsidiaries:
- RWE INNOGY AERSA (Spain)
- INVESTERG (Portugal)
with onshore wind, hydro and solar technologies

RWE Innogy assets Iberia

<table>
<thead>
<tr>
<th>Hydro plants</th>
<th>Onshore wind sites</th>
<th>Solar sites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

RWE Innogy activities in the Peninsula

- RWE Innogy is present in Spain and Portugal through its subsidiaries:
  - RWE INNOGY AERSA (Spain)
  - INVESTERG (Portugal)
  with onshore wind, hydro and solar technologies

### Capacity (MW<sub>e</sub>)

<table>
<thead>
<tr>
<th></th>
<th>In operation</th>
<th>Under construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind onshore</td>
<td>447</td>
<td></td>
</tr>
<tr>
<td>Wind offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td>28</td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td>7&lt;sup&gt;1)&lt;/sup&gt;</td>
<td></td>
</tr>
</tbody>
</table>

<sup>1)</sup> Pro-rata. 50 MW Andasol 3 Concentrated Solar Power. RWE Innogy and RheinEnergie jointly hold 25.1% of the shares via a holding company (RWE Innogy: 51%, RheinEnergie: 49%).

(Accounting view + PPA as at Q1 2012)
RWE Renewables Polska is one of the leading wind farm operators in Poland

RWE Innogy activities in Poland

> RWE Innogy present in Poland through its subsidiary RWE Renewables Polska with offices in Warsaw, Szczecin and Suwałki
> Focus on onshore wind
> RWE Renewables Polska one of the Top 5 investors in Poland (concerning installed capacity)
> Considerable pipeline of onshore wind projects at various stages of development

<table>
<thead>
<tr>
<th>Capacity (MWₐ)</th>
<th>In operation</th>
<th>Under construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind onshore</td>
<td>108</td>
<td>44</td>
</tr>
<tr>
<td>Wind offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Accounting view + PPA as at Q1 2012)
RWE Innogy has entered the Italian market through a Joint Venture

RWE Innogy activities in Italy

- RWE Innogy entered the Italian market in 2008 through a JV with the group FriEl Green Power
- First wind farm in operation during 2010
- Significant pipeline of onshore wind projects at various stages of development
- One major biomass project under construction in Enna
- RWE Innogy Italia headquarters is located in Bolzano, offices in Milano and Enna

<table>
<thead>
<tr>
<th>Capacity (MW$_{el}$)</th>
<th>In operation</th>
<th>Under construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind onshore</td>
<td>66</td>
<td></td>
</tr>
<tr>
<td>Wind offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
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<td>19</td>
</tr>
<tr>
<td>Biogas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Accounting view + PPA as at Q1 2012)
RWE Innogy is active in the wind energy field in the Netherlands for a quarter of a century

RWE Innogy activities in Netherlands

> Active in the wind energy field for a quarter of a century

> Wind farm Westereems (capacity 156 MW, realised in 2008) is the largest Dutch onshore wind farm so far

> In the middle of wind farm Westereems two turbines, each with a capacity of 6.15 MW, are now under construction

> The Dutch area management for onshore wind is located in Zwolle

### RWE Innogy assets Netherlands

#### Wind onshore

- Westereems (156 MW, realised in 2008)
- Spijk (2 x 6.15 MW, under construction)
- Pieterburen
- Westermeerdijk
- Scheemda/Harkstede
- Zuidermeerdijk
- De Beitel Heerlen
- Volkerak
- Karolinapolder
- Sabinapolder
- Pieterburen
- Westereems
- Spijk
- Scheemda/Harkstede
- Pieterburen
- Westermeerdijk
- Zuidermeerdijk
- De Beitel Heerlen
- Volkerak
- Karolinapolder
- Sabinapolder
- Halsteren

#### Wind offshore

- Volkerak
- Spijk
- Westermeerdijk
- Scheemda/Harkstede
- De Beitel Heerlen

#### Biomass

- De Beitel Heerlen

#### Biogas

- De Beitel Heerlen

#### Hydro

- De Beitel Heerlen

#### Solar

- De Beitel Heerlen

### Capacity (MWₑ)

<table>
<thead>
<tr>
<th>Technology</th>
<th>In operation</th>
<th>Under construction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wind onshore</td>
<td>201</td>
<td>13</td>
</tr>
<tr>
<td>Wind offshore</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biogas</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Solar</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(Accounting view + PPA as at Q1 2012)
Innogy’s Business Approach
In order to be trusted leaders in sustainability, renewable energy and innovative technology…

RWE Innogy aims to …

be among the top 5 companies in the European renewable energy sector

contribute to the RWE Group's growth strategy

provide sustainable value added to the RWE Group

be a key element in RWE's CO₂ reduction programme

stand for state of the art operation of renewable technology

be a leading player in developing new renewable technologies
Proficient in coping with all critical success factors in the value chain

### Critical success factor

<table>
<thead>
<tr>
<th>Relationship with land owners</th>
<th>Evaluation of e.g. wind speed data</th>
<th>Timely response and high consenting success rate</th>
<th>Access to equipment and service providers at right price</th>
<th>Build to time and budget</th>
<th>Early identification of performance issues</th>
<th>High plant availability</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>RWE Innogy</strong></td>
<td>Local offices or development partners in all key regions</td>
<td>Strong team of in-house specialists</td>
<td>Mix of project management and environmental science capability</td>
<td>Plant procure-ment specialists and strong links with suppliers</td>
<td>Specialist in-house project management capability</td>
<td>In-house testing capability</td>
</tr>
</tbody>
</table>

Source: Goldman Sachs Report (Sept. 2007), updated and edited by RWE Innogy.
Risk diversification across technologies, regions and support mechanisms

---

**...technology**

- Offshore Wind
- Onshore Wind
- Biomass
- Hydro
- New Technologies

---

**...country**

- Germany
- UK
- Other
- Netherlands
- Poland
- Spain

---

**...support mechanism**

- Feed-In Tariff
- Power Price only
- Certificate/ Premium
- New Technologies

---

**...meteorological risk**

- UK Wind
- SE Wind
- SWE Hydro
- NWE Hydro
- NWE Wind
- Biomass
- New Technologies
Renewable Technologies
## Overview of technologies in RWE Innogy’s main focus

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Wind Offshore</th>
<th>Wind Onshore</th>
<th>Biomass</th>
<th>Hydro</th>
</tr>
</thead>
</table>
| **Maturity of technology** | > Pioneer phase  
> Industry is making substantial progress | > Mature | > Mature | > Very mature |
| **Markets**    | > UK: growing  
> Germany, Netherlands, Belgium: emerging | > CE/SE: stable  
> EE: growing  
> SEE: emerging | > Germany, UK, Italy  
> Benelux: emerging  
> USA: growing (upstream pellets) | > CE/SE: mature  
> SEE: growing, significant potential |
| **Specialities** | > Partnerships share risk and expertise | > Partly fragmented markets | > Market for fuel supply  
> Sustainability | > Large scale hydro limited to few countries in Europe  
> Long run times |
| **Size of projects (capacity)** | > Large (500 – 1,000 MW) | > Small to medium (20 – 200 MW) | > Small to medium (5 – 80 MW)  
> 100k – 750k ton/a pellet plant | > Average size > 1 MW and all types |
| **Approx. load factor** | 35 – 40% | 25 – 30% | 80% | 50% |
## New Technologies on their path to commercialisation

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Solar Thermal</th>
<th>Biogas</th>
<th>Marine energy</th>
<th>Photovoltaic</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Maturity of technology</strong></td>
<td>&gt; Solar Thermal: maturing</td>
<td>&gt; Core technology: developing</td>
<td>&gt; Small assets: demonstration phase</td>
<td>&gt; Core technology: mature</td>
</tr>
<tr>
<td></td>
<td>&gt; Feed-into the gas grid: maturing</td>
<td>&gt; Large assets: commercial operation (similar to Offshore Wind)</td>
<td></td>
<td>&gt; Need to develop smart PV and grid integration</td>
</tr>
<tr>
<td><strong>Markets</strong></td>
<td>&gt; Spain, Italy, Greece, Turkey: growing</td>
<td>&gt; Germany: growing, strong targets by government</td>
<td>&gt; UK and France: emerging</td>
<td>&gt; Germany: growing in customer related smart PV plants</td>
</tr>
<tr>
<td></td>
<td>&gt; North Africa: potential</td>
<td></td>
<td>&gt; Locations for Tidal Stream are available</td>
<td>&gt; Mediterranean countries: growing</td>
</tr>
<tr>
<td><strong>Specialities</strong></td>
<td>&gt; Storage systems</td>
<td>&gt; Feedstock dependency</td>
<td>&gt; Tidal: predictable power generation</td>
<td>&gt; Capacity freely scalable</td>
</tr>
<tr>
<td></td>
<td>&gt; Feed-in into the grid</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Size of projects (capacity)</strong></td>
<td>&gt; Small to medium: 20 – 150 MW</td>
<td>&gt; Small: 5 – 50 MW</td>
<td>&gt; Small: &lt; 30 MW</td>
<td>&gt; Small to large: 1 kW bis &gt;&gt; 100 MW</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt; Large: &gt;&gt; 100 MW</td>
<td></td>
</tr>
<tr>
<td><strong>Approx. load factor</strong></td>
<td>57%</td>
<td>90%</td>
<td>25 – 35%</td>
<td>Germany: 8-12%, Spain and Southern Italy: 20-25%</td>
</tr>
</tbody>
</table>
Wind Offshore
Europe clearly leading the pack in offshore wind energy

> Europe is leading in offshore wind energy with an installed capacity of **3,813 MW** in 2011

> The installed offshore capacity in Europe is expected to grow by an average of **28.7%** p.a. to **37.4 GW** in 2020 – Europe will continue in leading the pack in offshore wind as other regions focus on exploiting the onshore potential

### Total offshore wind capacity year-end 2011 (in MW)

- **UK**: 2,094 (55%)
- **Denmark**: 857 (23%)
- **Sweden**: 164 (4%)
- **Belgium**: 195 (5%)
- **Ireland**: 25 (1%)
- **Germany**: 200 (5%)
- **Netherlands**: 247 (6%)
- **Finland**: 26 (1%)
- **Norway**: 2.3 (0%)
- **Portugal**: 2 (0%)
- **Norway**: 2.3 (0%)
- **Finland**: 26 (1%)
- **Norway**: 2.3 (0%)
- **Finland**: 26 (1%)

Offshore wind market in Europe to grow by 28.7% p.a. until 2020, representing 17.3% of the wind market

- The share of offshore is expected to reach 17.3% in 2020 as onshore growth slows down in Europe

- Growth in offshore is mainly driven by:
  - Strong pipeline of projects
  - Technological developments addressing the still existing challenges
  - Strong regulatory support (high political targets & attractive remuneration schemes)

The major growth markets in EU for offshore wind are UK and Germany

Wind offshore growth potential to reach NREAP targets

Natural offshore wind conditions (at 50 m height)

Source: RWE analysis based on National targets (NREAPs)

Source: European Wind Atlas, copyright by Risø National Laboratory
Turbines dominate cost of wind projects

For both on- and offshore projects, wind turbines dominate the capex split – appropriate turbine prices are thus crucial for an attractive return on investment.

Offshore investment split varies according to project details, e.g. water depth, distance to shore, grid connection works, etc.

Cost of grid connection depends on distance to coast, foundation also depends on depth of water – in contrast to the UK market, the grid operator in Germany is obliged to connect the projects to the electricity grid and to bear capital and finance cost.

Source: RWE Innogy.
## Wind Turbines
- Increasing turbine sizes (6 MW+) reduce costs per installed MW
- More intensive competition among turbine manufacturers reduces turbine prices
- Leaps in technology (e.g. direct drive technology) increase turbine reliability and reduce unplanned maintenance activities
- Increased turbine reliability reduces number of unplanned offshore service activities

## Foundations
- Serial production of foundations leads to reduced prices and faster production
- Optimised designs for various foundations types (monopiles, jackets, gravity foundations etc.) reduce prices (e.g. due to less steel requirements)
- Alignment of German industry regulations with international regulations would lead to significant reductions of foundation costs (e.g. due to less strict requirements regarding steel thicknesses)

## Operation & Maintenance
- Increased in-house activities regarding O&M for offshore wind farms will partly or fully replace costly O&M contracts with turbine manufacturers
- Geographical clusters for offshore wind farms (e.g. off the coast of North Wales: North Hoyle, Rhyl Flats, Gwynt y Môr) create synergies for O&M activities
- Increased rated power of turbines means a reduced number of turbines to be maintained without reducing the capacity of the wind farm
RWE Innogy focus: Offshore wind is an engineering skill & scale game

European Market Features

- Maturing technology with high rate of innovation, but limited track record
- Few suppliers with proven technology
- Main growth countries are Germany and the UK
- Technology with relatively high generation cost per MWh but existing support mechanisms provide attractive remuneration
- Large scale projects often funded through partnerships models

Opportunities

- Wind resource better than onshore (load factors 35%+)
- Attractive growth opportunities & industrial scale projects
- Technology progress with significant cost reduction potential
- Strong political support reduces regulatory risks

Challenges

- Tight supply situation across the value chain
- Relative to onshore wind, high maintenance risks far out at sea: safety, costs, access, technology
- Limited best practice track record available make it a skill game

RWE Innogy Strengths

- Secure key value chain technologies (e.g. turbines, vessels)
- Build large-scale power plants
- Recruit best offshore experts available (build in-house know-how)
Offshore wind power: RWE Innogy has strong starting position in the UK

Markets and operations
Technology & markets
> Growing market: 3.8 GW\(^4\) installed offshore wind capacity in EU-27 in 2011
> Strong market growth in medium to long term
  – Time horizon depends on technical progress and development of approval procedures
> Significant technological challenges remain especially in offshore foundations and structures
> Trends: technical hurdles overcome, allocation of attractive sites, development of projects, M&A of projects

RWE Innogy's assets
(Accounting view + PPA as at Q1 2012)
> 150 MW\(^1\) offshore wind farm (North Hoyle, Rhyl Flats) in operation and 598 MW (Greater Gabbard\(^2\), Gwynt y Môr\(^3\)) under construction in UK and 295 MW (Nordsee Ost) under construction in Germany
> Pro-rata view: 27% stake in Belgian offshore wind project Thornton Bank - 30 MW already operational, additional capacity of 295 MW to be constructed by the end of 2013

---

1) Of the offshore capacity of 150 MW, 90 MW is wholly owned by RWE Innogy. 60 MW offshore capacity is owned by Zephyr and is 100% contracted to RWE npower through a PPA. Please refer to footnote 2 on slide 9 for further explanation.
2) Total capacity 504 MW, 50% ownership RWE Innogy.
3) Total capacity 576 MW, 60% ownership RWE Innogy.
Overview of RWE Innogy’s offshore wind projects in Germany, UK, Belgium and the Netherlands

**In operation**

- **North Hoyle**, UK, 60 MW: Completely commissioned 2004
- **Rhyl Flats**, UK, 90 MW: Completely commissioned 2009
- **Thornton Bank I**, BE, 30 MW: Completely commissioned 2009

**Under construction**

- **Nordsee Ost**, GER, 295 MW
- **Gwynt y Môr**, UK, 576 MW
- **Greater Gabbard**, UK, 504 MW
- **Thornton Bank II+III**, BE, 295 MW

**In development**

- **Innogy Nordsee 1**, GER, 996 MW
- **Galloper**, UK, 500 MW
- **Triton Knoll**, UK, 1200 MW
- **Atlantic Array**, UK, 1500 MW
- **Tromp Binnen**, NL, 300 MW
- **Dogger Bank**, UK, 9000 MW

1) RWE Innogy (33%), owned by Zephyr Investments Ltd., 2) RWE Innogy (27%), owned by C-Power consortium, 3) RWE Innogy (60%), Stadtwerke Munich (30%) and Siemens (10%), 4) RWE Innogy (50%), Scottish and Southern Energy (50%), 5) RWE Innogy (25%), Scottish and Southern Energy (25%), StatOil (25%), Statkraft (25%).
Details of some of RWE Innogy’s most important offshore wind projects currently under construction

Examples of offshore wind projects

<table>
<thead>
<tr>
<th>Wind Farm</th>
<th>Size</th>
<th>Distance to shore</th>
<th>Water depth</th>
<th>First generation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gwynt y Môr ¹)</td>
<td>160 x 3.6 MW Siemens turbines (576 MW), 124 km²</td>
<td>13 km off the coast of North Wales</td>
<td>12 – 28 m depth</td>
<td>First generation in 2013, full generation in 2014</td>
</tr>
<tr>
<td>Greater Gabbard ²)</td>
<td>140 x 3.6 MW Siemens turbines (504 MW ¹¹), 147 km²</td>
<td>25 – 47 km offshore</td>
<td>24 – 34 m depth</td>
<td>First generation in December 2010, full generation in 2012</td>
</tr>
<tr>
<td>Nordsee Ost</td>
<td>48 x 6.15 MW REpower turbines (295 MW), 34 km²</td>
<td>32 – 45 km offshore</td>
<td>22 – 26 m depth</td>
<td>First generation in 2013, full generation in 2013 ³)</td>
</tr>
</tbody>
</table>

¹ 60% ownership RWE Innogy, Stadtwerke Munich (30%) and Siemens (10%).
² 50% ownership RWE Innogy, Scottish and Southern Energy (50%).
³ Depends on availability of grid connection.
RWE Innogy has built its own two installation vessels for constructing offshore wind farms

Overview

> Construction of two self propelled Jack-Up vessels

> Especially designed for turbines in the 5 to 6 MW class and deepwater environment: possibility to be used in water depth > 45 meters (using leg extensions)

> Less exposed to weather conditions

> Names of the vessel linked to RWE’s history. RWE Innogy names the vessel “Friedrich Ernestine” and “Victoria Mathias”
Wind Onshore
The world market for wind energy

Installed global wind power capacity (in GW)

Top 10 with > 85% of newly installed capacity (in MW)

Top 10 with > 85% of total installed capacity (in MW)

ROW = Rest of World
Onshore wind in Europe: Steady path for solid growth

Installed capacity in Europe has grown 15.3% p.a. since 2004, corresponding to an average of 7.9 GW p.a. incremental capacity.

In certain areas, electricity production from wind energy has grown to a significant level (e.g. > 25% in Denmark, 8% in Germany, in some German federal states exceeding 40%, 15% in Spain as of 2010).

Steady path for solid growth:
- European onshore wind expected to increase installed capacity by 8.0% p.a. until 2020 (9.0 GW annual incremental capacity)
- Spain, France, UK, Italy and Germany with 55% of net additions in installed capacity by 2020
- Focus moving to medium sized markets which will grow faster
- Medium- to long-term growth is expected to slow down due to increased saturation of large markets and shift towards offshore.

Major markets in EU based on size and wind resources

Wind onshore growth potential to reach NREAP targets

- **Spain**
- **Germany**
- **United Kingdom**
- **Italy**
- **Portugal**
- **Netherlands**
- **Belgium**
- **Greece**
- **Poland**
- **Romania**
- **Finland**

*Bubble size: total capacity in 2020 [MW]*

New installation 2010 – 20 (GW)

- **United Kingdom**
- **Sweden**
- **Ireland**

Capacity CAGR 2010 – 20

- 0%
- 5%
- 10%
- 15%
- 20%
- 25%
- 30%

**DK:** Installed capacity in 2010 exceeds NREAP 2020 targets

Source: RWE analysis based on National targets (NREAPs)

Natural onshore wind conditions (at 50 m height)

- **Wind speed m/s**
  - > 7.5
  - 6.5 – 7.5
  - 5.5 – 6.5
  - 4.5 – 5.5
  - < 4.5

Source: European Wind Atlas, copyright by Risø National Laboratory
European wind power continued strong growth in 2011 - still dominated by onshore wind

In 2011, installed wind power capacity increased by 11% to 93.9 GW in EU-27
- Onshore wind accounted for 90.1 GW (96% of total installed wind power capacity), corresponding to a growth rate of 10.3%
- With an installed capacity of 3.8 GW in 2010 (+29.4% y-o-y), offshore wind still holds a minor share of 4% in the European wind market

New installations in EU-27 amounted to 9,616 MW in 2011
- TOP 3 countries Germany (2,086 MW), UK (1,293 MW) and Spain (1,050 MW) account for 46% of 2011 installation

In mature markets such as Germany repowering can play a key role for growth

**Increased energy yield**

- Increased turbine size and improved technology leading to
  - Higher installed capacity on same area of land
  - Improved load factors (higher utilisation and larger rotor diameter)
  - Reduced operating costs
  - Improved power grid integration since modern turbines have variable speeds and voltage control

**Reduced environmental impact**

- Reduced number of wind turbines leading to enhancement of natural landscape
- Reduced flicker effect as larger turbines rotate at much lower speed

---

**Support & Restrictions**

- Repowering bonus in current (2012) EEG is attractive from an economic perspective, but ...
- ... height restrictions and spacing requirements do not allow harvest of the full potential in Germany

---

Note: Repowering of Simonsberg Wind Farm: number of turbines reduced from 11 to 3 – capacity increased from 5.5 MW to 15 MW – full load hours up from 2,545 h/a (29%) to 3,200 h/a (37%) – annual energy yield increased from 14 mn kWh to 48 mn kWh (Source: BWE).
RWE Innogy focus: Onshore wind is a must-have for fast growth

European Market Features

- Mature technology but still room for innovation
- Significant capacities installed in Western Europe still with attractive growth and repowering potential
- Growing number of opportunities in Eastern Europe
- Trend towards M&A driven consolidation
- Many turbine suppliers available with long-term track record
- Turbine supply turning from supplier- to customer-driven market

Opportunities

- Stable support schemes in most European countries promote growth
- Low cost and fast construction of significant capacity
- Short/mid-term opportunities to profit from distressed sellers

Challenges

- Intense competition for best wind sites
- Large project pipelines necessary due to regulatory risk associated with building consent

RWE Innogy Strengths

- Strong existing wind farm portfolio and significant track record in new build and operation
- Regional diversification to reduce country-specific regulatory risks
- Growth strategy with focus on organic projects, but making use of short-term opportunities also through M&A
- Large realisable project pipeline

1) In comparison to other renewable energy technologies.
Onshore wind power is a key element in RWE Innogy's growth strategy

Onshore wind capacity

United Kingdom
335 MW\(^1\)

Poland
108 MW

Netherlands
201 MW

Germany
450 MW

Italy
66 MW

Spain
447 MW

Markets and operations

Technology & markets

> Relatively mature markets especially in Germany and Spain
> 90.1 GW\(^2\) capacity installed in EU27 as of 2011
  > High maturity of technology
  > Power generation costs competitive with conventional energy sources
> Still attractive growth rates & repowering potential in mature markets
> In the foreseeable future positive and stable financial support systems (e.g. fixed feed-in tariffs/obligations)
> Trend: consolidation through M&A

RWE Innogy's assets
(Accounting view + PPA as at Q1 2012)

> 1.607 GW onshore wind farms in operation
  (of which Zephyr UK 196 MW under economic control of RWE Innogy\(^1\)) and 271 MW under construction

\(^1\) 335 MW onshore = 120 MW Innogy wholly owned assets + 196 MW of Zephyr assets + 19 MW of Green GECCO assets. Please refer to footnote 2 on slide 9 for further explanation.

RWE Innogy’s flag ship onshore wind projects in its core markets (1/2)

**Wind farm Titz**

- **Location**
  > In the RWE lignite mining region ("Rheinisches Revier"), 35 km west of Cologne

- **Technical data**
  > Installed capacity: 20 MW
  > 10 wind turbines REpower, type MM92-Evolution a 2 MW
  > Rotor diameter: 92.5 m
  > Tip height: approximately 150 m
  > Planned start-up: 3rd quarter 2012

**Wind farm Westereems**

- **Location**
  > In Eemshaven, Province of Groningen / NL

- **Technical data**
  > Installed capacity: 156 MW
  > 52 wind turbines type E82 a 3 MW from Enercon
  > Rotor diameter: 82 m
  > Tip height: approximately 140 m
  > Start-up: 1st quarter 2009
  > In the middle of wind farm Westereems two wind turbines type 6M from Repower, each with a capacity of 6.15 MW, are under construction (Planned start-up: end 2012)
RWE Innogy’s flag ship onshore wind projects in its core markets (2/2)

Wind farm **Suwalki**
- **Location**: In Masuria/Poland, approx. 50 km to the Lithuania frontier
- **Technical data**:
  - Installed capacity: 41.4 MW
  - 18 wind turbines type SWT 2.3 a 2.3 MW from Siemens
  - Rotor diameter: 92.6 m
  - Tip height: approximately 150 m
  - Start-up: 4th quarter 2009

Wind farm **Las Planas**
- **Location**: Located 12 km in the south of Zaragoza/Spain on the plateau „Plana de Zaragoza”
  - 600 m above sea level
- **Technical data**:
  - Installed capacity: 90 MW
  - 120 wind turbines a 750 kW
  - Hub height: 55 m
  - Rotor diameter: 48 m
  - Full load hours round about 2,600 h/a (load factor of 30%)
  - Start-up: February 2002

Wind farm **Ururi**
- **Location**: Located in the Molise region, south of Italy, approx. 20 km from the coast
  - 130-280 m above sea level
- **Technical data**:
  - Installed capacity: 26 MW
  - 13 wind turbines Vestas V-90 a 2 MW
  - Hub height: 80 m
  - Rotor diameter: 90 m
  - Full load hours round about 2,130 h/y (load factor approx. 25%)
  - Start-up: December 2010
Biomass
RWE Innogy focus: Biomass is a viable option for “green” capacity

**European Market Features**

- Efficient generation of power and heat (CHP): Supply of heat, process steam, electricity, compressed air and cooling energy
- Solid biomass plant technology is mature and guarantees a stable performance
- Solid biomass as main fuel is becoming a globally traded commodity
- Focus on integrated biomass business based on diverse sources such as fresh and residual wood, energy crops and pellets
- Favorable regulatory support in most European countries as biomass is expected to contribute significantly to EU renewable targets
- Key markets are the UK, Italy and Germany

**Opportunities**

- Key advantage over other renewable technologies: ability to operate at high utilization rates and to generate base load electricity
- Still attractive market growth: Biomass potential not yet exploited by far; additional growth in large scale conversion and co-firing
- Efficiency improvements of existing facilities possible through extensions and modifications

**Challenges**

- Feedstock represents 25 – 40% share of full costs, but cannot be effectively hedged: strong position in feedstock supply is crucial
- Only limited scalability of power plants when feedstock sourced locally, as availability and logistic cost issues limit growth potential
- Securing sustainability of biomass fuel sourcing especially for commodity pellets business

**RWE Innogy Strengths**

- Strong group-wide biomass expertise bundled within RWE Innogy – pooling of support and expert functions
- Access to partners such as municipalities and industry through RWE Group is a key success factor in CHP business
- Ensuring high operational availability in the long-run through preventive maintenance
- Large scale, sustainable, industrial pellet production capacity to supply RWE group’s biomass fuel requirements for converted power plants and co-firing coal plants
RWE Innogy’s Biomass with two focus points: developing upstream capabilities & strengthening existing business

Markets and operations

Technology & markets

- Biomass enjoys favourable regulatory support in most European countries and is expected to contribute significantly to the EU renewable energy targets
- Solid biomass plant technology is mature and mainly used for distributed power generation
- Economic feasibility of projects strongly depends on access to feedstock which accounts for 25-40% of production costs
- Utilisation of CHP (combined heat and power) generation elevates efficiency and profitability (critical in some markets)

RWE Innogy’s assets

(Accounting view + PPA as at Q1 2012)

- RWE Innogy is a centre of biomass competence within RWE Group thus supporting the business
- 110 MW\textsubscript{el}\textsuperscript{1)} biomass/CHP capacity in operation and 79 MW\textsubscript{el} under construction in UK, Italy and Germany
- 750 kt of industrial pellet production for co-firing and converted power plants
- 100 kt per year of residential pellet capacity
- Integration BTB GmbH for CHP in Berlin
- Joint venture with Fri-El Green Power for development of biomass power plant projects in Italy

\textsuperscript{1)} Includes 32 MW\textsubscript{el} mixed fossil/biomass capacity (co-firing - combustion of biomass partly substituting fossil fuels).
Example: Biomass-fired CHP plant in Wittgenstein

Overview

Purpose of plant
> Provision of process steam to pellet factory, electricity is fed into the grid

Main components
> Grate-fired furnace by Weiss
> Steam turbine by TGM

Technical details
> Electrical capacity of turbine: 5 MW<sub>el</sub>
> Thermal capacity: 25 MW<sub>th</sub>
> Steam capacity: 30 t/h
> Heat supply of up to 17 MW<sub>th</sub>

Fuel input
> Biomass – fresh wood, 90,000 t/a air dry

Status quo
> Operational
Example: Georgia Biomass pellet plant

Overview

Purpose of plant
> Annual production of 750,000 tons of industrial wood pellets

Main components
> Wood yard
> Chipper and dryer
> Pelletiser and Cooling
> Rail and shipping logistics

Site details
> Staff: 80 employees
> Site size: 120+ hectares
> Storage capacity 50,000 tons (in Savannah harbour)

Raw Material input
> Southern Yellow Pine from Georgia
> Annual consumption of 1,5 million ton of virgin wood
> Raw material supply fully certified (SFI, FSC) for sustainability
> GHG emissions footprint meets EU targets

Status quo
> Operational
Hydro
Hydro: Mature technology but still some opportunities in Western and huge potential in South-Eastern Europe

> More than 300 TWh/year of unused economical hydro power potential in Europe
> Almost two-thirds of the economical potential in South-Eastern Europe is not developed

<table>
<thead>
<tr>
<th>EU-15 without GR incl. NO, CH</th>
<th>South-Eastern Europe</th>
<th>Central Eastern Europe</th>
</tr>
</thead>
<tbody>
<tr>
<td>(TWh/year)</td>
<td>(TWh/year)</td>
<td>(TWh/year)</td>
</tr>
<tr>
<td>1,698</td>
<td>763</td>
<td>115</td>
</tr>
<tr>
<td>737</td>
<td>380</td>
<td>51</td>
</tr>
<tr>
<td>595</td>
<td>247</td>
<td>31</td>
</tr>
<tr>
<td>430</td>
<td>102</td>
<td>25</td>
</tr>
</tbody>
</table>

- **28% unused economical potential**
- **59% unused economical potential**
- **19% unused economical potential**

1) Average values of the following sources: WEC, 2007 Survey of Energy Resources; EUROSTAT; UCTE; Europe’s hydropower potential today and in the future, CESR, University of Kassel; Hydropower & Dams World Atlas, 2007.
RWE Innogy focus:
Hydro power is cost competitive and sustainable

### European Market Features

<table>
<thead>
<tr>
<th>Feature</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very mature technology with limited innovation potential</td>
<td></td>
</tr>
<tr>
<td>Huge new build potential in SEE and Turkey with focus on large scale plants</td>
<td></td>
</tr>
<tr>
<td>Limited new build potential in Western European markets</td>
<td></td>
</tr>
<tr>
<td>Relatively high utilisation, compared to other renewable technologies</td>
<td></td>
</tr>
</tbody>
</table>

### Opportunities

<table>
<thead>
<tr>
<th>Opportunity</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Increasing electricity demand and – at the same time – capacity shortage in SEE and Turkey</td>
<td></td>
</tr>
<tr>
<td>Advanced legal system and power trading</td>
<td></td>
</tr>
<tr>
<td>Allows for load shaped generation</td>
<td></td>
</tr>
</tbody>
</table>

### Challenges

<table>
<thead>
<tr>
<th>Challenge</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Access to grid</td>
<td></td>
</tr>
<tr>
<td>Time consuming approval processes</td>
<td></td>
</tr>
<tr>
<td>Regional partnerships often required</td>
<td></td>
</tr>
<tr>
<td>Environmental aspects</td>
<td></td>
</tr>
</tbody>
</table>

### RWE Innogy Strengths

<table>
<thead>
<tr>
<th>Strength</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology well covered by experienced staff of RWE Innogy with over 100 years experience</td>
<td></td>
</tr>
<tr>
<td>Centralised asset management, decentralised operation and maintenance</td>
<td></td>
</tr>
<tr>
<td>Full value chain can be covered in Europe</td>
<td></td>
</tr>
<tr>
<td>Portfolio containing combination of peak and base load plants</td>
<td></td>
</tr>
<tr>
<td>Regional partnerships established</td>
<td></td>
</tr>
<tr>
<td>Ability to coordinate large amount of plants according to demand of international markets</td>
<td></td>
</tr>
</tbody>
</table>
Hydro power represents an area of growth for RWE Innogy

Hydro capacity

- United Kingdom 70 MW
- Germany 376 MW
- Switzerland 23 MW
- France 45 MW
- Spain 12 MW
- Portugal 16 MW

Markets and operations

Technology & markets

- Small hydro plants (< 10 MW) expected to have significant share in future capacity growth in Western Europe
- Most significant growth potential of several GW in South-Eastern Europe and Turkey
  - Strategic partnerships helpful
  - Large hydro plants > 100 MW feasible
  - Run-of-river and storage plants for reliable power supply needed in South-Eastern Europe
  - Market price system for hydro favorable

RWE Innogy’s assets

(Accounting view + PPA as at Q1 2012)

- Hydro power plants with 542 MW in operation
- 7 MW under construction

1) Pro-rata: RWE Innogy's share is 356 MW in Germany.
Example: Hydro power plants in operation

Hydro power plant Albruck-Dogern

- Albruck-Dogern, Baden-Württemberg
- Kaplan Bulb Turbine
- 24 MW electrical generation capacity
- 180 GWh annual electricity generation
- 50,000 households will be supplied with CO₂-free electricity
- Start of operation in December 2009

Hydro power plant Heimbach

- Heimbach, North Rhine-Westphalia
- 2 Francis Turbines
- 16 MW electrical generation capacity
- 25 GWh annual electricity generation
- In operation since 1905, modernised in 1975
- Listed building
New Technologies and Research & Development

Wind Offshore  Wind Onshore  Biomass  Hydro  New Technologies and Research & Development  Venture Capital
Concentrated Solar Power (CSP) can be a significant part of the future energy supply

**European Market Features**

- Approved and reliable way to produce CO₂-free electric energy
- CSP is expected to become commercially mature within the next 10 years
- In combination with thermal storage CSP is capable of providing base as well as peak load electricity
- The CSP plant electrical generation capacity in the EU-27 at the end of 2011: 1,151 MW
- More than 20 GW in operation expected until 2020
- Desertec project evaluates the potential supply of 15% of the European energy demand with solar power from the Sahara region by 2050

**Opportunities**

- Fastly growing markets, especially in North African countries, South Africa and on the Arabian Peninsula
- Many countries in Southern Europe are developing support schemes

**Challenges**

- Cost reduction is crucial because today CSP operates with higher costs than solar PV
- High capex per MW installed – access to capital essential
- Research and development of new applications and technologies (e.g. cost efficient storage and solar tower)
- Potential geographically limited

**RWE Innogy’s Approach**

- Gain know-how to profit from early mover opportunity
- Investigate in solar markets around the Mediterranean Sea
RWE Innogy is already engaged in a CSP project: Andasol 3

**CSP Power Plant Andasol 3**

**Markets**
- CSP is a rapidly growing technology
- First European CSP tariff established in Spain, other South European countries expected to follow depending on the development of the economic crisis

**Technology**
- Parabolic trough technology
- Capacity: 50 MW electrical power output
- Location: Southern Spain in the province of Granada
- RWE Innogy and RheinEnergie jointly hold 25.1% of the shares via a holding company (RWE Innogy: 51%, RheinEnergie: 49%)
- Construction started in March 2009, connection to the grid and first electricity production in autumn 2011
- Thermal storage using Molten Salt technology with a capacity of 1,010 MWh allows 8 further hours of electricity production even at night or in times the sun is not shining
- Contrary to PV a CSP plant with thermal storage is dispatchable
Photovoltaic power generation employs solar panels composed of a number of solar cells

European Market Features

- 21.9 GW of Photovoltaic (PV) systems were connected to the European grid in 2011, compared to 13.4 GW in 2010
- With a total installed capacity of 51.7 GW at the end of the year 2011, PV is, after hydro and wind power, the third most important renewable energy source in terms of European-wide installed capacity
- Module prices have dropped significantly due to economies of scale and production overcapacities in the past years and it is expected that this trend continues
- PV will become independent from regulatory support in regions with high solar irradiation; in the future market growth will mainly be driven by the market

Opportunities

- Further cost reduction of PV modules expected in the short- and mid-term
- Increasing efficiency of PV systems
- Cost setting of renewable price by PV and Wind Onshore
- Enormous potential

Challenges

- Grid integration makes PV more system adequate
- Further cost reduction of PV modules is crucial
- Research of micro storages to stimulate an active Demand Side Management of PV installations ("Smart PV")

RWE Innogy Approach & Strengths

- RWE is initiating a flexible PV market entry aiming at markets where PV is close to competitiveness even without subsidies
- In addition, RWE is involved in the Desertec project. Based on the solid project preparation provided by Dii, RWE has decided to pursue a 100 MW project in Morocco which will generate electricity produced by both solar (PV) and wind power
**Biogas is a multifunctional, storable renewable energy source**

### European Market Features

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>&gt; Commercial biogas production is a fairly new technology, but already at the edge of marketability</td>
<td>&gt; Trend towards decentral gas production, purification and feed-in of biomethane into gas grid</td>
</tr>
<tr>
<td>&gt; Political target: substitution of annually 6 bn m³ natural gas by 2020 and up to 10 bn m³ by 2030 in Germany, international markets emerging</td>
<td>&gt; Development of large-scale biogas plant concepts; development of industrial standards</td>
</tr>
</tbody>
</table>

### Opportunities

<p>| | |</p>
<table>
<thead>
<tr>
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<tbody>
<tr>
<td>&gt; Further cost reduction expected in the short- and mid-term</td>
<td></td>
</tr>
<tr>
<td>&gt; Biogas is viable option for municipalities, which have to source an increasing part of energy from renewables</td>
<td></td>
</tr>
<tr>
<td>&gt; Significant and efficient transport and storage capacities are already in place</td>
<td></td>
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<tr>
<td>&gt; Cooperation with farmers and strategic market players</td>
<td></td>
</tr>
<tr>
<td>&gt; Win-win-situation: digestate conditioning and fertilizer production</td>
<td></td>
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</tbody>
</table>

### Challenges

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt; Feedstock supply is crucial, but cannot be effectively hedged</td>
<td></td>
</tr>
<tr>
<td>&gt; Limited scalability of power plants especially due to feedstock availability and logistic issues</td>
<td></td>
</tr>
<tr>
<td>&gt; Legal regulations concerning restrictions of the use of biomethane obliged to be amended (e.g. Wärme-EEG)</td>
<td></td>
</tr>
<tr>
<td>&gt; Extensive research and testing of new substrates for biogas production have to be done to avoid the potential so called “food or fuel” problem</td>
<td></td>
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</table>

### RWE Innogy Approach & Strengths

<p>| | |</p>
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>&gt; Regional site-specific plant concepts regarding substrate availability</td>
<td></td>
</tr>
<tr>
<td>&gt; Utilisation of various substrates like manure and agricultural by-products</td>
<td></td>
</tr>
<tr>
<td>&gt; Focus of gas purification and biomethane feed-in into the gas grid</td>
<td></td>
</tr>
<tr>
<td>&gt; Realisation of efficient large-scale biogas plant concepts</td>
<td></td>
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</tbody>
</table>
Biogas – one of the most efficient ways to use biomass for power & heat generation

Biogas plant Güterglück (feed-in of biomethane)

> Güterglück, Saxony-Anhalt
> Gas treatment and feed-in into the gas grid
> 6.7 MW thermal capacity
> 52 GWh annual biomethane output, equivalent to 21 MWh\textsubscript{el}
> CO\textsubscript{2}-emission avoidance of 15,000 ton per year
> In operation since Q3 2009

Technology & markets

> Use of alternative substrates to maize (manure, new energy crops)
> Biogas plant technology is adapted to the agriculture area
> Biogas upgrading and biomethane feed-in
> Digestate conditioning and fertilizer production
> Cooperation with farmers and strategic market players

RWE Innogy's assets

(Accounting view + PPA as at Q4 2011)

> RWE Innogy GmbH bundles biogas competencies within RWE Group
> 0.7 MW\textsubscript{el} biogas CHP and 6.7 MW\textsubscript{th} biomethane feed-in into the gas grid in operation (in total 4 MW\textsubscript{el} CHP capacity)
> In 2012 the construction of biogas plant Bergheim Pfaffendorf starts
> Current development of an innovative biogas concept based on manure only, in conjunction with regional farmers’ association (Project Velen); The construction of biogas plant Velen is expected in 2013
> RWE Innogy plans to extend its biogas activities and to build up further biomethane capacities
Implementation and operation of demonstration plants to enhance marketability of new technologies

**Marine**
- Voith and Innogy test 1 MW prototype tidal turbine on the Orkney Islands
- Marine Current Turbines Ltd. (Siemens), in partnership with RWE npower renewables and other shareholders, has submitted a consent application to install a 10 MW array of tidal stream turbines in 2015
- The array, consisting of up to nine twin rotor turbines arranged across an area of 0.56 km², will harness the power of the tidal waters; it will be the first tidal array to be deployed in Wales

**Micro wind turbine**
- Micro wind turbine with up to 10 kW capacity
- Decentral power generation on top of buildings or piles
- Easy installation
- Demonstration plant of Quiet Revolution on ETEC-building in Essen; 8 further plants installed
Technologies and Research & Development

R&D improves conversion of already established renewable energies, opens up new business segments and assesses alternative technologies

Comprehensive R&D drivers

- Strong growth path of RWE Innogy
- Profitability for most renewable energies still based on the regulatory recognition of environmental impact of conventional energy sources
- Maturity of most conversion technologies not yet on equal level with conventional power plants
- Tapping of additional potential through new technologies

R&D targets

- Improve profitability of the core businesses by reducing costs and increasing availability
- Allow further growth and opening of new business segments
- Develop and sustain know-how
- Support the good reputation of the company
RWE Innogy sales Green Energy via different products

> **Market for Green Energy in Germany**
  - 2011: more than 3.2 million customers
  - Strong growth: CAGR 10/11: +39%
  - Substantial added value – for new and old generation assets

> **Principle of Green Energy Products**
  - Delivery of electricity (commodity) together with guarantees of origin or certificates from a chartered accountant
  - Green Certificates can also be sold separately

> **Capabilities of RWE Innogy**
  - Fully developed process over all time periods (forward, spot, reserves)
  - Own scheduling and balance account management
  - Structuring of customized green products

---

### Green Energy Products by RWE Innogy

- About 2,000 GWh sold to RWE retail companies and single industrial and commercial customers in 2011
- Proof by guarantees of origin and TÜV Süd certification
- Use of green power privilege and/or direct sales for EEG eligible plants in addition to market premium model
- Long term deal with DB AG: Single largest green energy contract in Germany
- Delivery of green energy for e-mobility
- Electricity disclosure: RWE Innogy is 100% green supplier
Venture Capital
Innogy Venture Capital is driving the commercialisation of innovative renewable energy technologies

Innogy Venture Capital GmbH invests in European start-up companies that provide solutions for CO₂-neutral, renewable energy generation and storage. With a final closing size of EUR 115 million the currently managed "Innogy Renewables Technology Fund I" is a leading early stage investor in this segment in Europe. The fund's sponsors are RWE Innogy and Conetwork Erneuerbare Energien, an investment company of Lampe Bank Group focusing on renewable energy. The fund’s portfolio is diversified in terms of technologies, countries and stages.
Venture Capital promotes competitive advantage and profitable growth for RWE

**Competitive advantage**
- Promotion of new market segments
- Commercialise innovative technologies
- Testing of new business models

**Profitable growth**
- Identify growth options for RWE Group
- Realise financial returns
- Manage risks through portfolio approach

**Strong CSR\(^1\) culture**
- Create high tech jobs
- Address climate change
- Address resource limitations
- Ensure security of supply
- Finance start-ups & innovation

\(^1\) CSR = Corporate Social Responsibility
Political Framework
EU targets a renewable energy share of 20% in gross final energy consumption by 2020

Overall share of renewable energy in EU

- Target of 20% share of renewables in gross final EU energy consumption by 2020, i.e. covering
  - Power
  - Heating/cooling
  - Transport
- At least 10% of gross final consumption of energy in transport in 2020 in each country

Individual country targets

<table>
<thead>
<tr>
<th>Country</th>
<th>2010</th>
<th>Gap</th>
<th>Target 2020</th>
<th>RES share in gross final energy consumption in 2010 (%)</th>
<th>Gap up to target achievement for 2020 based on national RES potential as forecasted by MS (% indicates target achievement as cited in NREAP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sweden</td>
<td>46.9</td>
<td></td>
<td>50.2</td>
<td>40%</td>
<td>4%</td>
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<tr>
<td>Latvia</td>
<td>24.4</td>
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<td>25</td>
<td>38%</td>
<td>2%</td>
</tr>
<tr>
<td>Finland</td>
<td>33.6</td>
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<td>34%</td>
<td>34%</td>
<td>0%</td>
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<tr>
<td>Austria</td>
<td>30.7</td>
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<td>31%</td>
<td>31%</td>
<td>0%</td>
</tr>
<tr>
<td>Portugal</td>
<td>24.7</td>
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<td>30%</td>
<td>25%</td>
<td>5%</td>
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<tr>
<td>Denmark</td>
<td>23%</td>
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<td>25%</td>
<td>25%</td>
<td>0%</td>
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<tr>
<td>Estonia</td>
<td>24.1</td>
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<tr>
<td>Slovenia</td>
<td>21.7</td>
<td></td>
<td>24%</td>
<td>24%</td>
<td>1%</td>
</tr>
<tr>
<td>Romania</td>
<td>21.4</td>
<td></td>
<td>23%</td>
<td>23%</td>
<td>1%</td>
</tr>
<tr>
<td>France</td>
<td>12.4</td>
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<td>16%</td>
<td>16%</td>
<td>4%</td>
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<tr>
<td>Lithuania</td>
<td>21.1</td>
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<td>22%</td>
<td>1%</td>
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<tr>
<td>Spain</td>
<td>14.1</td>
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<td>20%</td>
<td>20%</td>
<td>3%</td>
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<tr>
<td>Germany</td>
<td>10.7</td>
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<td>15%</td>
<td>15%</td>
<td>1%</td>
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<tr>
<td>Greece</td>
<td>3.1</td>
<td></td>
<td>4%</td>
<td>4%</td>
<td>2%</td>
</tr>
<tr>
<td>Italy</td>
<td>3.6</td>
<td></td>
<td>6%</td>
<td>6%</td>
<td>1%</td>
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<tr>
<td>Bulgaria</td>
<td>12.9</td>
<td></td>
<td>15%</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>Ireland</td>
<td>3.9</td>
<td></td>
<td>15%</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>Poland</td>
<td>9.9</td>
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<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>UK</td>
<td>3.3</td>
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<td>15%</td>
<td>15%</td>
<td>1%</td>
</tr>
<tr>
<td>Netherlands</td>
<td>3.8</td>
<td></td>
<td>14%</td>
<td>14%</td>
<td>1%</td>
</tr>
<tr>
<td>Slovakia</td>
<td>1.4</td>
<td></td>
<td>13%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>Belgium</td>
<td>3.4</td>
<td></td>
<td>13%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>3.7</td>
<td></td>
<td>13%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>Cyprus</td>
<td>3.5</td>
<td></td>
<td>13%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>Hungary</td>
<td>3.5</td>
<td></td>
<td>13%</td>
<td>13%</td>
<td>2%</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>2.6</td>
<td></td>
<td>11%</td>
<td>11%</td>
<td>1%</td>
</tr>
<tr>
<td>Malta</td>
<td>8.3</td>
<td></td>
<td>10%</td>
<td>10%</td>
<td>2%</td>
</tr>
</tbody>
</table>

Source: European Commission; Eurostat; Directive 2009/28/EC; National renewable energy action plans (NREAP); EurObserv’ER.
Mechanisms to support renewable energy generation in Europe

Main types of support mechanism

<table>
<thead>
<tr>
<th>Characteristics of mechanism:</th>
<th>Strength/Weakness:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Quota obligation &amp; tradable certificates</strong></td>
<td>&gt; Forces suppliers to take action to meet their obligation, market based system should drive costs down</td>
</tr>
<tr>
<td>&gt; Electricity suppliers are obliged to have a certain proportion of their electricity from renewable sources</td>
<td>&gt; Lack of revenue certainty, cost of administration, failure to support immature technologies</td>
</tr>
<tr>
<td>&gt; Renewable Energy Certificate is a tradable commodity proving that certain electricity is generated using renewable energy sources (per MWh)</td>
<td></td>
</tr>
<tr>
<td>&gt; Certificates are traded to fulfil renewable obligations</td>
<td></td>
</tr>
<tr>
<td>&gt; Renewable power generators receive wholesale market price for generated power plus the value of the certificate</td>
<td></td>
</tr>
<tr>
<td><strong>Feed-in tariffs / Feed-in premium</strong></td>
<td>&gt; Price and investment certainty</td>
</tr>
<tr>
<td>&gt; Renewable energy producers are paid a tariff</td>
<td>&gt; Political risk, cost to consumers, generator does not receive CO\textsubscript{2} upside</td>
</tr>
<tr>
<td>– Instead of power price (Feed-in tariffs)</td>
<td></td>
</tr>
<tr>
<td>– In addition to power price (Feed-in premium)</td>
<td></td>
</tr>
<tr>
<td>&gt; Tariffs usually vary depending on technology, capacity and age of power plant and are typically limited in time</td>
<td></td>
</tr>
</tbody>
</table>

Source: EREF – Prices for renewable energies in Europe: Feed-in tariffs versus quota systems – a comparison, 2006/2007; Datamonitor – Are national policies sufficient to drive renewable investment? – April 2007; EC [52]; BMU (January 2007); FORRES 2020 – Analysis of the renewable energy sources’ evolution up to 2020 (Fraunhofer et al, April 2005); Eurelectric - 20% Renewables by 2020, October 2011.
UK: Renewables support framework based on renewable obligations and tradable certificates

<table>
<thead>
<tr>
<th>Renewables support in UK</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Legal framework</strong></td>
</tr>
<tr>
<td><strong>Price mechanism</strong></td>
</tr>
<tr>
<td><strong>Length of mechanism</strong></td>
</tr>
<tr>
<td><strong>Value of mechanism</strong></td>
</tr>
</tbody>
</table>
| **Other earnings captured** | > Power price  
|                         | > Levy Exemption Certificates |
| **Future legislation changes** | > The current ROC bands are under review. Consultation has taken place regarding the new ROC band. Governments decision is expected May 2012 and will come into effect in April 2013  
|                         | > Government is undertaking an Energy Market Review which may replace the RO with an alternative mechanism from 2017 |

<table>
<thead>
<tr>
<th>ROC bands by technology (effective from April 2009)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Band</strong></td>
</tr>
<tr>
<td>----------</td>
</tr>
<tr>
<td>Established</td>
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<tr>
<td></td>
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<tr>
<td>Reference</td>
</tr>
<tr>
<td>Post-demonstration</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Emerging technologies</td>
</tr>
</tbody>
</table>

* Entitlement is increased by 0.5 ROC if combined with CHP
UK: Revenues from renewable energy combine market price, ROC purchase and tax incentives

Support mechanism

Buy-out price sets rate suppliers need to pay if they don't present sufficient ROCs (£40.71/ROC for April ’13 to March ’14)\(^1\).

The proceeds of the buy-out fund are paid back on a pro-rated basis to suppliers that have presented ROCs (recycling mechanism)\(^2\).

Wholesale baseload power price (variable)

+ Buy-out price (fix)

+ Recycle price (variable)

+ Levy exemption certificates (LECs, fix)

= Total Support

Renewables Obligation Certificates (ROC)

- A ROC is the green certificate issued for electricity from eligible renewable source, which is both generated and consumed within the UK.
- Generators are issued ROCs (which they can then sell on) for each MWh of eligible electricity generated.

Renewables Obligation (RO)

- Electricity suppliers are obliged to redeem ROCs or pay the buy-out price for a pro-portion of their supply (15.8% in 2012/13).
- A buy-out fee is payable for any shortfall.
- Most suppliers purchase ROCs from their generation assets or enter into long-term purchase agreements with independent generators.
- In 2010, new RO legislation created a minimum fixed headroom of 10% between ROC generation and suppliers’ MWh obligation.

\(^1\) Buy-out price is updated each year by Ofgem to reflect changes in Retail Prices Index (RPI).
\(^2\) Since the size of the buy-out fund is dependent on the volume MWh’s for which suppliers fail to redeem ROCs, this value depends upon the obligation target being greater than the available renewables obligation certificates (in 2010/11 the compliance ratio by ROCs amounted to 72% of the total obligation target).
The renewables support framework in Germany is based on fixed feed-in tariffs

**Feed-in tariff by selected technologies (in €/MWh)**

<table>
<thead>
<tr>
<th>Technology</th>
<th>Remuneration range for different types and sizes</th>
<th>Bonus dependent on use of specific technologies/materials or date of installation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onshore Wind</td>
<td><img src="image" alt="Graph" /></td>
<td></td>
</tr>
<tr>
<td>Offshore Wind</td>
<td><img src="image" alt="Graph" /></td>
<td></td>
</tr>
<tr>
<td>Hydro</td>
<td><img src="image" alt="Graph" /></td>
<td></td>
</tr>
<tr>
<td>Geothermal</td>
<td><img src="image" alt="Graph" /></td>
<td></td>
</tr>
<tr>
<td>Biomass</td>
<td><img src="image" alt="Graph" /></td>
<td></td>
</tr>
<tr>
<td>Solar PV</td>
<td><img src="image" alt="Graph" /></td>
<td></td>
</tr>
</tbody>
</table>

**Renewables support in Germany**

<table>
<thead>
<tr>
<th>Legal framework</th>
<th>Feed-in tariff system described in Renewable Energy Act (Erneuerbare-Energien-Gesetz EEG)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price mechanism</td>
<td>Regressive, guaranteed feed-in tariff (fixed once installation is commissioned)</td>
</tr>
<tr>
<td>Length of mechanism</td>
<td>Tariffs guaranteed up to 20 years</td>
</tr>
<tr>
<td>Value of mechanism</td>
<td>Varying tariffs depending on technology, capacity and location</td>
</tr>
<tr>
<td>Other earnings captured</td>
<td>None</td>
</tr>
<tr>
<td>Legislation</td>
<td>EEG 01/01/2012</td>
</tr>
</tbody>
</table>

Source: RWE on the basis of EEG 2012 – BMU
1) Starting fee of 89.3 €/MWh for the first 5 years, decreasing to 48.7 €/MWh for the next 15 years. Bonuses: 4.8 €/MWh system services bonus; 5 €/MWh repowering bonus;
2) Starting fee of 150 €/MWh for first 12 years or 190 €/MWh for first 8 years for installations prior to January 2018, decreasing to 35 €/MWh for the next 8 respectively 12 years;
3) Germany remunerates only CHP plants. The FIT is weighted by tranche of power, from 143 €/MWh for the first 150 kW to 60 €/MWh between 5 and 20 MW; bonuses depending on input mixture and tranche of power from 25 €/MWh to 110 €/MWh. Separate FIT for usage of biowaste (16 €/MWh for the first 500 kW and 24 €/MWh up to 20 MW) and for predominant use of slurry (25 €/MWh up to 75 kW);
4) FIT from 211,1 €/MWh to 220,7 €/MWh for plants not installed on buildings, for plants installed on buildings from 287,4 €/MWh for the first 30 kW to 215,6 €/MWh for more than 1 MW.
Germany:
Wind power support mechanism

Onshore wind (c/kWh)

- Basis tariff of 4.87 c/kWh\(^1\) for a maximum of 20 years plus year of commissioning
- Increased tariff of 8.93 c/kWh\(^1\) for first 5 years for assets achieving at least 150% of reference yield\(^2\), additional 0.48 c/kWh for assets commissioned before January 1, 2015 and additional 0.5 c/kWh for repowering
- Tariff levels reduce by 1.5% p.a.

Offshore wind (c/kWh)

- Basis tariff of 3.50 c/kWh\(^1\)
- Increased tariff of 15.00 c/kWh for 12 years (or 19.00 c/kWh for installations before January 1, 2018 for 8 years)
- This period is prolonged by 0.5 months for every nautical mile increase in range above 12 nautical miles and it is prolonged by 1.7 months for every metre in water depth in excess of 20 metres
- Tariff levels reduce by 7% p.a. from 2018

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\(^1\) For assets commissioned in 2012.

\(^2\) The reference yield is a yield generated by the reference installation. It is a wind energy converter of a specific type for which a yield at the target installation can be compared on the basis of a P-V curve (power-wind speed curve), measured by an authorised institution (Fördergesellschaft Windenergie e.V.).
# The renewables support framework in Spain offers two alternative schemes

## Renewables support in Spain

> Royal Decree-Law 1/2012 of 27/01/2012: Temporary suspension of the pre-assignment procedure to grant economic incentives to new renewables plants |
| **Price mechanism** | Choice between  
> Market price plus premium ("variable tariff") including cap and floor  
> Feed-in tariff ("fixed tariff") |
| **Length of mechanism** | Period of 15–30 years depending on technology  
> For certain technologies prices also regulated for years after initial period |
| **Value of mechanism** | Variable tariff: Premium as well as upper and lower limits (if applicable) fixed for first period of 15–25 years  
> Fixed tariff: Tariffs fixed for first period and years thereafter  
> Regular revisions and updates of tariffs based on an adjusted consumer price index |
| **Other earnings captured** | Variable tariff: Pool price  
> Additional compensation under both regimes such as an efficiency allowance, voltage gap allowance and a reactive energy allowance for certain technologies |
| **Future legislation changes** | New builds under Royal Decree 661/2007 are applicable until December 31st 2012  
> Electricity system regulatory review expected during March-April 2012  
> Issuance of the new regulation for the future development of renewables has not been determined |
Spain: Onshore wind power support mechanism

Example onshore wind power

Fixed tariff

Variable tariff

> The revenue per MWh is a fixed amount independent of the current pool price
> The tariff is annually updated based on the consumer price index change
> After initial period the reference price is lowered

> Within limits, the revenue is given by the sum of pool price and premium
> The floor is the guaranteed minimum price
> If market prices exceed upper cap, the price becomes equal to the market price but no additional premium
> After initial period no premium is paid

1) Tariffs as based on Royal Decree 661/2007.
The renewables support framework in Italy

Renewables support in Italy

<table>
<thead>
<tr>
<th>Legal framework</th>
<th>Green Certificates (GC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price mechanism</td>
<td>Certificate-based, indirect variable subsidy</td>
</tr>
<tr>
<td>Length of mechanism</td>
<td>15 years; photovoltaic power: 20 years</td>
</tr>
<tr>
<td>Value of mechanism</td>
<td>Green Certificate (GC)</td>
</tr>
<tr>
<td></td>
<td>Guaranteed GSE price for 2012: 82.12 €/MWh (GC generated in 2011)</td>
</tr>
<tr>
<td></td>
<td>Average weighted exchange price for certificates in 2011: 81.09 €/MWh¹</td>
</tr>
<tr>
<td></td>
<td>Annual adjustment of certificate value</td>
</tr>
<tr>
<td>Other earnings captured</td>
<td>Power price</td>
</tr>
<tr>
<td>Future legislation changes</td>
<td>Last effective change in legislation in March 2011², future changes are expected to occur in 2012</td>
</tr>
</tbody>
</table>

GCs by technology (Legge Finanziaria no. 244, 2008)³

<table>
<thead>
<tr>
<th>Coefficient (GC/MWh)</th>
<th>Technologies</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.0</td>
<td>Onshore wind (plants of more than 200 kW)</td>
</tr>
<tr>
<td>1.5</td>
<td>Offshore wind</td>
</tr>
<tr>
<td>1.0</td>
<td>Hydro</td>
</tr>
<tr>
<td>0.9</td>
<td>Geothermal plants</td>
</tr>
<tr>
<td>1.8</td>
<td>Waves and tidal</td>
</tr>
<tr>
<td>Conto Energia⁴</td>
<td>Photovoltaic power</td>
</tr>
<tr>
<td>1.3</td>
<td>Biodegradable waste and biomass (other than the one indicated in the following point)</td>
</tr>
<tr>
<td>1.8</td>
<td>Biomass and biogases obtained from agriculture, animal husbandry and forestry on a short supply-line basis</td>
</tr>
<tr>
<td>0.8</td>
<td>Landfill gas, sewage treatment plant gas and biogases (other than the ones indicated in the previous point)</td>
</tr>
</tbody>
</table>

¹) Price as of 29 March 2012 (published on the website of GME).
²) The mandatory quota of RES-E that producers and importers from conventional sources are required to inject into the grid, equal 7.55 % for 2012, shall be linearly reduced beginning in 2013 until reaching zero by 2015. (Decreto legislativo no 28 from 3 March 2011).
³) In accordance with the Budget Act of 2008 and ARG/elt 1/09, generators with an installed power between 1kW and 1 MW (200 kW for onshore wind) are entitled to a guaranteed feed-in tariff as an alternative to green certificates. Generators with an installed capacity of at least 1 MW are eligible for the green certificate mechanism.
⁴) Remuneration for electricity generation from photovoltaic plants is regulated by the so-called “Conto Energia”. The recent Conto Energia IV was introduced by Ministerial Decree of 5 May 2011. The key instruments for the support of photovoltaic power in electricity generation is a feed-in premium mechanism. The premium tariff will exist by the end of 2012. From 2013 there will be a feed-in tariff mechanism. Depending on capacity and type of the individual plant, tariffs vary from 133 to 274 €/MWh for 2012 and will be reduced in the following years by a maximum of 30% in 2016. Italy has implemented a cap for installed capacity of large installations of 150 Mio. € in the first half of 2012 and of 130 Mio. € in the second half of 2012. No cap has been implemented for small installations.
**Italy: Revenues from renewable energy combine market price and green certificate value**

**Green Certificates**

- Distributors report the production data of the renewable plants to the Energy System Authority (Gestore del Sistema Elettrico or GSE).
- GSE issues Green Certificates (GCs) for each MWh of eligible electricity generated.
- The sale of the certificates can be performed either directly to another company (agreed price) or via the green certificates market place at the Italian energy exchange managed by GME (Gestore del Mercato Elettrico), whereas the price is determined by supply and demand.
- In addition, GSE is obliged to take back GCs in excess on the market. The GC Pay Back Price is defined by the formula $0.78 \times (180 - \text{"average sale price"})$. The "average sale price" is the average value of the zonal prices and the production poles. The Italian Energy Authority (AEEG) calculates it each year within the end of January for the year ahead.

<table>
<thead>
<tr>
<th>Support mechanism GME (stock exchange) and GSE – VAT excluded</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average weighted exchange price for certificates 2011 (VAT excluded) registered by the GME.</strong></td>
</tr>
<tr>
<td><strong>GME average weighted GC price for 2011</strong></td>
</tr>
<tr>
<td>81.09 €/MWh&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

Calculation:

\[
\text{Value for 2012} = 0.78 \times (180 - \text{"average sale price"})
\]

\[
\text{Value for 2012} = 82.12 \text{ €/MWh}
\]

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<sup>1</sup> Price as of 29 March 2012 (published on the website of GME).

<sup>2</sup> Defined by Italian Energy Authority (AEEG) with Delibera 11/2012/efr on 26th January, 2012.