Germany: On Track to a Successful Energiewende

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The per capita emissions of large western economies are still twice as high as those of China.
Energy imports and domestic production in Germany

The Energiewende hits many birds with one stone as renewables and efficiency reduce Germany’s energy dependence.
German nuclear phase-out timeline

Nuclear phase-out will reduce Germany’s total power capacity. The remaining 8 nuclear power plants will be phased out by 2022.
Five reasons for the Energiewende

- Development of new technologies as new sources of growth and employment
- Energy policy can be both sustainable and economically successful
- Reduce dependency on energy imports
- Reduce carbon emissions and reach climate protection targets
- Phase-out nuclear power generation

*The Energiewende is a long-term strategy based on public acceptance.*
Key elements of the *Energiewende*

**Supporting fields of action**

- **Energy Efficiency**
  - Key legislation:
    - Energy Saving Ordinance
    - Heating Cost Ordinance
  - Increasing energy productivity
  - Cost-efficient savings

- **Renewable Energy**
  - Key legislation:
    - Renewable Energy Sources Act
    - Renewable Energy Heat Act
  - Steady growth
  - Environmentally friendly energy supply

*Energy efficiency and renewables secure a sustainable energy transition.*
# 2050 *Energiewende* targets

<table>
<thead>
<tr>
<th>Climate</th>
<th>Achieved 2014</th>
<th>2020</th>
<th>2025</th>
<th>2030</th>
<th>2035</th>
<th>2040</th>
<th>2050</th>
</tr>
</thead>
<tbody>
<tr>
<td>% greenhouse gas reduction (vs. 1990)</td>
<td>-27%</td>
<td>-40</td>
<td>-55</td>
<td>-70</td>
<td>-80 to -95</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% gross electricity consumption</td>
<td>32.5% (2015)</td>
<td>35</td>
<td>40 to 45</td>
<td>50</td>
<td>55 to 60</td>
<td>65</td>
<td>80</td>
</tr>
<tr>
<td>% gross final energy consumption</td>
<td>13.7%</td>
<td>18</td>
<td>30</td>
<td>45</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Energy Efficiency</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% primary energy consumption (vs. 2008)</td>
<td>-7.3% (2015)</td>
<td>-20</td>
<td></td>
<td></td>
<td>-50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>final energy productivity (vs. 2008)</td>
<td>1.7% p.a.</td>
<td></td>
<td></td>
<td></td>
<td>+2.1% p.a. (2008-2050)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>building renovation</td>
<td>~1% p.a.</td>
<td></td>
<td></td>
<td></td>
<td>doubling of renovation rate: 1% → 2% p.a.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% transport energy consumption (vs. 2008)</td>
<td>1.7%</td>
<td>-10</td>
<td></td>
<td></td>
<td>-40</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The energy transition follows a transparent, long-term strategy with specific targets.
Political steering of the *Energiewende*

**Federal and state coordination**
- Chancellor
- Prime ministers of the *Länder*

**In charge of the Energiewende**
Federal Ministry for Economic Affairs and Energy

Source: BMWi 2014
Energy efficiency and the switch to renewables are gaining momentum.

Source: AGEB 2015

*preliminary data
Renewables have overtaken each conventional source to become the largest electricity source in just ten years.
Cornerstones of the Renewable Energy Sources Act

- Guaranteed grid access for renewables; priority transmission and distribution
- Support payments for every kWh produced
  - Feed-in premium (and feed-in tariffs in some cases)
  - From 2017 on mostly based on auctions
- Technology specific payments, also with regard to further provisions (e.g. site and size)
- Renewables’ support costs are offset through the EEG levy; the special equalization scheme reduces the burden for energy-intensive industries
- Grid operators ensure grid stability independently from the public budget
- Expansion corridors guide growth pathway
- Regular monitoring and evaluation; accompanying research

Source: ERGO-Kommunikation, Ecofys, BMWi 2016
Renewable Energy Sources Act Amendment 2014

- **More planning security**
  - Binding target corridors for RES deployment
  - Introducing quantity control mechanisms

- **More efficiency**
  - Focus on cost-efficient technologies

- **More market integration**
  - Increase market integration through premium system
  - Tendering scheme for ground-mounted PV

- **More diversified distribution of costs**
  - EEG levy on self-supply
  - Adjusted exemptions for the industry

- **More Europe**
  - Open auctioning scheme for European neighbours

**Affordability**

**Environmentally-friendly energy supply**

**Security of supply**
Renewables share in gross electricity consumption

Overall target corridor
- In 2025: between 40% and 45% RES-E
- In 2035: between 55% and 60% RES-E

Capacity additions
- Onshore wind and PV: 2,500 MW (2.5 GW) per year each
- Bioenergy: 100 MW per year
- Offshore wind: 6.5 GW by 2020, 15 GW by 2030

Focus on Wind and PV as most cost-effective solutions

Source: Ecolys, BMWi 2015
Renewables are increasingly competitive with conventional power plants.

RES levelised cost of electricity in Europe 2014, 2020, 2030

Source: Fraunhofer ISI 2014
Auctions to replace feed-in premium based support

Results of German renewables auctions pilots scheme for ground-mounted PV in April 2015:

• 500 MW were on offer in three separate rounds: 150 MW in 1st and 2nd round each, and 200 in 3rd round
• Competition was high and therefore prices declined significantly.
• A variety of different types of actors was successful.

The auction scheme led to a further decrease in PV support levels.
Key pillars of the NAPE

**Stepping up energy efficiency in buildings**
- Energy efficiency incentive programme
- Energy efficiency strategy for buildings

**Energy efficiency as a return and business model**
- Tender model
- Default guarantees for energy performance contracting

**Individual responsibility for energy efficiency**
- Energy efficiency networks
- Top-Runner strategy

Energy efficiency policy frameworks

Germany’s energy efficiency policy is embedded in the EU framework.
Benefits of fostering energy efficiency and renewables

The energy transition has positive effects on various levels of the economy.
In 2014, Germany could save about €13 billion compared to the previous year by reducing the import costs for fossil fuels.
Of all sectors, employment in the building sector benefits most from the energy transition.
Ownership structure of German RES facilities in 2012

Total ~ 73 GW

- private owners, 35%
- farmers, 11%
- industry, 14%
- utilities, 12%
- project developers, 14%
- funds and banks, 13%
- contractors, 0.2%
- others, 1%

Renewable installations create multiple opportunities for entrepreneurship – the ownership structure is versatile.

Source: trend:research 2013
Public acceptance of the *Energiewende*

1. development of renewables is "(extremely) important" - 92%
2. phasing out nuclear energy by 2022 - 71%
3. the energy transition is right - 56%
4. energy transition is "(very) important" - 89%
5. aims of the energy transition are right - 82%
6. aggregated index for acceptance - 68%

Percentage of people that agree or strongly agree with the given statement

The energy transition enjoys a high degree of public approval.

Future: German electricity system volatility in 2022

Renewables can cover the total demand by 2022 but conventional back-up capacity for the winter will still be needed.
Four areas to increase flexibility

Technology neutral policies foster innovation: Different flexibility measures are suitable for different challenges to the grid.
The challenge: connecting supply and demand

New power lines need to transport excess supply in northern Germany to southern Germany in order to prevent shortages.
Climate: German greenhouse gas emissions

Germany has made significant progress in reducing emissions, but will need further measures to achieve its 40% target by 2020.
Thank you for your attention

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Additional Slides
Technology specific support levels as of April 2016

Remuneration in cent/kWh

<table>
<thead>
<tr>
<th>Technology</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>solar PV</td>
<td>8</td>
<td>12.7</td>
</tr>
<tr>
<td>wind offshore*</td>
<td>3.9</td>
<td>18.4</td>
</tr>
<tr>
<td>wind onshore*</td>
<td>4.83</td>
<td>25.2</td>
</tr>
<tr>
<td>geothermal</td>
<td>5.79</td>
<td>23.49</td>
</tr>
<tr>
<td>biomass</td>
<td>3.8</td>
<td>18.4</td>
</tr>
<tr>
<td>landfill, sewage &amp; mine gas</td>
<td>3.5</td>
<td>12.52</td>
</tr>
<tr>
<td>hydropower</td>
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* The standard payment for wind onshore is 8.69 cent/kWh and for wind offshore 14.9 cent/kWh.

Technology-specific payments reflect the varying cost of different types and sizes of renewables.

Source: BNetzA 2016, BMWi 2015
### NAPE: Efficiency measures and their expected savings

<table>
<thead>
<tr>
<th>Measure</th>
<th>Savings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality assurance and optimising of energy consulting</td>
<td>4.0 PJ</td>
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<tr>
<td>Incentive programme for energy-efficient renovation</td>
<td>up to 40 PJ</td>
</tr>
<tr>
<td>Continuation and increased funding of the CO2 building modernisation programme</td>
<td>12.5 PJ</td>
</tr>
<tr>
<td>Promoting “energy performance contracting”</td>
<td>5.5-10 PJ</td>
</tr>
<tr>
<td>National energy-efficiency label for old heating installations</td>
<td>10.0 PJ</td>
</tr>
<tr>
<td>National top runner initiative</td>
<td>85.0 PJ</td>
</tr>
<tr>
<td>Pilot programme for energy savings meters</td>
<td></td>
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<tr>
<td>Introduction of a competitive tendering scheme for energy efficiency</td>
<td>26-51.5 PJ</td>
</tr>
<tr>
<td>Upgrading the KfW energy efficiency programmes</td>
<td>29.5 PJ</td>
</tr>
<tr>
<td>Energy efficiency networks initiative</td>
<td>74.5 PJ</td>
</tr>
<tr>
<td>Obligation to perform energy audits for non-SMEs</td>
<td>50.5 PJ</td>
</tr>
<tr>
<td></td>
<td>32-76.5 PJ savings</td>
</tr>
<tr>
<td></td>
<td>85 PJ savings</td>
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<tr>
<td></td>
<td>180.5-206 PJ savings</td>
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</tbody>
</table>

**A balance of information, support and regulation.**

Source: Ecolys 2015 based on BMWi 2014