Efficient RES-E Support in Europe and its Impact on the Conventional Power Market

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Policy Overview
RE Targets in Europe and Germany

Renewable Share of Final Energy Consumption

<table>
<thead>
<tr>
<th>Region</th>
<th>Target Year</th>
<th>Value</th>
<th>2020 Target</th>
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</thead>
<tbody>
<tr>
<td>EU</td>
<td>2005</td>
<td>8.3%</td>
<td>20%</td>
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<tr>
<td>G</td>
<td>2005</td>
<td>5.8%</td>
<td>18%</td>
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Target in 2020

Renewable Share of Electricity Consumption

<table>
<thead>
<tr>
<th>Region</th>
<th>Target Year</th>
<th>Value</th>
<th>2020 Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>2006</td>
<td>14.5%</td>
<td>30-35%</td>
</tr>
<tr>
<td>G</td>
<td>2006</td>
<td>12.0%</td>
<td>30%</td>
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</tbody>
</table>

Target in 2020

Policy Overview
Development of RES-E Generation in EU-25

Source: BMU (2008)
Policy Overview
Status-Quo – Main Promotion Systems in the EU-27

- Feed-in tariff system / Bonus system in 17 EU member states
- Quota obligation system in 7 EU member states
- Tax incentives and other systems in 3 EU member states
General Remarks
Attributes of RES-E Support Systems

- price based support system (feed-in-tariffs)
- national support
- technology-specific support

vs.

- quantity based support system (quota)
- harmonized support
- technology-neutral support
Scenario Definitions

- **Business-as-usual (BAU)**
  Extrapolation of current RES-E policies in all Member States

- **Harmonized quota system**
  EU-wide quota (not differentiated by technology or country)

- **Cluster**
  BAU-system, in which quota countries form a cluster
Model Coupling
LORELEI and DIME

LORELEI
European RES-E Model

Marginal
Generation Costs

DIME
Competitive European Power
Market Model

Hourly RES-E
Feed-in Profiles
Methodology: The LORELEI Model
Linear Optimisation Model for Renewable Electricity Integration in Europe

**Input**
- Available areas
- Short run RES-E expansion barriers
- Social, technical, political barriers
- Feed-in profiles
- Existing RES-E capacities
- Economical parameters of current and prospective RES-E capacities
- Technical parameters of current and prospective RES-E capacities

**Output**
- Marginal generation costs from DIME-Model
- RES-E generation
- Installed capacities
- Variable and fixed costs
- Promotion payments
- Certificate price, weighted average feed-in tariff
- Feed-in tariffs (for feed-in tariff system / premium system)
- Quota obligation (for quota system)
Methodology: The DIME Model
Dispatch and Investment Model for Electricity Markets in Europe

Input
- Total demand
- Residual demand
- Exogenous Generation
- Political restrictions
- Existing generation capacities
- Technical properties of technologies
- Economical properties of technologies
- Fuel prices
- Existing transmission capacities
- Transmission loss

Demand

DIME
Linear optimization problem for competitive markets

Supply

Output
- Commissioning and retirement of capacities by technology
- Installed capacities
- Annual generation structure
- Plant dispatch by load level
- Physical exchange
- Marginal generation costs
- Fixed and variable generation costs
- Fuel consumption
- Carbon emissions
Qualitative Results
Harmonization Gains and Green Certificate Transfers

Substantial harmonization gains

Green certificate transfer
- EU 15 are net TGC importers
- EU 10+2 are net TGC exporters
- Fair effort sharing depends on RES-E targets and on distribution between sectors

Business-as-usual scenario
- Technology specific support leads to more diversified RES-E Mix
- Regular amendment of tariffs is important

Impact on conventional power market needs to be taken into account
Qualitative Results
Conventional Power Market

- Efficient RES-E deployment does not necessarily result in an efficient power market!

- The electricity markets need to increase flexibility through enhancements of transmission capacities, power storages, demand-side management and disconnection of wind mills.

- Integration challenges increase with more ambitious targets, especially in critical regions in a harmonized system. Therefore harmonization gains need to be leveled against these additional costs.

- Baseload share becomes reduced due to increase of intermitting RES-E, which also require sufficient back-up capacities.

- An ambitious RES-E target needs to consider the different reaction time of an adequate system (capacity and grid). Long-term planning security is not only important for the supported RES-E part of the power system. A well adapted system is crucial to receive a reliable system on top of a clean system.
Thank you for your attention!

For further information please visit: www.ewi.uni-koeln.de
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