Session 3: Grid Integration of Renewable Energy

Network Integration of Renewable Energies: Economic, institutional and legal barriers in the German electricity sector

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SEEKEr – Electricity from renewable energies in the context of the current national and European energy laws

SEEKEr – Strom aus Erneuerbaren Energien im Kontext des aktuellen nationalen und europäischen Energiewirtschaftsrechts

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Integration of renewable energies into the electricity System

Two levels of integration:

- **network integration** as precondition for market access
- market access as „**market integration**“ with the help of market design

Integration needs

- technical requirements
- **economic guidelines**
- **legal support**

Four different areas of network integration

1. network connection
2. network access
3. network usage

} **for renewable plants**

4. network optimization

} **including renewable plants**

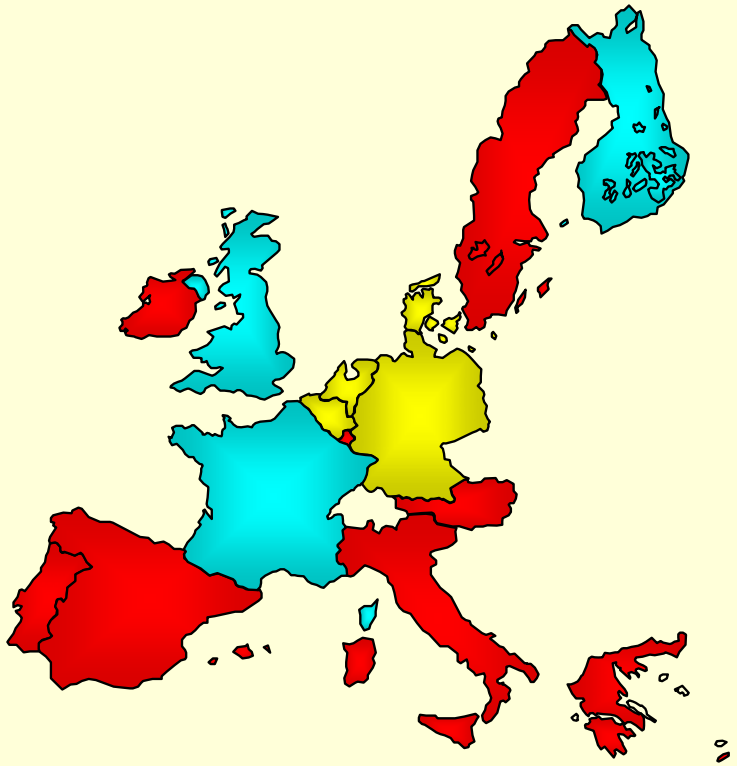
Barriers of network connection

- **Legal options to refuse connection**
  - if the plant does not meet the technical requirements ➔ grid code design
  - if the costs are “too high” / not “just and reasonable” ➔ design of the incentive regulation regime

- **High costs to prohibit connection economically**
  - locational signals / what is the “optimal” connection point from an economic point of view, and who decides?
  - deep vs. shallow connection charges

Connection charges

Source: Knight (ELEP project), 2006



Predominant Charging Philosophy

- Deep
- Mixed or no standard
- Shallow

Charging Method	Summary
"Shallow"	Generator pays only for the cost of equipment needed to make the physical connection to the grid. Costs of reinforcement are borne by DNOs.
"Deep"	Generator pays all costs associated with its connection. Includes the cost of physical connection to the grid and any upstream grid reinforcement costs.

Barriers of network access

- **Not sufficient network capacity available?**
  - Which plants must close down first? (Germany: absolute priority access for renewable energies, even with respect to CHP)
  - Who pays if the plants have to close down?
  - Can connection of renewable plants be refused if the plant operators do not sign contracts that allow for automatic plant control as part of the network management of the TSOs/DSOs?
- **“Slow” network operators?**
  - Who controls whether network operators are too slow? What is “too slow”?
  - Are there penalties for the TSOs/DSOs if the network was not reinforced/upgraded “early enough”? What is “early enough”?

Barriers of network usage

- Do the renewable plants have to pay network charges? (Not in Germany)
- Does the regime of fixing the use-of-system charges allow for
  - the recovery of costs associated with the connection of new and existing renewable plants (one-time and continuous costs)
  - the consideration of adequate parameters in the benchmarking procedure
  - the approval of costs associated with a good service quality for renewable plant operators?

➔ Does the incentive regulation regime neutralize any negative incentive that the TSOs/DSOs might have towards the connection of renewable plants in their network territories, and does it even give some positive incentives to encourage further expansion?

Barriers of network usage

The German regulation formula for DSOs

$$EO_t = KA_{dnb,t} + (KA_{vnb,0} + (1 - V_t) \cdot KA_{b,0}) \cdot \left(\frac{VPI_t}{VPI_0} - PF_t \right) \cdot EF_t + Q_t$$

- in the cost factors (KA) the costs associated with new and existing renewable plants should be included
  - CAPEX: network reinforcement costs
  - OPEX: contractual costs, transaction costs, control costs, ..
- in the individual efficiency factor V the number and size of renewable plants should be reflected
- in the quality factor Q costs of a good service quality for renewable plant operators could be approved

Barriers with respect to network optimization

DIRECTIVE 2003/54/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 26 June 2003

concerning common rules for the internal market in electricity and repealing Directive 96/92/EC

Article 14

Tasks of Distribution System Operators

7. When planning the development of the distribution network, energy efficiency/demand-side management measures and/or distributed generation that might supplant the need to upgrade or replace electricity capacity shall be considered by the distribution system operator.

- **How to „consider“ renewable plants within the network management of the DSOs?**
  - **How to use DER (distributed energy resources) to enhance existing network capacity?**
  - **How to create a “level playing field” for DER and network extension options?**
- **How to incentivise the DSOs to consider DER in their planning process?**

Rough guidelines for network integration

- non-discriminating network connection
  - shallow connection charges
  - fair locational signals
- priority network access for renewable plants
- an incentive regulation regime that neutralizes negative incentives of the TSOs/DSOs towards renewable plants
- a network optimisation approach that includes systematically distributed energy resources (DER)

Thank you very much for your attention !

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