The changing role of distribution system operators in liberalised and decentralising electricity markets

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Outline of the presentation

• Electricity market structure
• Threats to current business of DSO
  – Increasing DG penetration
  – Regulated efficiency incentives
  – Connection charges for DG
  – Unbundling
• Behavioural strategies of DSOs
• Advantages of DG
• Changing role of DSOs
• Conclusion
Electricity market structure

- Wholesale market
- Balancing market
- Energy supplier
- Consumer
- TSO
- Large power producer
- DG Operator
- DSO
- Ancillary services market
- Commodity subsystem
- Physical subsystem

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Threats to current business model of DSO

• Increasing DG penetration
  – Decreasing revenues for DSOs
    – Less transport of electricity to end users
  – Increasing network costs
    – Stability
    – Power quality
    – Balancing: wind and CHP are not load-following

• Regulated efficiency incentives
  – To simulate competition and to stimulate efficiency

• Connection charges for DG
  – Shallow/deep connection charges

• Unbundling
Behavioural strategies of DSOs

• Stabilisation strategy
  – Evaluate implications of regulatory framework
  – Gain operational experience
  – Reduce uncertainty

• Defensive strategy
  – Mitigate the impact of unfavourable regulatory and market developments (such as increasing DG)
  – Resisting change wherever new regulatory arrangements could lead to diminished profits

• Entrepreneurial strategy
  – Proactively influencing regulatory developments
  – Cooperating with regulators to implement new regulatory arrangements
Entrepreneurial strategy

• Developing new business activities
• Changing passive network operation policy into an active one: active network management
• Providing market access to DG as a market facilitator
• Providing network and ancillary services through intelligent management of the network

➤ Use advantages that DG can offer!
Possible advantages of DG

- Enhanced system reliability
- Avoided transmission and distribution line losses
- Congestion relief in transmission system
- Avoided infrastructure investments
- Ability to offer certain network ancillary services
  - Reactive power support
  - Voltage control
  - Frequency control

➤ Depending on specific location of DG
➤ Through aggregation and integration into power system planning operation
Changing role of DSO: business model

- Revenues:
  - Additional reliability
  - System information
  - Connection charges
  - UoS charges
  - Local balancing
  - Storage
  - Congestion management

- Capital expenditures:
  - Extensions / reinforcements
  - Ancillary services
  - Energy losses
  - O&M costs

- Money flow:
  - Equipment supplier
  - TSO
  - TSO / DG Operator
  - DG Operator / Large power producer
  - Energy supplier / DG Operator / Consumer

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Conclusion

- Electricity market developments create threats for distribution system operators (DSOs):
  - Increasing DG penetration
  - Regulated efficiency incentives
  - Connection charges for DG
  - Unbundling
- DSOs can overcome the threats:
  - by developing new business activities, thereby diversifying the business model
  - by transforming operational philosophies from passive into active network management
- Regulation needs to evolve:
  - DSOs should have access to a wider range of options and be able to innovate
  - DSOs should provide incentives to DG operators and consumers to behave efficient