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DSO unbundling and regulatory options to stimulate smart grid applications in the Netherlands

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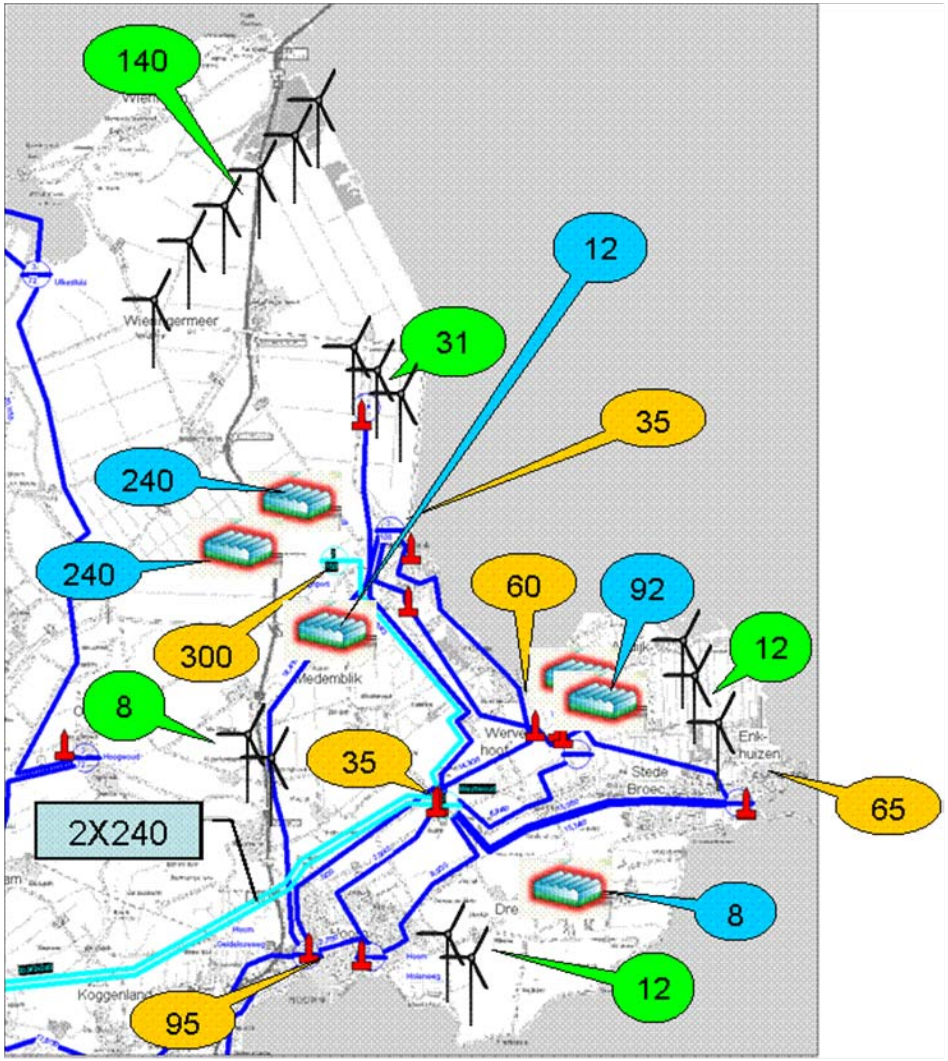
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- Business models for implementation
  - Via supplier
  - Via DSO
  - Via independent party (ESCO / aggregator)
- Does unbundling restrict smart grid business model implementation?

IEE IMPROGRES project

- IMPROGRES stands for ‘Improvement of the Social Optimal Outcome of Market Integration of DG/RES in European Electricity Markets’
- Main research question: Can smart grids increase the efficiency of the electricity system, and especially distribution network management in practice?
- 3 Case studies: distribution networks in Spain, Germany, and the Netherlands
- Business as usual case: Load and generation growth until 2020, but no smart grids
- Response case to reduce network integration costs (differing for the 3 case studies)
- Dutch case study:
  - Quite extreme supply developments (wind and CHP)
  - Production >> demand

IMPROGRES case study Netherlands: Distribution grid North Holland; 2020 medium DG scenario [MW]



- Loads and generation:
- Orange: contracted load (590 MW)
- Blue: CHP (600 MW)
- Green: wind (200 MW)

- Grid:
- Light blue: 150 kV (transmission)
- Dark blue: 50 kV (distribution)

More efficient network planning required

- Current ‘fit-and-forget’ network management philosophy deemed to be increasingly costly due to decreasing network capacity utilisation
  → intelligent networks required

- Supported by European legislation; *Directive 2009/72/EC* concerning common rules for the internal market in electricity
  - Article 25 (7): When planning the development of the distribution network, energy efficiency/demand-side management measures or distributed generation that might supplant the need to upgrade or replace electricity capacity shall be considered by the distribution system operator.

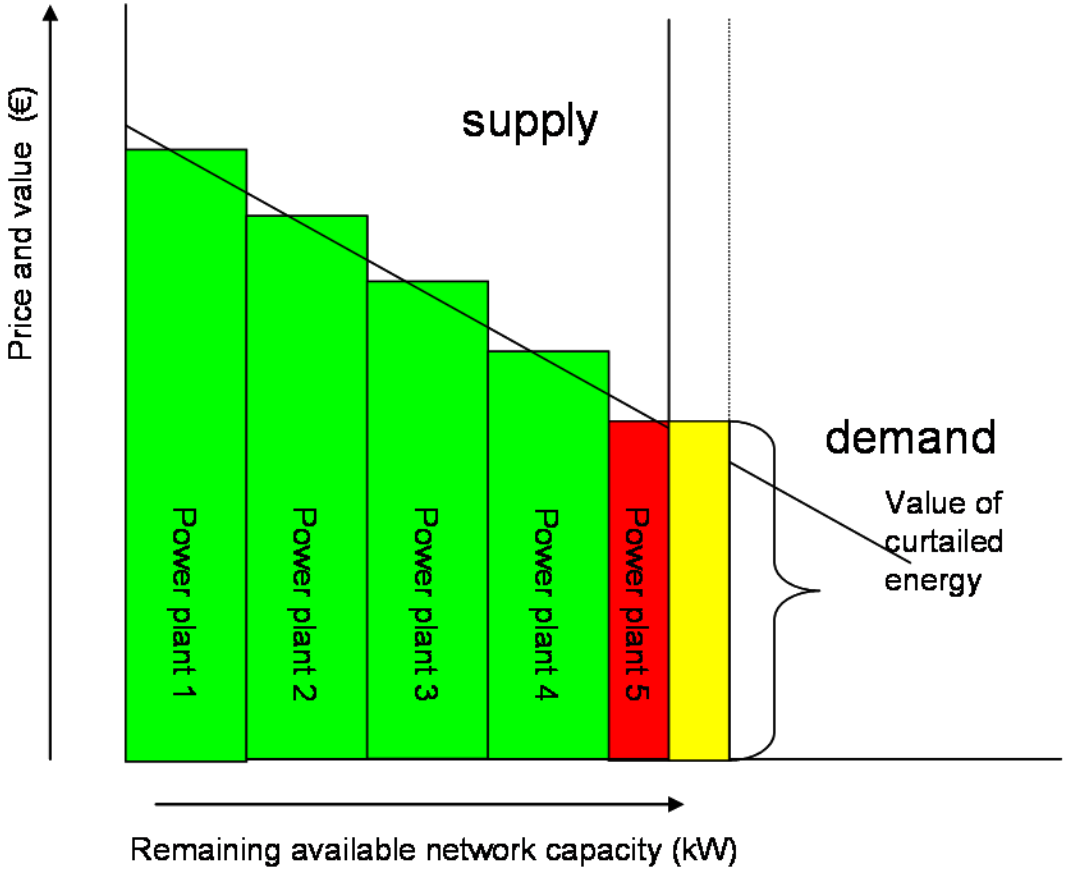
  - Article 2 (29) favours demand response and other measures, such as interruptible supply contracts, over investments to increase generation capacity

  - Article 3 (11) aimed at optimising the use of electricity, for example by providing energy management services, developing innovative pricing formulas, or introducing intelligent metering systems or smart grids

DSO smart grids response options

1. Curtailment of wind (reduce output of wind farms a few hours a year when there is high supply from wind and CHP compared to load)
   - Passive: limit the contracted connection capacity of wind farms to a level below the installed wind power capacity
   - Active: reduce the output of wind farms temporally at moments of congestion
2. Shift generation with CHP units to other times of the day
3. Shift electricity demand of horticultural companies (same as having CHP) to other times of the day

Example of passive curtailment (i)



Amount of fees to be paid

- Marginal avoidable network costs of DSO need to compensate lost generation revenues DG

Challenges / contractual conditions:

- DSO needs certainty that investments can be avoided for a sufficient long period

  - How to deal with new connection requests that impacts this network costs?

- DSO needs sufficient counterparties to limit costs

Example of passive curtailment (ii)

Assumptions:

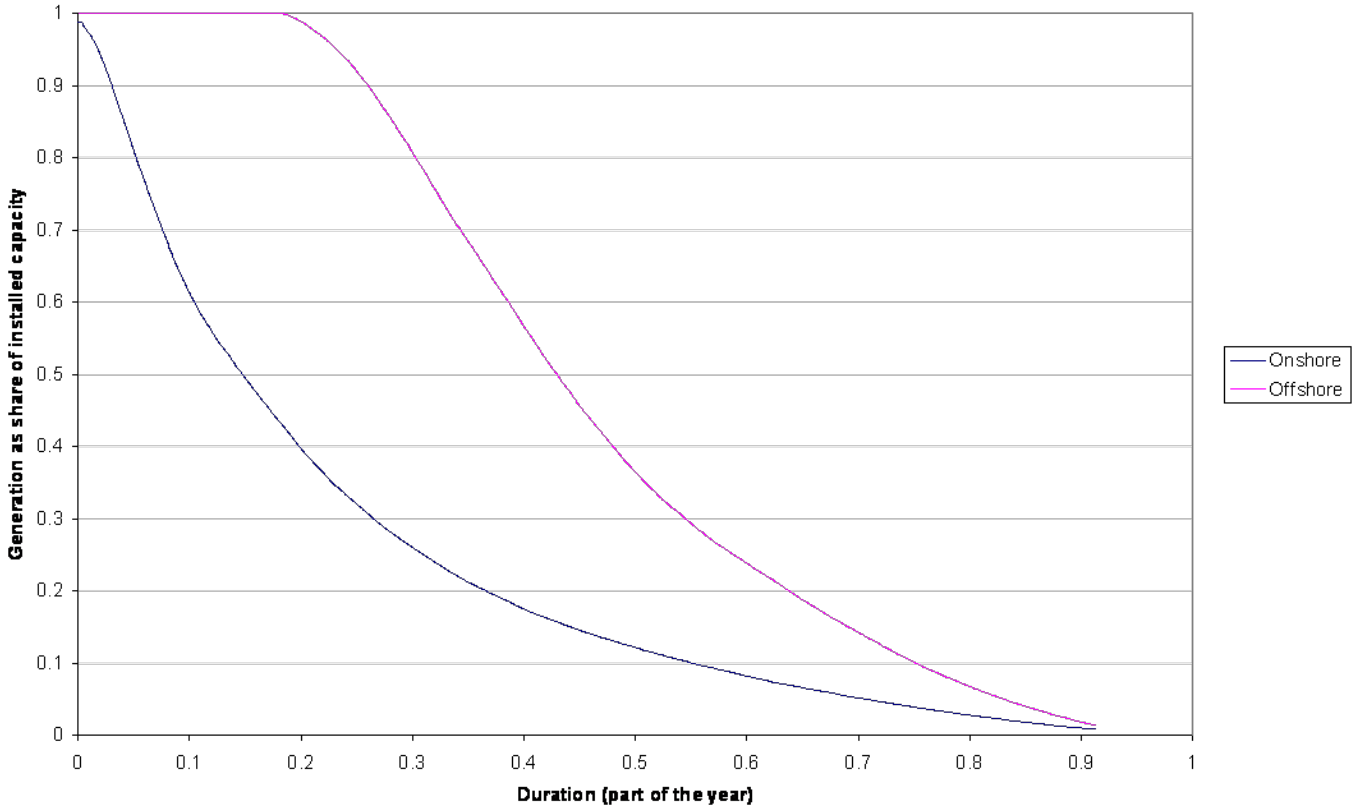
- wind farm of 25 MW, curtailment at 80% of installed wind power capacity → 5 MW avoided network capacity
- according to wind duration curve: lost wind generation = 52 kWh/ 1 kW wind installed → 52*1000*5 = 260 MWh.
- network investment costs 20 euro/kW DG/ year

DSO: marginal investment cost saving: 20*1000*5 = €100,000

DG: If marginal market price 2020 = € 50 / MWh → lost wind generation revenues amount to €13,000 a year.

→ Investment cost savings = 7 years of lost wind generation revenues << 20 years lifetime of wind generators

Example of passive curtailment (iii) - Wind duration curve



Business models for implementation of response options

- Two ways to implement response options:
  - Direct intervention by DSOs
  - Financial incentives for DG, consumer or intermediary party
- Financial incentives are more likely in the current liberalised market framework

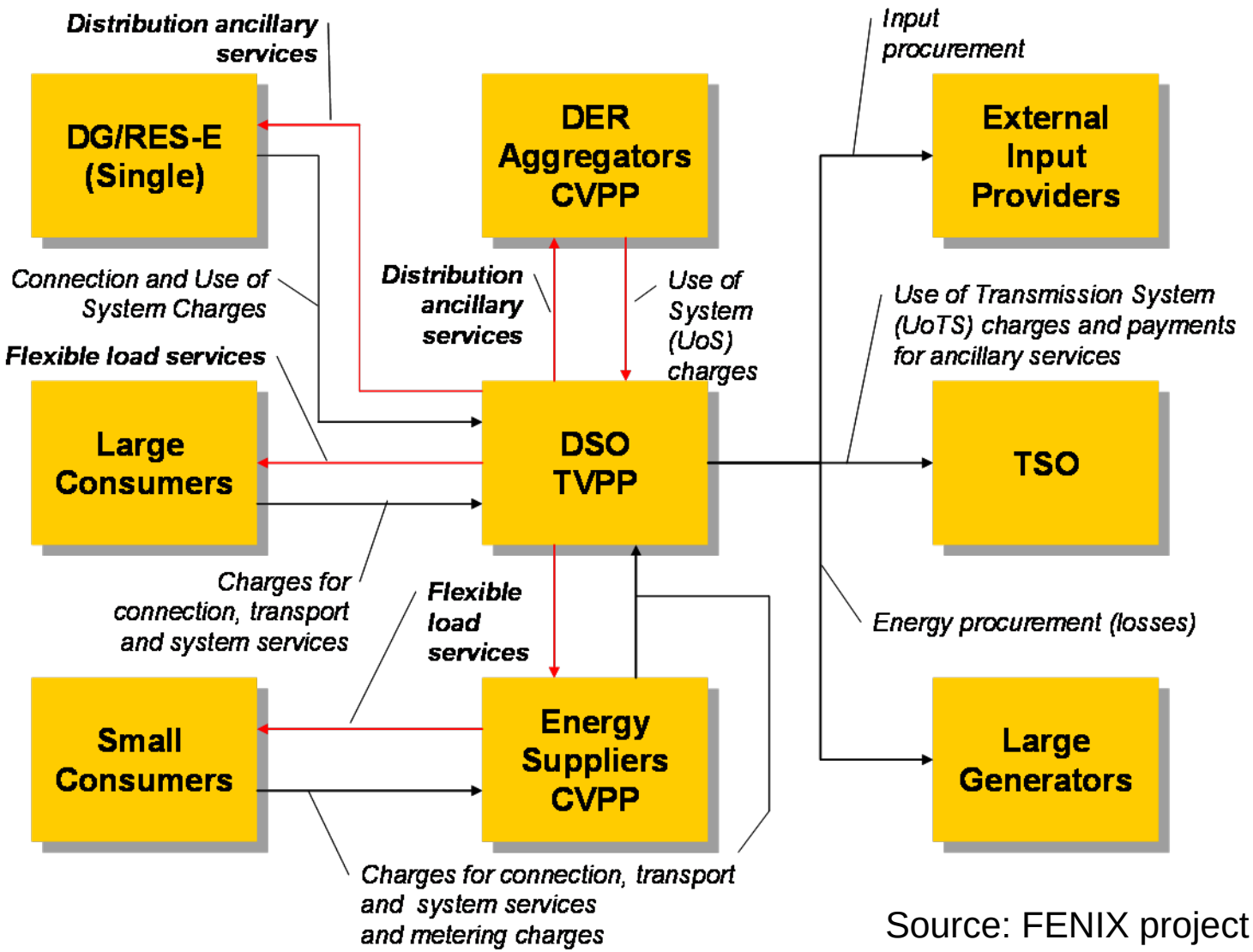
  → both DSO and counterparty need to profit from new contractual arrangements

  → business models required

Curtailment & Demand response:

- DSO contracts potential providers of curtailment & demand response services and pays fees
- DG lowers its production and diversifies its income
- Consumers lower their consumption and procure energy against lower prices
- Intermediary parties provide aggregation services and obtain fee

Possible DSO business models



Source: FENIX project

Implementation of identified regulatory options prevented by unbundling requirements?

- Depends on the type of business model chosen:

1) Direct intervention by DSOs
2) Contracts between DSO and DG

1. Direct intervention by DSOs

- Article 10b: a network operator is no part of a group that also performs commercial activities

  → direct intervention not allowed

- In line with EU legislation for unbundling of TSOs: ‘control over a transmission system or transmission system operator should preclude the possibility of exercising control or any right over a generation or supply undertaking’

2. Contracts between DSO and DG

- Definition Directive 2009/72/EC, article 2 (34):

  - ‘control’ means rights, **contracts** or any other means which, either separately or in combination and having regard to the considerations of fact or law involved, confer the possibility of exercising **decisive influence on an undertaking**, in particular by:

  (a) ownership or **the right to use all or part of the assets** of an undertaking; …

  → contracts may have decisive influence on an undertaking and against ownership unbundling

- However,

  - if congestion management is performed through balancing mechanism, only intermediary role for TSO/DSO

  - Dutch legislation seems to be less strict

Conclusions

- Contributions of production and demand are important for more efficient network planning → curtailment of production and demand response

- In a market-based system, both DSO, DG and load need to profit from the provision of new service → new business models required

- Ownership unbundling requirements seem currently not to prevent contracts between DSOs and DGs

  → no trade-off between unbundling and network planning

- Up to now favourable effects of ownership unbundling for smart grids:

  - DSOs think about their role and strategy

  - DSOs do not have to transfer income to the holding, but can reinvest their income.

Thank you for your attention!

More information on project website IMPROGRESS:
http://www.improgres.org/home/

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