ENERGITILSYNET
Danish Energy Regulatory Authority

The challenges of grid loss in the regulation of Danish distribution system operators

Danish Energy Regulatory Authority (DERA)

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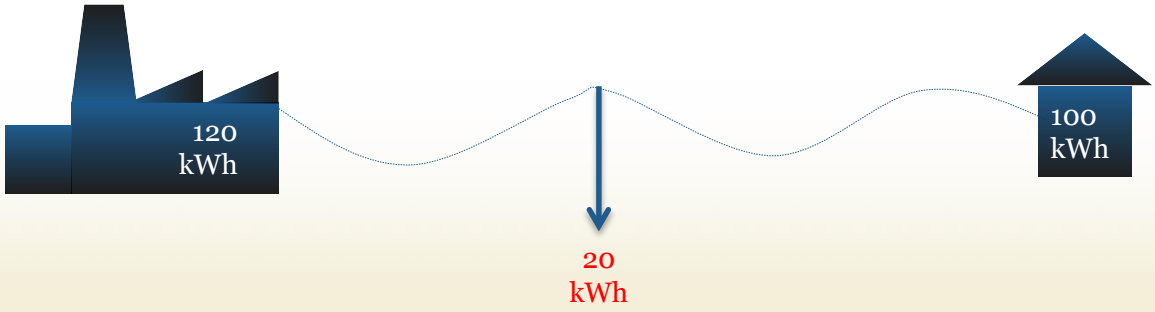
DERA's current level of information on grid loss

- According to acts DSOs must report their annual technical grid loss and the cost related to the grid loss.

- Technical grid loss is measured as the amount of electricity which enters the grid deducted by the amount of electricity delivered to the end-consumers.
  - A DSO which lets 120 kWh enters the grid in order to meet a demand of 100 kWh for the end-user, incurs 20 kWh of grid loss (the residual).



DERA's current regulation of grid loss

- In the current regulation, cost of covering grid loss is added to the DSO's allowed revenue cap
- However the amount of technical grid loss is permanently locked to a 2004 level
- The average price per unit of kWh technical grid loss is calculated based on reported cost to cover grid loss.
- The cost to cover grid loss is subtracted from the cost used to calculate the economic efficiency
- Lack of regulatory incentive to reduce the cost to cover grid loss

The scope of the grid loss and its related cost in 2015

- In total the DSOs had DKK 769.4 m in cost to cover grid loss
- The total amount of controllable cost were DKK 1952.8 m
- The cost to cover grid loss equates to 39 % of the total controllable cost
- For every 100 kWh delivered to the end-consumer approximately 4 kWh will be lost as technical grid loss

The ability to affect and reduce technical grid loss

- The network consists of components with a depreciation periods stretching more than 30 years into the future
- The engineers have to predict the electricity demand 30 years into the future when planning the optimal grid topology
- A complete reinstallation of the grid could reduce the technical grid loss, but such an undertaking would be extremely costly. The benefits may not outweigh the total cost.
- The DSOs have large grid investments planned for the near future due to cyclic investment programs.

The cost of technical grid loss

- The DSO covers grid loss by acquiring the electricity on either pre-negotiated dials or from the spot market (Nord Pool)
- Using pre-negotiated dials results in little or no control of the price beyond the terms of the dial negotiated by the DSO and the supplier
- Using Nord Pool leads to the DSO assuming a price taking role where prices are determined by market powers
- It is DERA's responsibility to ensure that DSOs are acquiring the electricity in a manner which meets competitive pricing principles

Moving towards green energy

- The DSOs in Denmark are challenged with an increasing amount of decentralized production, e.g. solar and wind power.

- As part of their grant to distribute electricity, the DSOs must connect these decentralized production plant to the power grid.

- The decentralized production has reversed the traditional downstream role for the DSO who now must provide a grid that can direct electricity from the decentralized production plant and back up to the transmission grid.

Panel of experts on a new Danish benchmarking model

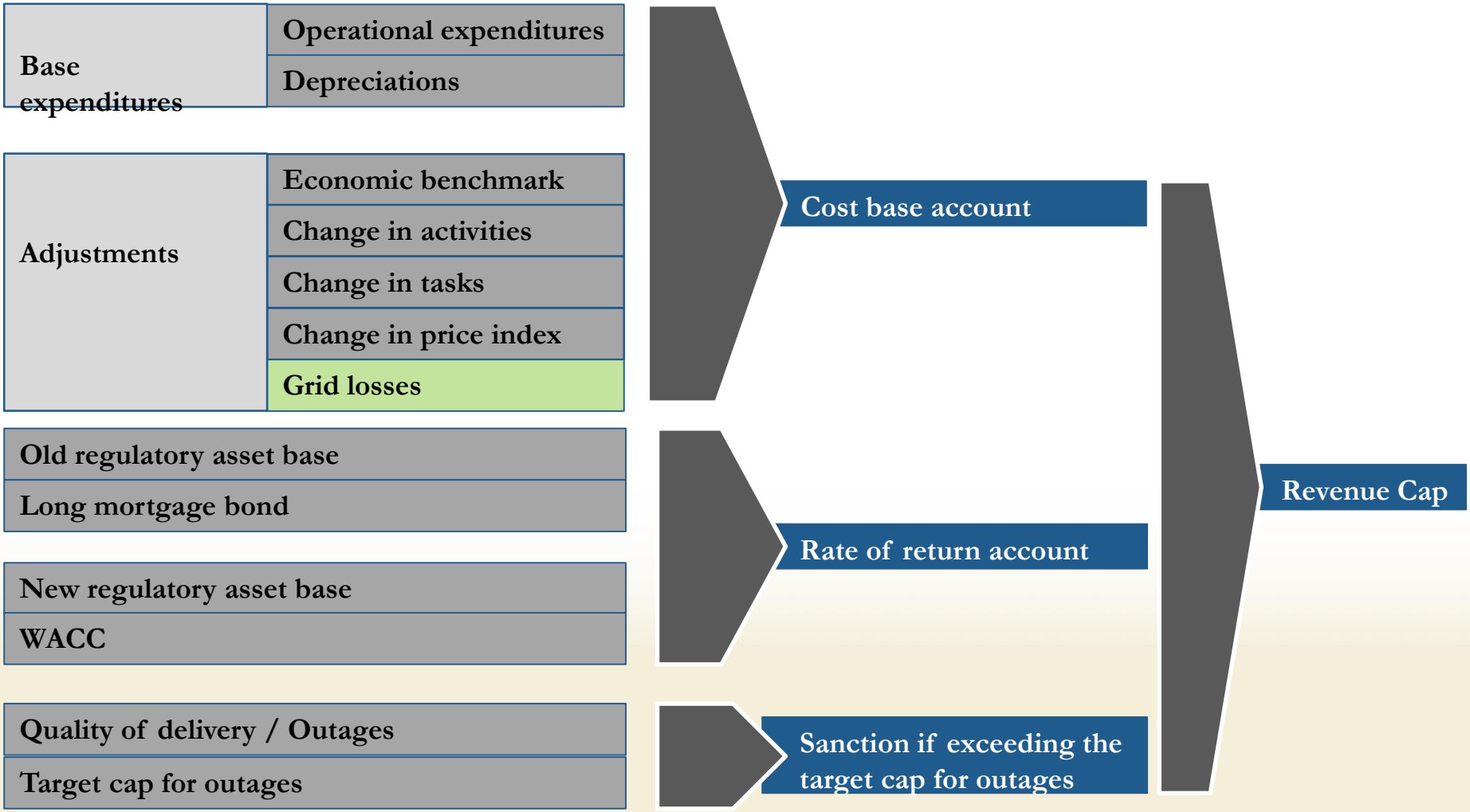
- On February 1st 2017, a panel of experts handed over their final report regarding a new benchmarking model to DERA.

- Measuring and calculating an optimal network topology, with the minimum level of technical grid loss, is impossible with the current level of information and network measuring points.

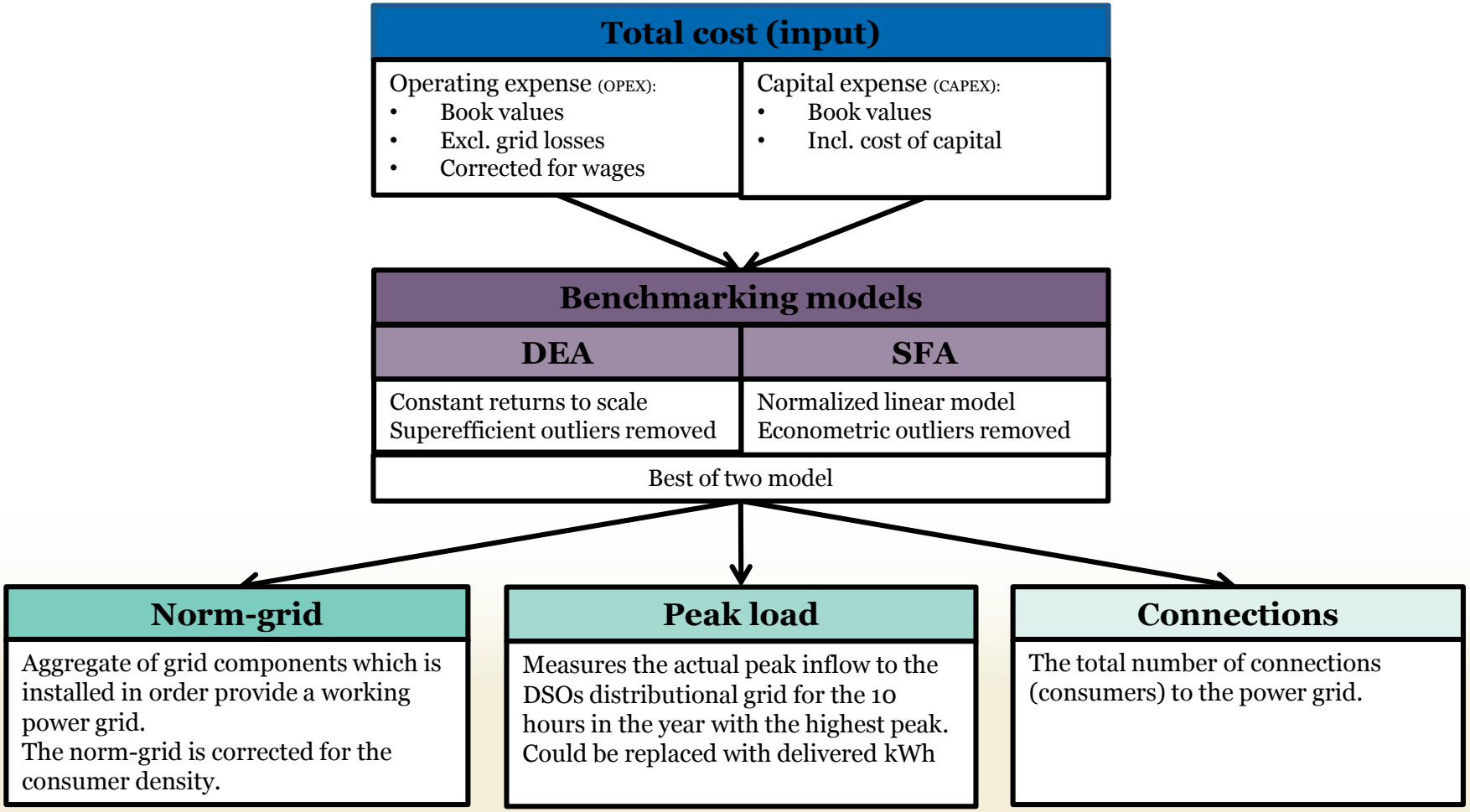
- Technical grid loss should for now be kept out of the economic benchmarking model. But looking ahead both technical grid loss and cost for covering grid loss should be in a benchmarking model.

- The experts expect that the full deployment of smart grid and remotely readable monitors in 2020 will allow the DSO to more precisely measure technical grid loss.

The building blocks of the new revenue cap



The new benchmarking model



The challenges ahead

- Should we regulate technical grid loss
- How can we accurately measure the efficient level of technical grid loss
- Can the regulator benchmark the cost to cover grid loss
- How can we determine the optimal price scheme for DSOs with different approaches to cover grid loss
- Can/should the regulation incentivize the desired behavior to reduce both technical grid loss as well as cost to cover grid loss to an efficient level