



The effect of renewables: How to address increased network losses

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Why even regulate network losses?

Isn't the engineers professional pride enough?

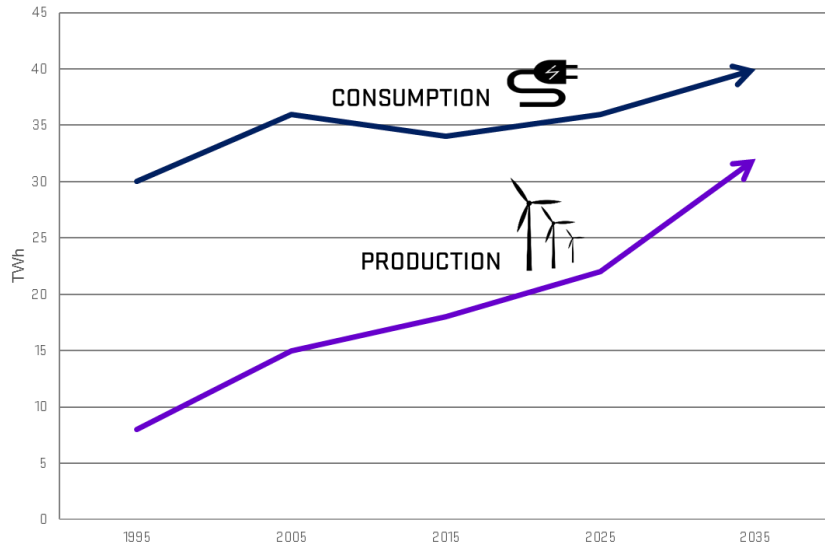
- **Because it's expensive** – network losses cost Danish DSO's about 800 million. DKK annually. That's almost 30 pct. Of OPEX
- **Because its significant** – network losses make up 5-6 pct. of total consumption at the DSO-level

So we understand why regulators have a keen interest in this.

BUT, a new normal in the DSO industry is challenging the traditional incentive models for regulating losses.

DSO's are facing new challenges and a changes energy system

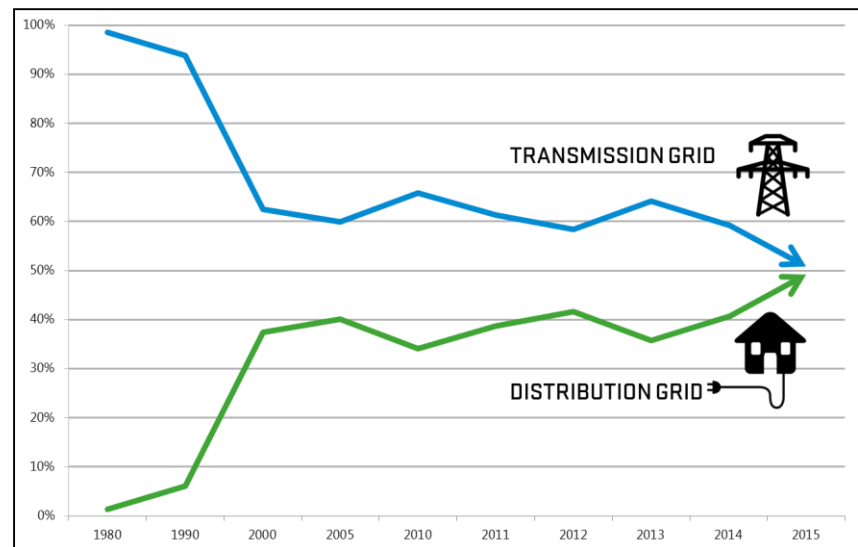
Graph 1: Consumption stagnates, renewable production grows



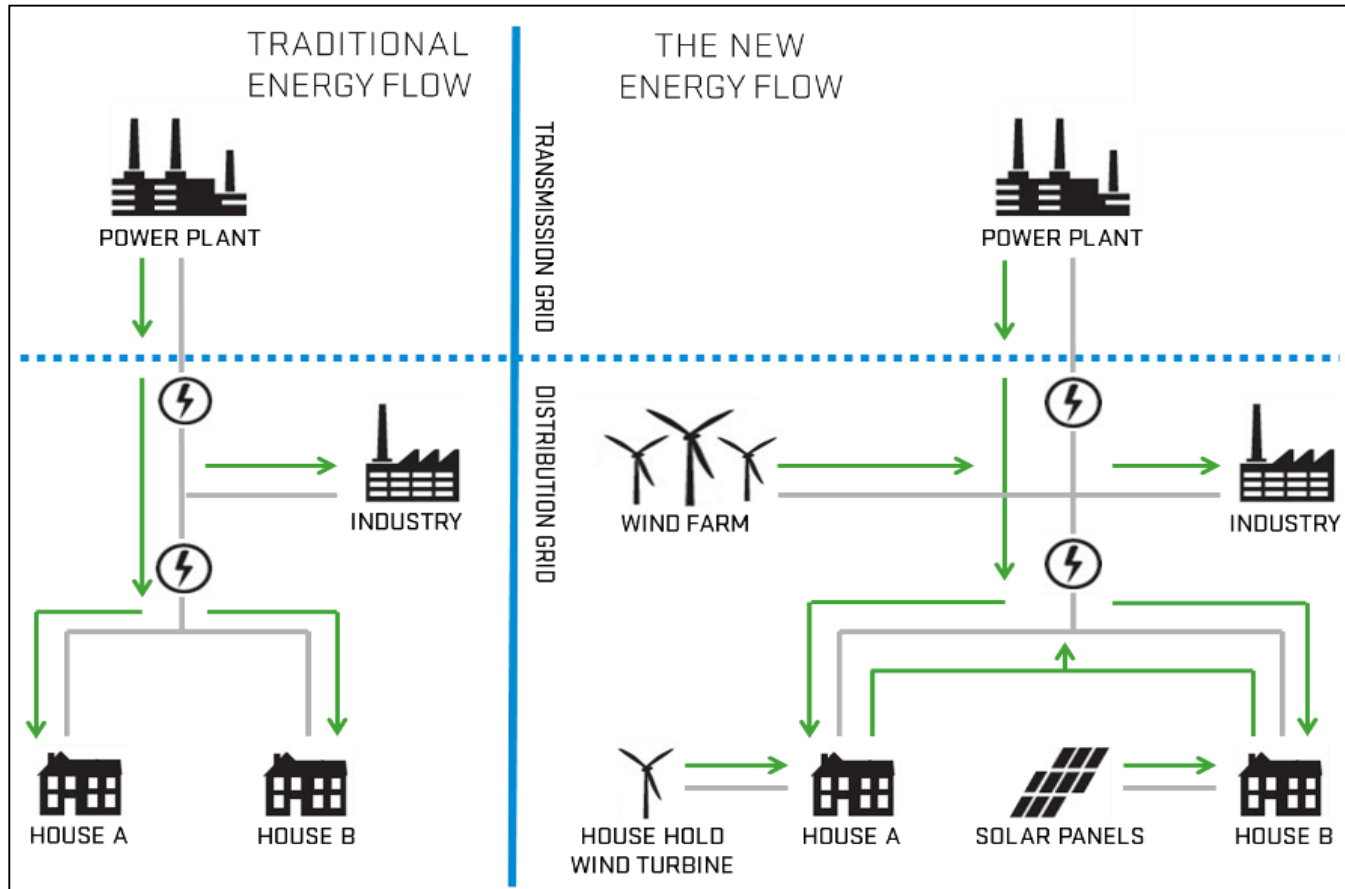
This trend is expected to continue as heating and transport become electric. Furthermore there is a trend among consumers, demanding power supply that is more individualized and democratic.

The political objective of reducing carbon emissions has led to more decentralized production of electricity. This is changing the role of the DSO's as we move towards a low carbon economy

Graph 2: Half of all production is now fed directly into the distribution grid



The energy flows have changed



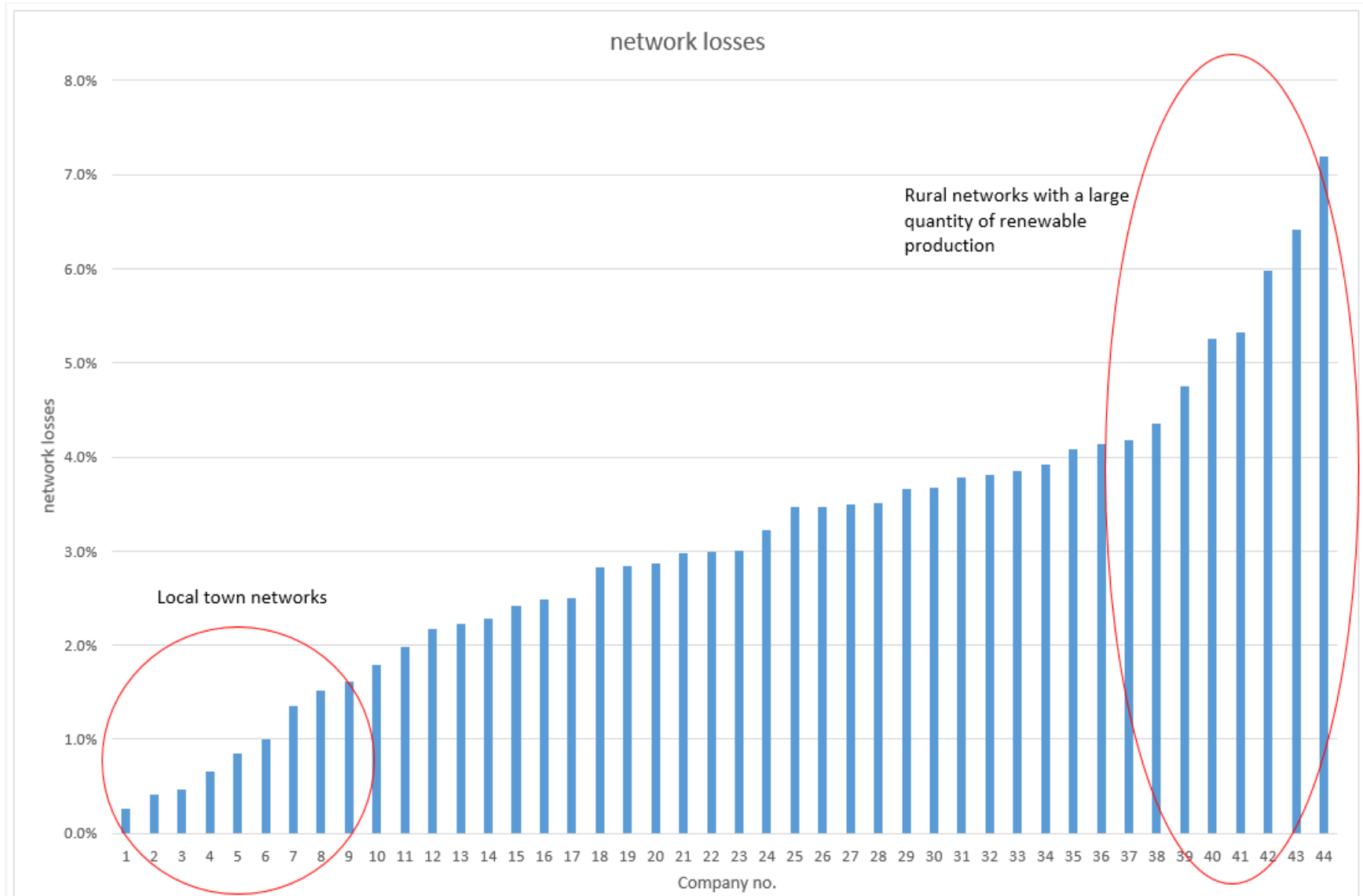
- **Traditional incentive regulation has focused on a traditional energy flow**, where network losses were relatively predictable.
- However the **new energy flow means a new reality and far less predictable and incomparable network losses.**

Why is this a challenge for building a good regulatory scheme

Because:

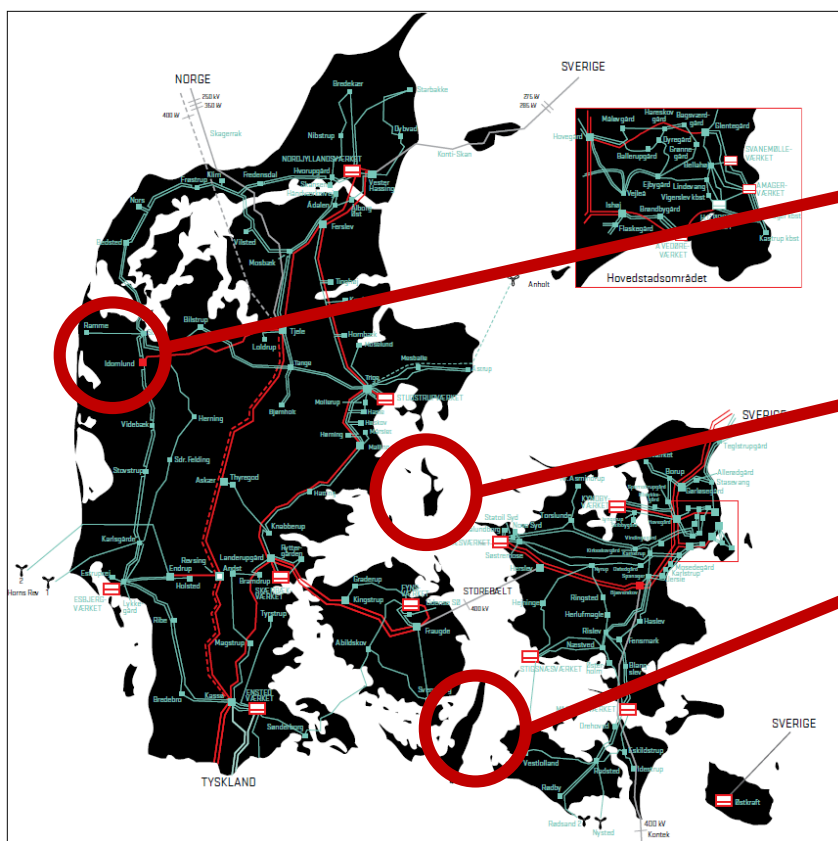
- **Production isn't evenly spread across the country, but localized.** Wind-farms, solar farms and other decentralized forms of production are usually located in sparsely populated areas.
- **The grid isn't yet geared to handle all this production,** especially the 50/60 kV-grids, which were built before the revolution in renewables, and transmission connections often aren't able to handle peak production.
- **It's a new normal,** we don't yet have the necessary data to analyze exactly how this affects the network losses, much less to build a model to describe it.
- **Because DSO's are different,** some DSO's cover only 0,4/10 kV in populated areas and are essentially unaffected, while companies in rural areas are under considerable financial pressure from increased losses.

DSO network losses in pct. of delivered energy



Amount of production connected to distribution grid

A couple of examples



Nordvestjylland

Peak production = 1000-1200 pct. of yearly consumption

Samsø

Yearly production = 308 pct. of yearly consumption

Langeland

Yearly production = 177 pct. of yearly consumption

These companies have huge challenges, that are not addressed in the incentive regulation and only partially addressed through direct compensation. They also face a huge financial risk if production keeps growing.

How does Danish regulation handle this challenge today?

- **Direct compensation for unpredictable losses, can be part of the solution.**
- Danish DSO regulation is composed of **two central elements**. An **incentive regulation of network losses in general**, and a **direct cash-compensation scheme for DSO's that have wind power** connected to their grid.
- The **compensation is financed collectively** by all electricity customers and **the scheme is based on a model**, set independently of actual losses, so as to insure correct incentives.
- The **compensation scheme today covers about 8-10 pct. of total network loss**. However, it doesn't cover losses from solar or decentral heat-power plants. It also **only covers losses in the 10 kV-grid and not the considerable spill-over in the 50 kV-grid**.

Data continues to be a challenge

- **Three different analyses** have within the last 5 years concluded that it was **not possible to construct a full model for describing network losses**.
- One major finding, is that the quality of **data amongst especially smaller DSO's is a challenge**.
- A fourth analysis will be initiated next year by the Danish energy agency this year.

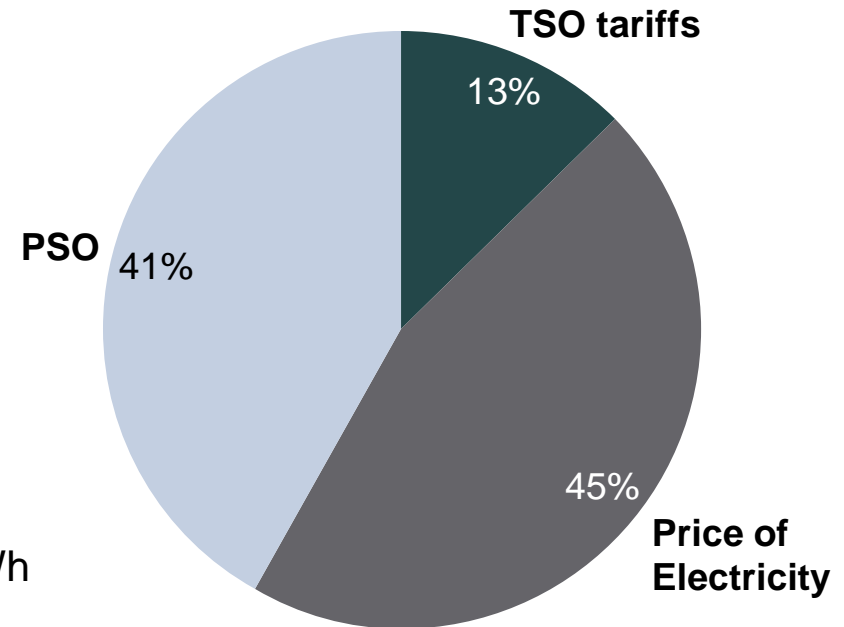
How about price regulation?

A look at what Danish DSO's are paying for

- The price of network loss was approx. 0,56 DKK/kWh in 2015

This total price is composed of three elements:

1. **Transmission tariffs** were 0,07 DKK/kWh
2. **Electricity bought to fill the network loss** was an average of 0,25 DKK/kWh
3. **Public service obligation** was 0,23 DKK/kWh



Ergo: only about 45 pct. of the price of network losses is actually the electricity itself!

Any price regulation will need to respect this fact.

What is needed going forward

- **Better data.** We need to understand more about network losses and insure transparency about the financial expenses.
- Ideally a **full cost coverage guaranteed**, to protect DSO's from the risk of increased losses, **until we know how to handle losses** from increased production from renewables.
- **Increased compensation** for network losses caused by renewables.
- Since data quality is poor, and conditions so different between DSOs, **network losses must be exempt from benchmarking.**
- Regulator focus on DSO's processes for buying electricity to cover losses.
- **A program for DSO reporting on their initiatives for minimizing network losses** – ideally as part of an asset management setup.

