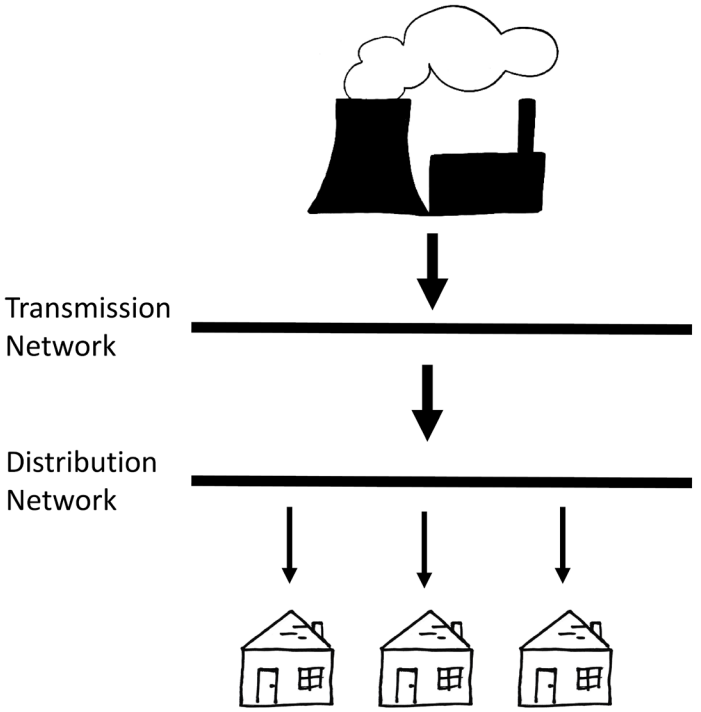
2 Crash course | History of our Energy System

This Crash Course first describes the traditional working of the energy system.
Next, it discusses how the increase in RE challenges the incumbent organization of the energy system. Finally, the potential opportunities that current changes could provide to energy communities are discussed.

History of our energy system

Traditionally,

- electricity has been generated by large scale fossil-fuel fired or nuclear power plants that feed electricity into the transmission network, that feeds electricity into the distribution network which then distributes electricity to consumers.
- our energy system has been characterized by a one-way flow of electricity, from the large-scale generators, towards consumers
- the operation of electricity markets, control of the network and matching of generation and demand has taken place at the level of the transmission network

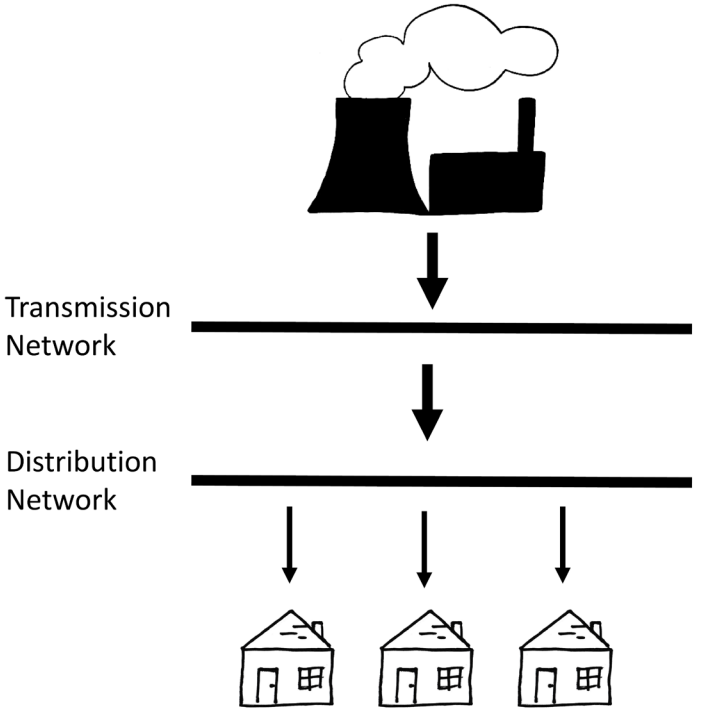


History of our energy system

In the electricity network, electricity supply and electricity demand always have to be in balance.
This balance has mostly been assured by generating more energy when demand is high or generating less when demand is low.

In other words, **supply follows demand**.

Furthermore, in case of insufficient capacity of the network to meet electricity demand, the solution has mostly been to upgrade the transmission and/or distribution network to enlarge capacity.



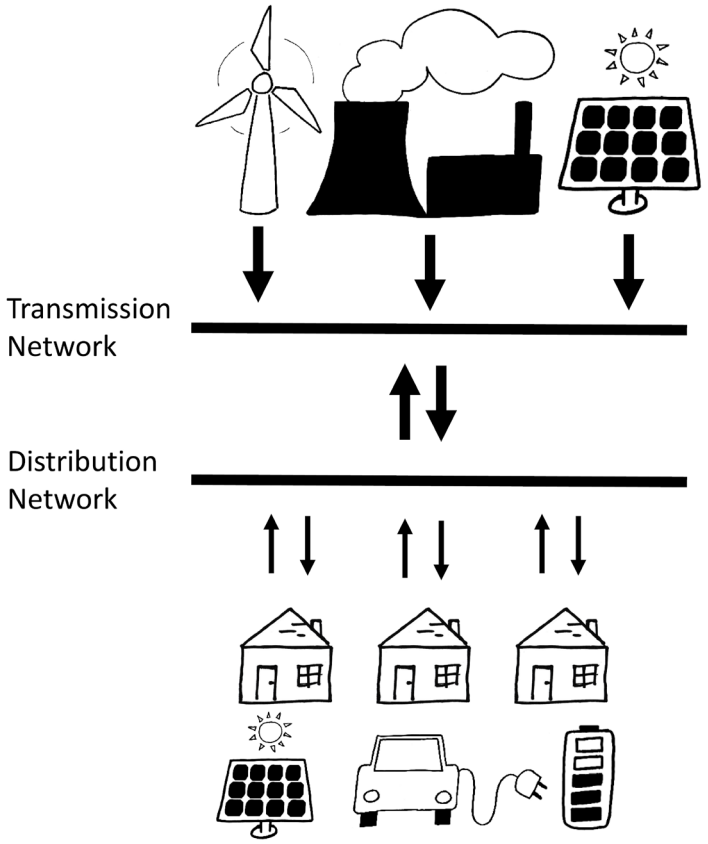
The future of our energy system

However, today:

- renewable energy sources (RES) are increasingly connected to the distribution rather than the transmission grid
- many of these RES are weather dependent (e.g. solar panels, windmills) and therefore lack controllability

If the share of renewable energy further increases, it will become increasingly difficult to adjust supply to follow electricity demand.

Another way to match the supply and demand is to adjust demand, by controlling appliances (e.g. heat pumps) and energy storage systems (e.g. batteries).

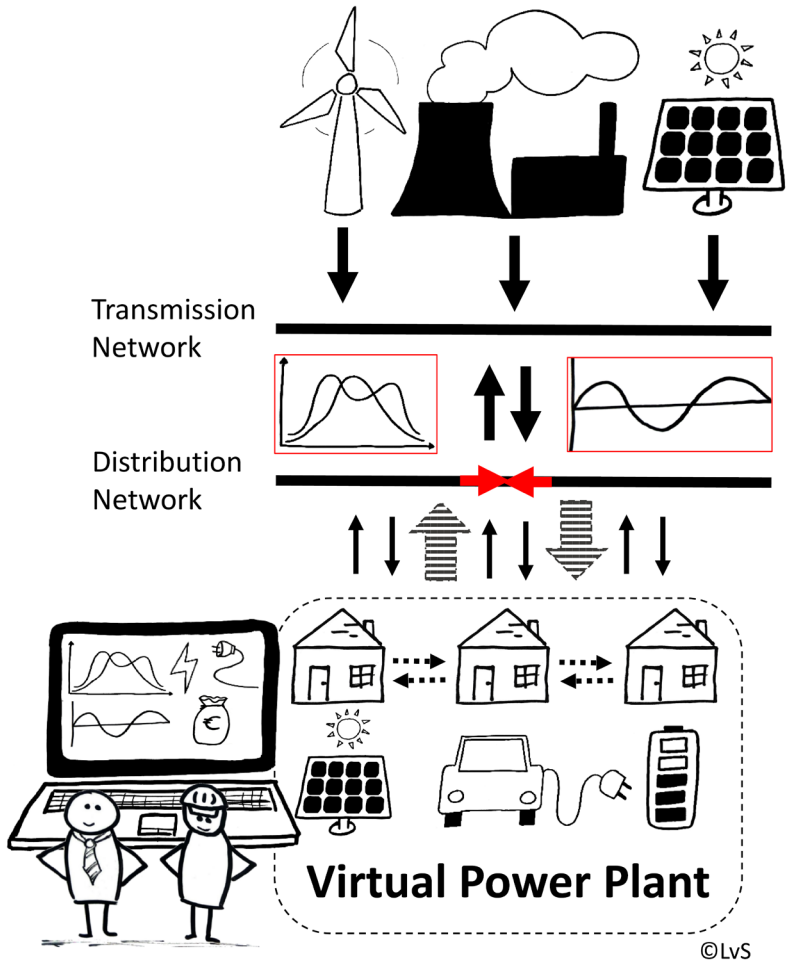


The future of our energy system

At industrial scale, adjusting of demand (called Demand Response) is already an established practice: financial incentives are provided to industry to encourage changes in their energy consumption patterns – which often means that energy-intensive processes are shifted in time towards moments when overall demand is low.

This ability to adapt demand is called **(demand-side) flexibility**

At household and community level, flexibility at the demand side increasingly is considered an important way to contribute to the overall balance of demand and supply in the network.
This flexibility is enabled by ICT systems like a virtual power plant.



2

What does this mean for energy communities?

Energy communities can play an important role in increasing the share of RE and in the adjusting of the electricity demand (demand-side flexibility). A cVPP can help organize this by enabling communities to take up new activities.

Examples of such activities (see also **tool | Value - Goal - Activity**) are:

- ☐ Actively collecting flexibility from RE, controllable appliances and storage and sell this through a third-party aggregator (at distribution or transmission level)
- ☐ Actively collecting, aggregating and selling flexibility from RE, controllable appliances and storage (bundling this with flex from other communities, as an aggregator) (at distribution or transmission level)
- ☐ Use flexibility provided by storage and household appliances to minimise the peak power usage (and peak of energy fed back to the distribution network) within households to lower the capacity tariff of households (tariff depending on size of connection with the network)
- ☐ Use community-level flexibility provided by storage and household appliances to balance demand and supply in line with physical availability of RE on the transmission network