Renewables, battery storage systems and power grids: the new trio for security of supply

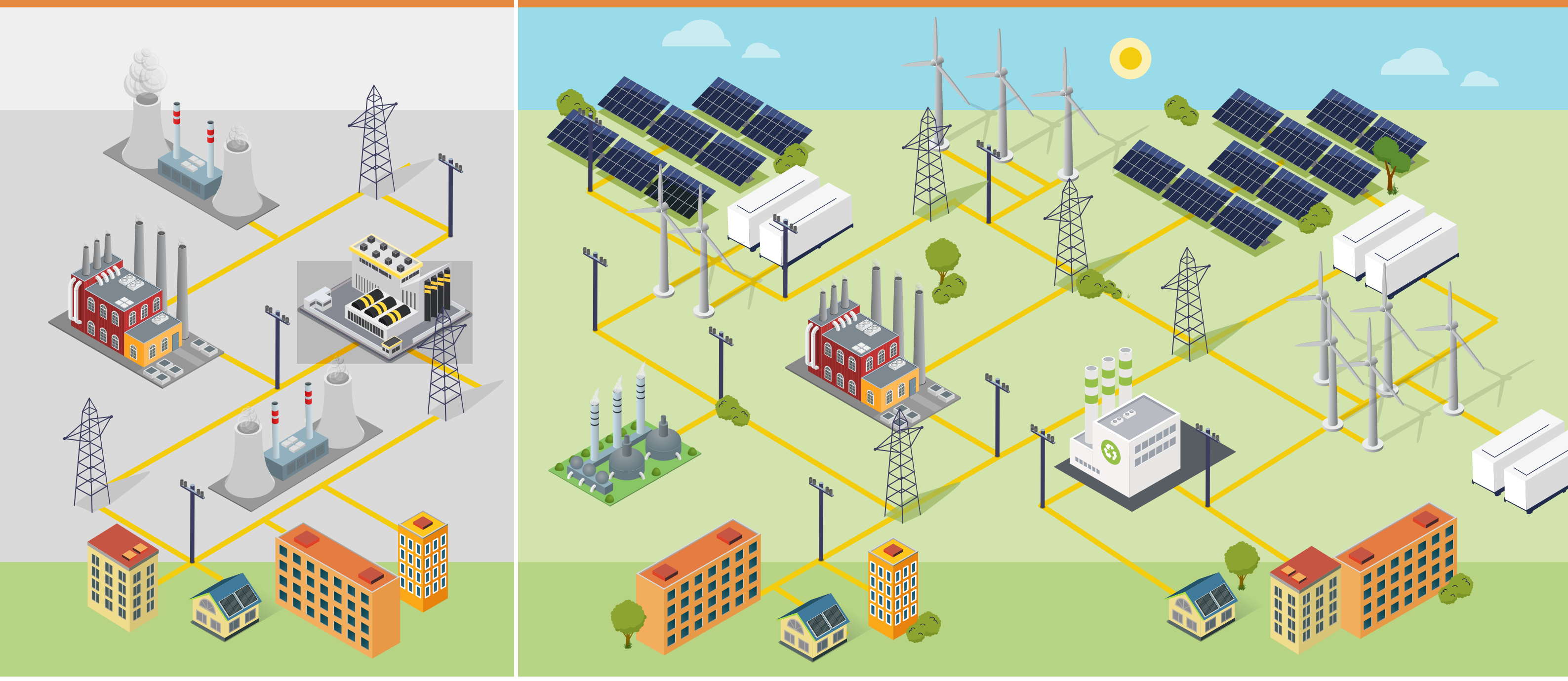
No strong energy transition without strong grids

Power grids are the **link between generators and consumers.** Efficient grids are the key to ensuring that electricity from renewable energies can contribute to security of supply. That's because a good power grid can efficiently balance the supply of temporarily stored wind and solar power with demand: grids manage the geographical balance, while storage systems strike the temporal balance by releasing the power when needed. Renewable energies already account **for 61% of the German electricity mix – but we need effective transmission routes in order to really exploit the potential.** In terms of climate policy, upgrading the power grid is the cheapest option, particularly from an economic perspective.

Green energy needs new approaches

By generating renewable electricity, Germany is moving away from supplying energy from large, central hubs such as nuclear and coal-fired power plants to **a number of smaller generation sites.** The many roof-mounted solar panels generate the electricity on a decentralised basis along with solar and wind farms**, which is why new ways of transmitting it to the consumer are needed.** Converting and upgrading the power grids is essential for ensuring that renewable energies reach all areas of our lives: at home, at work and on the move. We will remain dependent on the fossil energy system if we fail to create new transmission routes. The grid must be capable of embracing this new energy world by supplying temporarily stored renewable energy as and when required. **We must give renewables the opportunity to get to where they are needed.**

The energy world before | The modern energy world, outdated grid



How can grids help to achieve greater flexibility?

Our energy system urgently needs flexibility in order to supply all consumers with power from renewable sources as and when needed. **Battery energy storage systems can deliver this flexibility quickly and cheaply.** These storage systems must be connected to the power grid. In particular, **the distribution grids must be converted and upgraded.** In recent years, a great deal of attention has been paid to major power lines at transmission level – they are more visible, and the discussions were emotional. Renewables mainly feed into the distribution grid, however, and the task of converting and upgrading them has been "completely ignored". We urgently need to change this situation.

Yet sometimes it is not a new power line that is needed, but simply improvements to the way the existing infrastructure is used, the so-called upgrade. The process of **"overbuilding" – installing more generation capacity than permitted by the grid connection – and better utilisation of grid connection points** would also significantly help to improve flexibility. After all, battery storage systems act in a way that serves both the grid and the overall system by temporarily storing surplus electricity and quickly feeding it back into the grid when needed to compensate for fluctuations. They also help to stabilise the grid frequency, maintain security of supply and better integrate renewable energies.

Serving the system or serving the grid – what do the terms mean?

Energy facilities that actively contribute to the safe, stable and efficient functioning of the overall electricity supply are said to serve the system.

Renewable energy facilities and storage systems both serve the system, if they:
- feed in power as and when needed.
- provide system services such as maintaining frequency and voltage stability.
- keep power reserves available.

These facilities help to maintain security of supply and contribute to stable grid management – without overloading the local grid. Technically, battery energy storage systems have long been able to perform these functions.

(Market-based) energy facilities that actively contribute to the efficient and stable functioning of the grid are said to serve the grid.

Renewable energy facilities and storage systems both serve the grid, if they:
- support the operation of the power grid.
- maintain grid stability.

Flexible grid connection contracts can make it possible for grid operators and contracting parties to use these facilities in a clear and legally compliant manner.

Who is responsible for what?

BNetzA – Federal Network Agency

Regulating grid access and fees, approving grid upgrade projects, organising tender processes, etc.

Grid planning

Authorised to issue directives

Transmission system operator (TSO)

4 players

- Operating high-voltage grids (220 kV, 380 kV)
- Transmitting power over longer distances
- Maintaining grid stability
- Coordinating power trading across Europe

Communication + cooperation

Distribution system operator (DSO)

866 players

- Operating high-, medium-, and low-voltage grids (e.g. 110 kV, 20 kV, 400 V)
- Distributing regional power to the end user
- Maintaining (regional) security of supply Communication + cooperation

How are renewable energy facilities connected to the grid?

In line with legal requirements, the grid connection procedure should start with the **planning** process, during which operators and planners work out the connection requirements and the necessary technical data. The operator then submits the **digital connection application via the system operator's web portal.** The system operator reviews the application and may need to carry out a grid compatibility assessment before preparing a quote setting out the connection conditions and costs. During the construction phase, the system operator sets up the grid connection while the facilities are being installed. Upon completion, the installer registers the facilities with the system operator, who will then install the metering equipment in the final step.
What is the reality? The entire process can take anything from **several months to many years,** depending on various technical requirements, slow progress when upgrading the grid, lack of communication, etc. Accordingly, **operators** of renewable energy facilities **often plan, build and finance their own grid infrastructure.** Then there is the **current "grid connection backlog",** which in practice delays the commissioning of many facilities, whether solar, wind or battery.

The aim: to simplify and speed up grid connection procedures

The new energy industry needs highly efficient grids and digitalised system operators. It is the only way of making optimal use of storage systems and renewable energies. The grids are owned by monopolies – in accordance with Section 8 of the Renewable Energy Sources Act (EEG), they are duty-bound to connect the renewable energy facilities without delay and thus ably support the legally enshrined energy transition. It is important to simplify grid connection procedures, especially for stand-alone storage systems and the **new standard model: solar farms with storage systems.**

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