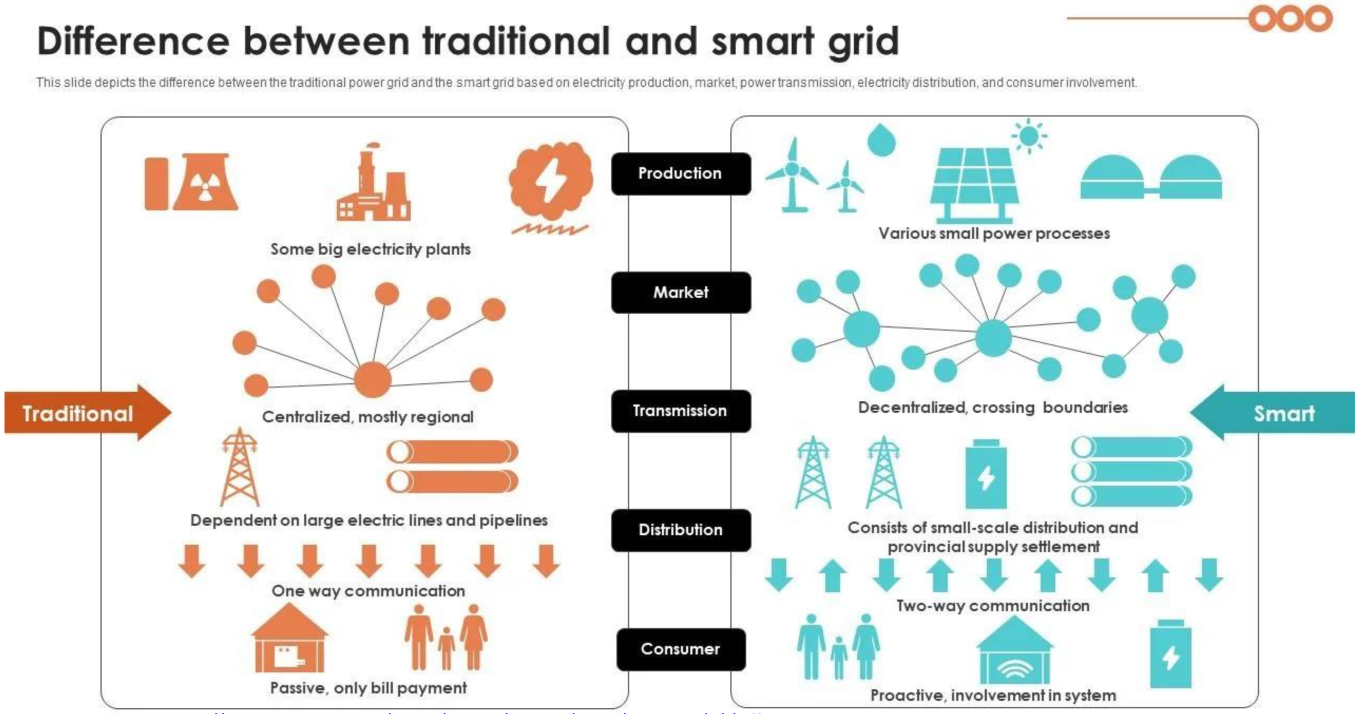
FACTSHEET
PHOTOVOLTAICS and GRIDS

Innovative grid integration of PV systems and storage

Renewable energies will make a significant contribution to the success of the energy transition - the expansion target is clear, by 2030 there will be much more PV in the electricity grid than there is today. The expansion of renewables is often viewed critically in terms of integration into the electricity grid. Keywords such as decentralization, variability and bidirectional power flow are usually followed by the assumed need to expand the grid. Photovoltaic systems already offer extensive opportunities to support the transformation to a smart grid, even without expanding the electricity grids.



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Active support of the electricity grid through photovoltaics

Photovoltaics are used at various levels to support the electricity grid through different measures and ensure a secure and sustainable power supply.

Compared to traditional electricity grids, smart grids offer the advantage that they enable more efficient control and monitoring of the electricity flow through the use of digital technologies. They promote the integration of renewable energies and enable dynamic adaptation to fluctuations in consumption, which increases grid stability. Smart grids also support the decentralized generation and use of energy, which improves security of supply and flexibility in the energy system.

The expansion of energy grids is expensive, lengthy and restrictive, as the structure is fixed for the long term and must therefore be well planned and efficiently implemented. Photovoltaics has the potential to actively support critical grid sections, provide energy locally and, together with storage systems, increase the proportion of renewable energy in the system. Photovoltaic systems already comply with the specified grid limits and can react flexibly to power quality by dynamically regulating voltage and frequency. They also enable feed-in management based on empirical values and external signals in order to proactively support the energy system, for example through on-site use and sector coupling. This active control makes photovoltaic systems an important component of the energy transition.

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Community operation

The energy transition is a joint project - the socio-economic involvement of all users is important for this. The introduction of energy communities has created the initial regulatory framework for this. A stronger steering effect through an adapted grid tariff structure is necessary for more far-reaching grid-friendly behavior. The technical solutions have been developed and digitalization offers a wide range of options for implementing complex processes simply and cost-effectively. In future, it must also be easy to implement system-friendly photovoltaics in the community.

Storage

Variable generation requires the expansion of storage capacities. Expensive and resource-intensive demand can be reduced by using flexibility options (load shifting over time), sector coupling and existing storage facilities (e-mobility, hot water).

Need for research

- Economically optimized operating modes for storage systems
- Standardization of interfaces and intelligent solutions for sector coupling (in particular bidirectional e-mobility, Power2Heat, etc.)
- Integration of new energy sources, e.g. hydrogen
- ...

Outlook

The energy system of the future is multi-layered. Only by bundling all capacities can a combination of renewable generation, storage, demand side management and sector coupling be successfully designed. By implementing sustainable concepts and measures, domestic value creation and increased added value for Austria can be guaranteed. With market-oriented research, intelligent solutions for grid-supportive feed-in into the electricity grid and appropriate regulatory framework conditions must be created.

Conclusion

Photovoltaics makes a significant contribution to the secure operation of the electricity grid, although its potential is far from exhausted. It acts as a measuring point and actuator in critical and relevant areas of the power grid, but suitable business models for its optimal use are still lacking. Standardized interfaces for data exchange and control between the various components, systems and market participants are required to ensure smooth integration. In addition, automated processes and digitalization must be further developed in order to efficiently support the implementation and realization of business models and the operation of energy systems. There should be a greater focus on collaborative and system-friendly operation, particularly in the area of energy storage. In addition, business models and regulations are needed that also make grid-friendly behavior financially attractive.

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