Aggregated Demand Side Flexibility: A Suitable and Cost-Effective Solution for Stabilizing the Power Grid

Florian Kind

Chief Technology Officer, Panitek Power

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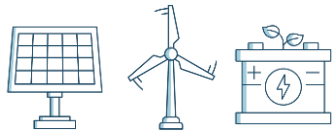
What's the Challenge?

Balancing supply and demand is one of the most challenging problems in the transition to a climate neutral energy system.

Two trends lead to an increasing need for flexibility at all time scales

Supply Side

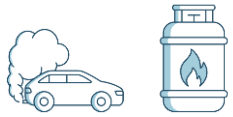
Shift to renewables



Increasing volatility
Less predictability
More congestion

Demand Side

Electrification

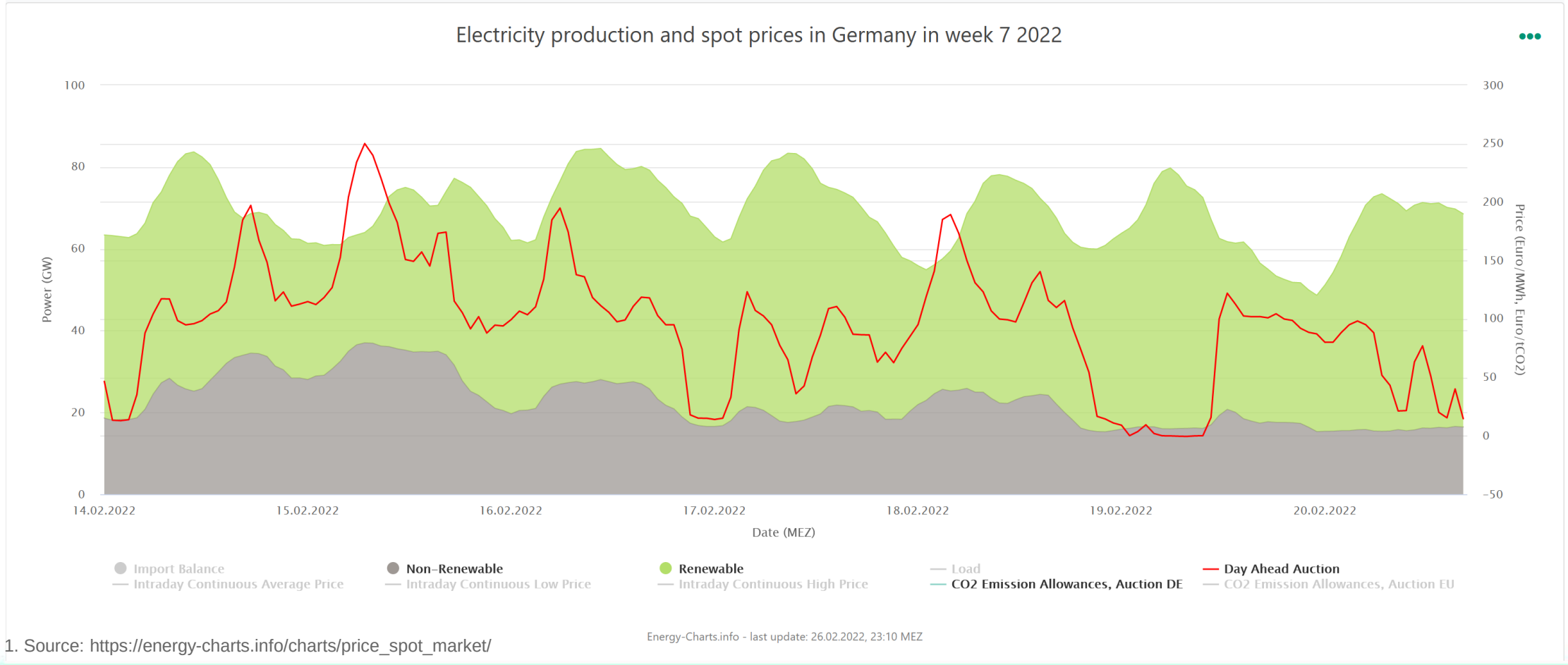


1. Source: https://www.iea.org/reports/demand-response

Example:
The Growing Need for Flexibility

Energy-Charts Power Energy Emissions Climate Prices Scenarios Map Infos

Fraunhofer ISE | Country | Language



1. Source: https://energy-charts.info/charts/price_spot_market/

Current Suite of Solutions for Balancing Services in India

- **Scheduling and Dispatch Mechanism**
  Scheduling is carried out as a coordinated, centralized process to forecast the day-ahead and 15 minutes blockwise, regional and all India demand, by aggregating demand forecast by the states and dispatching to GENCOs for planning power injection schedule.
- **Deviation and Settlement Mechanism (DSM)**
  DSM is a regulatory mechanism by which grid stability is achieved by imposing penalty and incentives for over drawl/injection or under drawl/injection from the schedule.
- **Ancillary Services (AS)**
  Ancillary services are services necessary to support power system or grid operation in maintaining power quality, reliability and security of the grid. Currently in India, AS is derived from supply side i.e., from the requisitioned surplus power of all generating stations.
- **Real Time Market (RTM) for Energy Balancing**
  Established in June 2020, where GENCOs and DISCOMs can participate in energy exchange on real-time basis.

CERC (Ancillary Services) Regulations, 2022
one focus aspect: **aggregated demand side assets to provide flexibility**

Unlocking Flexibility - Fast Lane for Energy Transition

Renew and Replace

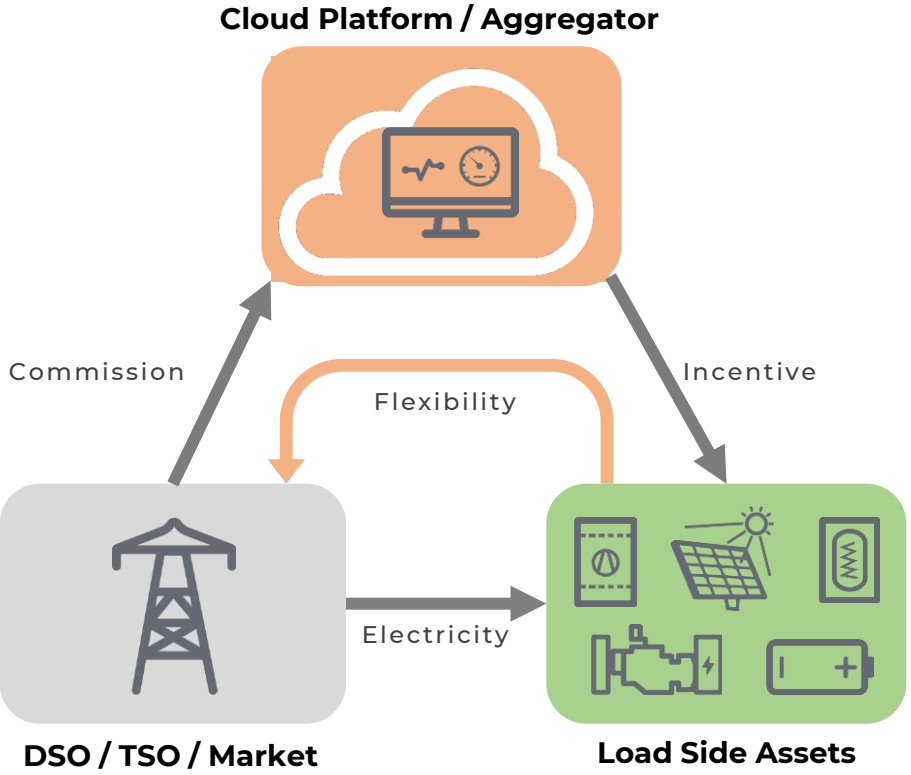
Replacing equipment with sustainable solutions is a necessary part of addressing climate change. However, waiting for better products is not enough.

Digitizing and Networking

An intelligent solution lies in the networking of devices and systems. Thanks to digitalization, it is possible to monitor, control and optimize energy flows for specific purposes.

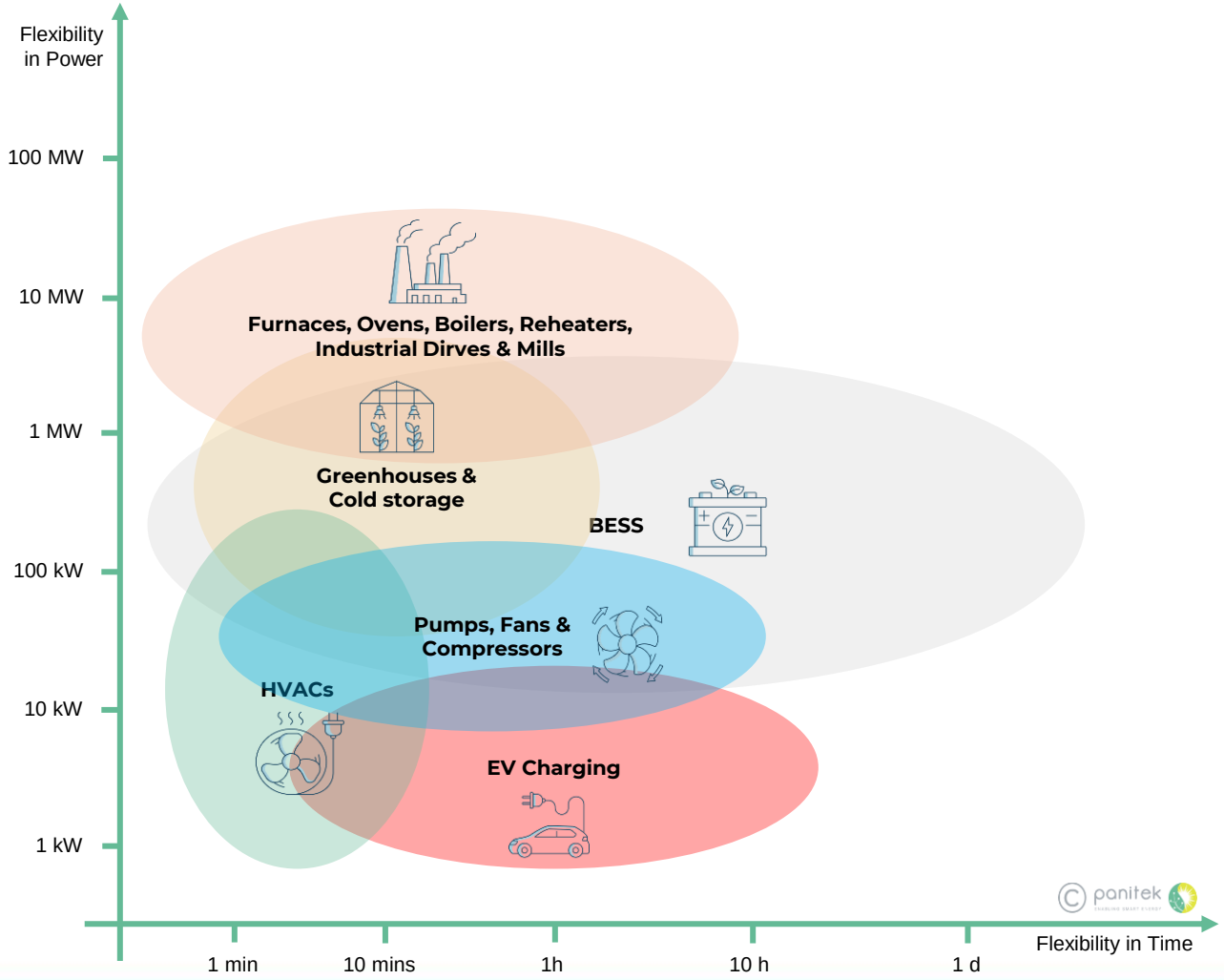
Ecological and Economical

It is not only ecologically necessary, but also makes economic sense, as it unlocks untapped potential from existing assets and processes.



Demand Side Asset Management

- **Industry and Agriculture**
  - Furnaces, ovens, boilers and reheaters
  - Dryers, evaporators and blowers
  - Pumps and Compressors
  - HVAC units and heat pumps
  - Hoist and conveyer drives, mills
- **Residential and Commercial**
  - HVAC & Cold Storage
  - Heat pumps & electric heating
  - Fans & ventilation systems
  - Lighting systems
  - Pumps & Compressors
  - EV charging



Aggregated Demand Side Flexibility

Flexible Assets

- Agricultural processes
- Businesses
- Fans
- Industrial processes
- Electric heating
- Back-up engines
- Batteries

Value Addition

Real-Time Flexibility

Dispatching | Forecasting | Reporting

AGGREGATOR

Bidding | Monitoring | Optimisation

Consolidated Revenue

Energy Markets

- TSO
- DISCOM
- Energy trading

Market Segments and Growth Domains

COMMERCIAL AND INDUSTRIAL CONSUMERS

Greenhouse

Pulp and Paper

Waste Water

Buildings

GROWTH OPPORTUNITIES

RE integration

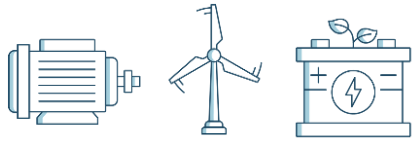
Smart Charging

District Heating/Cooling

ESS Management

Substantial Benefits to All Stakeholders

Commercial & industrial businesses

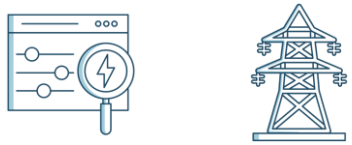


- **Electricity cost reduction:** Earn additional revenue by providing flexibility
- **Consumption monitoring:** More insights into energy usage and asset operation optimization
- **Greenhous gas reduction:** Become active participant in energy transition

Energy companies & energy service providers

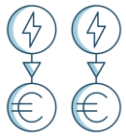
- **Load Balancing:** Revenue cut from balancing services
- Reduce **Peak Power purchase cost** and **deviation settlement penalties** through asset triggering and forecasting
- Accelerate the shift from **fossil fuels to renewables**
- **Increased depth of value creation** and customer experience through additional services

Grid Operators & Load Dispatch Centres



- **Reduced Grid operation costs**
- **Ancillary Services:** Security of supply through faster reaction
- **More sustainable grid**
- Cost effective solution to **Manage Grid Constraints and Congestions**

Benefits of Enabling Demand Flexibility



- Participation of small assets from >250kW to large ones >10MW
  - **Additional source of revenue for domestic, industrial, and commercial customers with flexible loads.**

- Maximize RE and energy storage integration into the energy mix
  - **Helps in decarbonization of electricity**

- Defer network capacity additions required to meet peak load demand
  - **Electric utilities can optimize infrastructure expenditure**

- Help DISCOMs in congestion management, reduce deviation penalties, and improve reliability indices (SAIDI and SAIFI)
  - **Better quality of supply and service**

- Decrease the use of fossil plants for grid balancing – optimizing the ecological and economical impact of stabilizing the grid
  - **Demand side flexibility is one of the cheapest sources of ancillary services for grid stabilization**

Thank You

For discussions/suggestions/queries please contact:

Florian Kind
Email: florian.kind@panitek.com
www.panitek.com

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