Energy Pool
Smart energy management

Demand-side Flexibility with focus on Industry: potential, benefits and challenges

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Strommarkttreffen – 31 März 2023

A 13-year track record in Energy Flexibility Management

From a startup in curtailment to a Smart Energy Manager

250 employees

> 3000 assets managed by EP
6 GW of capacity managed

DEVELOPMENT

- **2009**: Company founded by **Olivier Baud**
- **2015**: Establishment of **EP Turkey & EP Japan**
- **2019**: **TEPCO entering EP Japan's capital**
- **2020**: Establishment of **EP GmbH, Germany**
- **2021**: International acceleration (**NL, KSA, Ivory coast**)
- **2022**: **Financial independence** – **New Energy Pool**

2009 | 2010 | 2012 | 2013 | 2014 | 2015 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022

Startup Demand Response operator → Flexibility **aggregator** → **A solid grown-up company** – **New job**: Smart Energy Manager of complex systems

SUCESSES

- **2009**: **Pioneer** in the French Demand Response market
- **2012**: 1st curtailment in France
- **2014**: 1st operation of frequency containment regulation
- **2017**: 1st operation pooling multiple sites for frequency regulation
- **2018**: 1st battery flexibility monetization
- **2019**: 1st large-scale microgrid implementation in Thailand
- **2021**: 1st H2 electrolysis flexibility monetization
- **2022**: **V2G** pilot project

Energy Pool is delivering world-class services and solutions
to maximise the value creation for our customers

Flexibilities management & operational services

- Design of complex systems flexibilities, from real time to medium/long term
- Strategic advisory for maximizing revenues and reliability
- Technical enablement, contracting & 24/7 operations of aggregated portfolios

Software Solutions & microgrids

- Industrialized and Scalable Software solutions for distributed energy resources management
- Flexible solution adapted to different contexts: VPP, Demand response, microgrids, hybrid power plants
- Optional consulting and operation services

Consulting

- High level advisory on market design and regulatory
- Technology and economic feasibility expertise
- Operation design

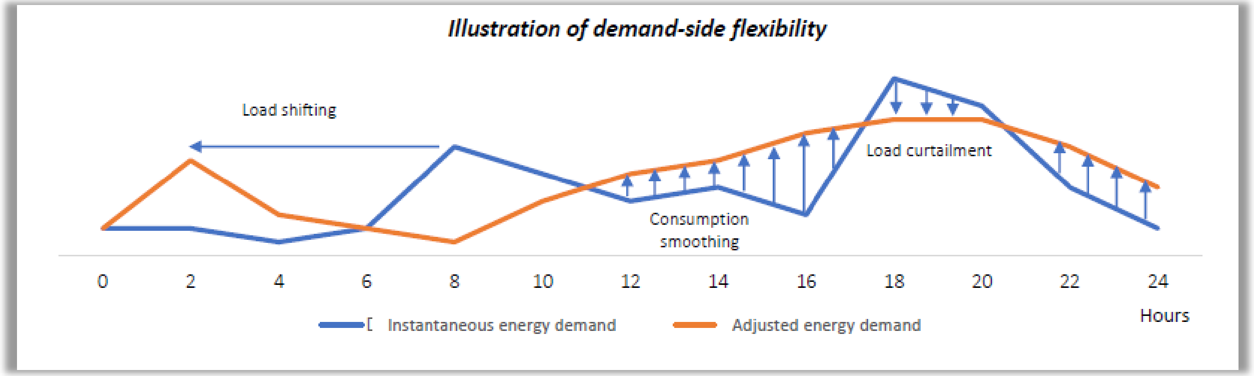
Process Transformation and hybridization

- Advising end-users of electricity in their strategy to reduce CO_2 emissions
- Design of hybridization & electrification plans, including flexibilities monetization
- Projects deployment and operations

What is Demand-Side Flexibility?

Demand-Side Management and associated costs from industry perspective

- Mecanism of reducing (or increasing) electric loads (demand) in response to electricity market system signals
- Cost-effective and sustainable type of Flexibility solution



- Explicit vs. implicit
- Capacity vs. energy

Investment costs of flexibilisation in €/MW (eg. additional energy or material storage in the production site, technical connection/steering ability of assets through EMS)

Yearly fixed costs of flexibilisation in €/MW)/y (IT, additional human resources…)

Activation costs in €/MWh (variable costs due to impact on production process, opportunity costs related to possibly lower production output)

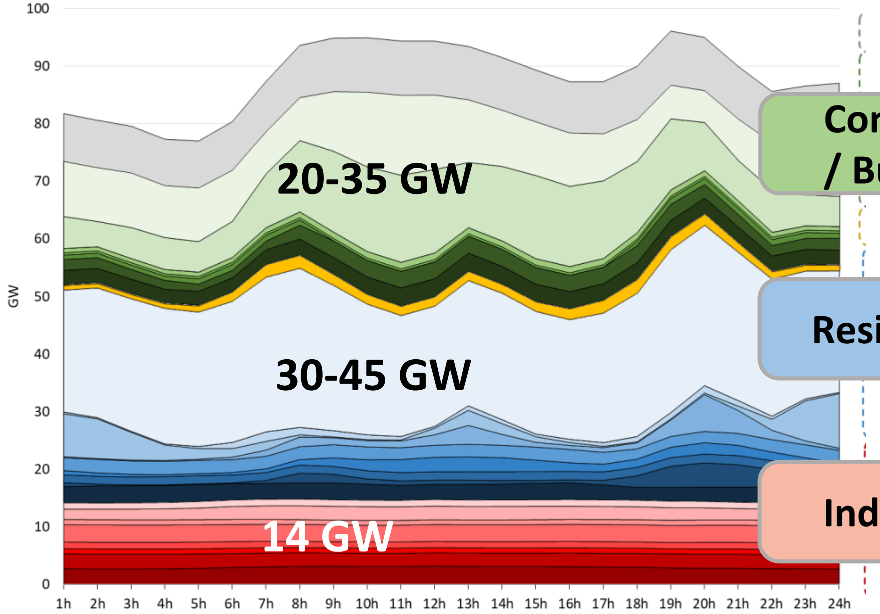
Dedicated remuneration schemes and sufficient incentives are required for i) supporting industrial flexibilisation and ii) compensating activation costs

Demand-side Flexibility potential is diverse

Industry shows high potential and key challenges

Different sources of load flexibilities entail different constraints, are accessible at different remuneration levels and require adapted incentive schemes and support.

French daily load curve of a working day of February with cold temperatures (but no major cold wave)



Source: RTE

	Individual curtailment capacity & availability	Implementa-tion speed & easiness	Curtailable process complexity	End-user cost & impact
Commercial / Buildings	Small	Medium	Low	Low
Residential	Very small	Slow to medium	Low	Low
Industry	Large	Fast	High	High

Huge stake to incentivize industrial flexibility: high investment costs vs. long-term competitiveness under increasing volatility assumption

The Demand-Side Flexibility potential Iceberg

Focus on industrial untapped and future Flexibility

- **Existing accessible flexibility potential**
  - Equipment & connectivity
  - Regulatory framework
  - Short-term economic incentives
- **Potential from flexibilisation**
  - Technical process transformation (eg.energy hybridisation)
  - Organisational process transformation
  - Long-term energy prices and return on investment
- **Additional potential from electrification**
  - « Built in » flexibility for new gigafactories (battery, H2 electrolyzers)
  - Increasing electric usages (e-mobility, data centers)

Key Success Factors to reveal additional Demand-Side Flexibility: economic incentives, change of production planning paradigm, automation and integration of DSM with manufacturing IT

Benefits for industrial consumers in a transitioning energy world

Positive impacts on energy cost and carbon footprint

Consumer's flexibility can contribute to power system balancing and security of supply, aim at optimising consumption and thus energy costs (price opportunities), and support reducing the CO_2 emissions from energy.

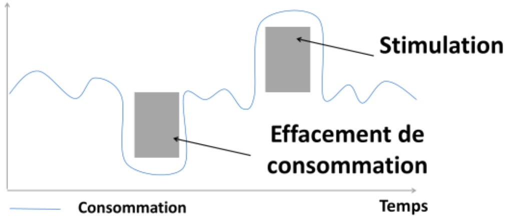
Energy intensive industry (eg. a cement plant)

Feasability (flex audit), automation, certification (1 to 9 months)

Different sources of flexibility

- ***Processes (eg. crusher)***
- ***Batteries / Storage***
- ***Decentralized production (CHP, PV)***
- ***Fuel switch (hybridisation power/gas)***

Load modulation



CURTAILMENT
Consumption is temporarily reduced to support the grid frequency, balancing or redispatch

STIMULATION
Consumption is shifted to benefit from lower prices on the power market

- **Reduction of 5-25% of energy bill under French remuneration schemes**
- **Long-term higher cost optimization opportunities with load modulation based on RES generation**

- **Decarbonation of energy sourcing (supply mix including less marginal fossil fuels)**
- **Higher decarbonation impact in RES intensive energy system**

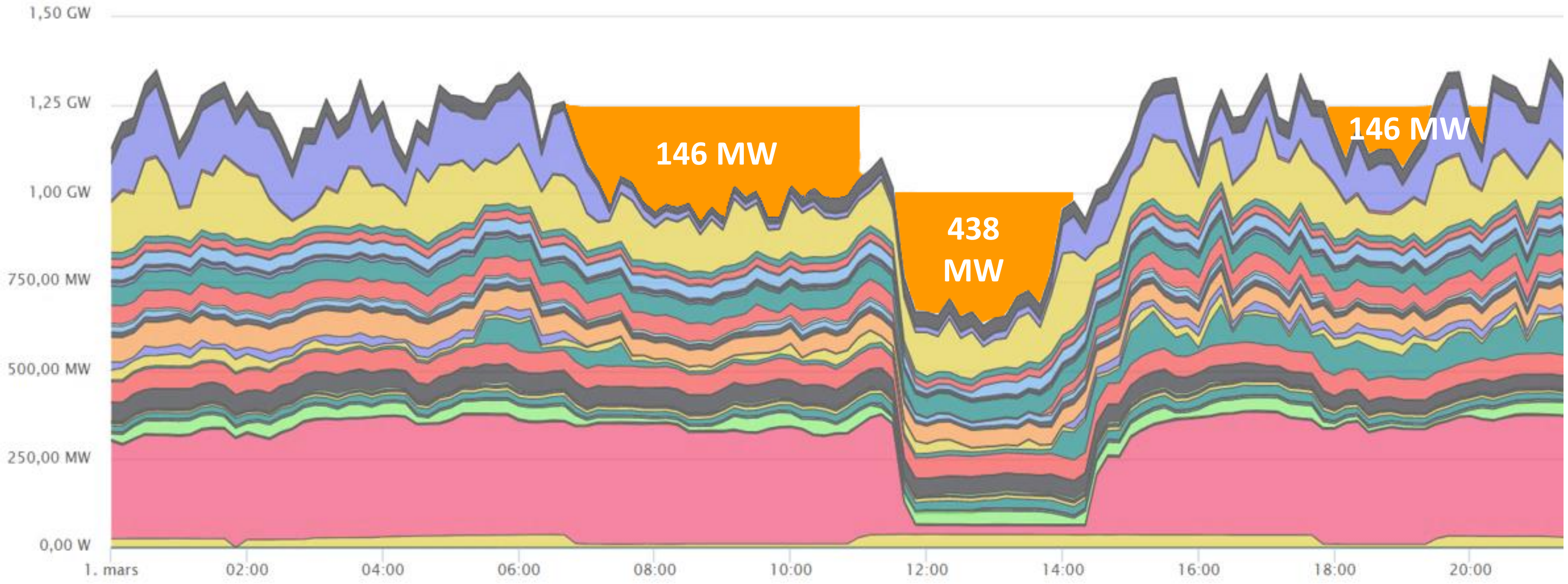
Benefit for the grid: peak-shaving example

Load reduction delivered by Energy Pool to French TSO RTE on March 1st 2018

Cold wave in France

Consumption peaks 90GW (11h)

Very low system margins



438 MW (max) curtailed

Total energy requested by RTE **1,7 GWh** on March 1st 2018

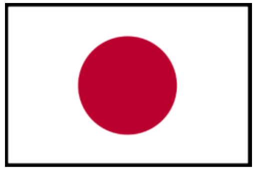
106

sites participating

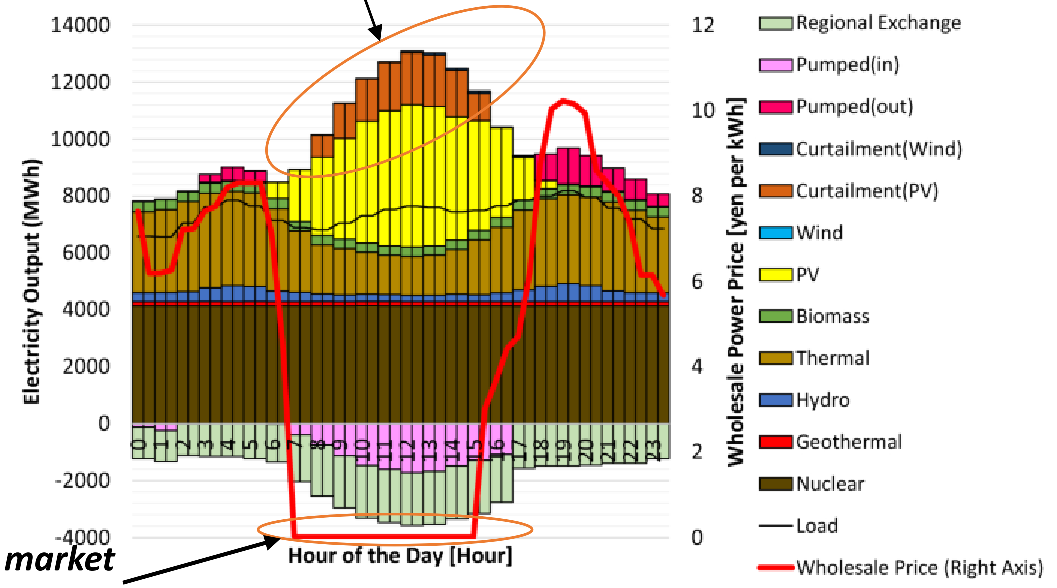
Benefit for the grid and energy transition realization

Load modulation as service to TEPCO enabling to integrate more RES

- «Net Zero Carbon by 2050 » objective ➔ Japan target power generation mix for 2030 with share of RES doubling in 10 years.
- Stake: maximize RES output utilization ➔ avoid frequent curtailment of PV farms in South and Western Japan on days with high PV output creating surpluses which cannot be absorbed by consumption, exports, or storage



PV farms curtailments in Kyushu, 3rd May 2019



Wholesale market price at 0€/MWh

Energy Pool Japan in 2022

12,3 GWh load-reduction
corresponding to 82 activations

119 GWh load stimulation
corresponding to 54 activations

40
sites participating

Key challenges to unlock and develop industrial Flexibility

Regulatory and economic obstacles to be removed

Technical
- Electrification & hybridisation (engineering projects)
- Automation and digitalization of processes incl. Energy management

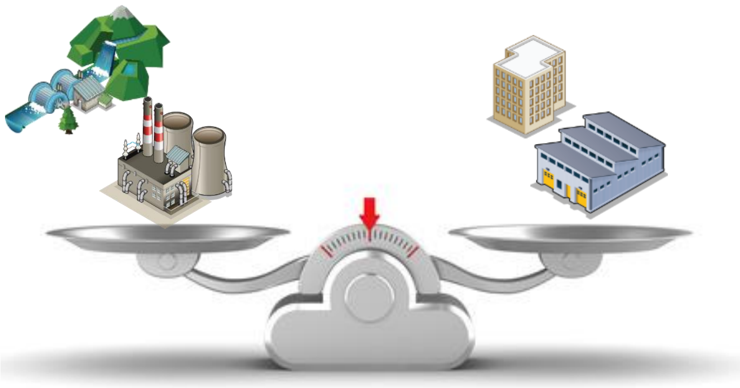
Economic
- Financing electrification & flexibility projects in an industrial crisis context
- Uncertainty on future price levels and volatility

Regulatory
- Removal of existing barriers (eg. Individual Grid tariffs § 19(2) Strom-NEV)
- Dedicated remuneration schemes for low-carbon flexibility
- Flexible tarifs & possibility for consumers to actively participate in markets

Cultural & societal
- Change of energy paradigm for consumers
- Necessity to rethink optimization of production processes for competitiveness

The main challenge is a change of paradigm of our energy system

DSM amouts to consuming better: when available, cheap, and carbon-free



CHALLENGE

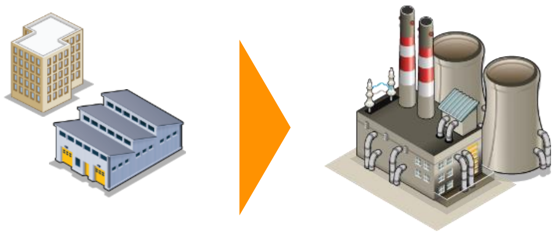
Ensuring security of supply while balancing the power system at lowest cost and CO_2 emissions

Production ⟷ Consumption ?

BEFORE

Energy was abundant and cheap. No CO_2 constraint.

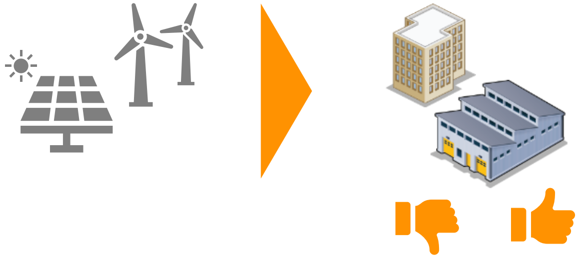
Consumption determined Production



TOMORROW

World of energy scarcity and intermittency creating high price volatility.

Production will determine Consumption



Demand-side is part of the solution with storage & interconnections

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