NODES' journey

IEEE PES

On-line, 21.10.20

Hallstein Hagen

Senior Consultant, NODES AS


We believe in creating
the marketplace for the future,
which will support the drive
to an emission free society!
NODES

Unlocking the **true value** of flexibility

- Open
- Transparent
- Integrated
- Independent

NODES market facilitates trading of flexibility

between grid operators and flexibility providers

The changing face of the energy system

Conventional generation decommissioned

- as we continue to decarbonise our energy system

Increased share of renewables

- driving down the cost of energy

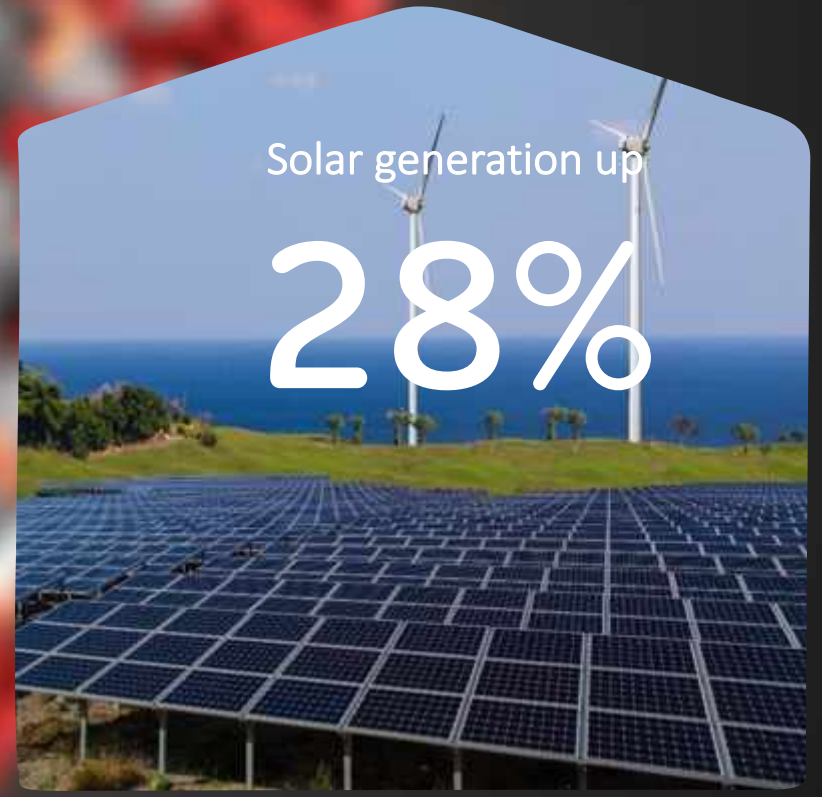
Estimated 50 billion connected devices by 2030

- giving consumers greater control over when and how they consume their energy

TSO is challenged to balance the network

- due to increased volatility in consumption patterns and lack of access to ancillary services from large scale generation

Analysis: Corona virus has cut CO_2 in Europe



.. this “postcard from the future” of the electricity system also highlights a lack of flexibility, ….

Dave Jones, electricity analyst at climate thinktank Ember
Carbon Brief 29.04.2020.

Grid impact

nationalgridESO

Who we are | Electricity explained | Future of energy | Industry information | Our strategy

Industry information > Codes Homepage > Grid Code

GC0143: Last resort disconnection of Embedded Generation

This modification sets out that under emergency condition
a last resort the Electricity System Operator (ESO) may in
Distribution Network Operator (DNO) to disconnect embe
generators connected to its system. The requirement for
due to the unprecedented societal changes brought abou
COVID-19 pandemic which has led to demands out-turning up to
20% lower than predicted

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GERMANY

German redispatch costs hit record high

20 June 2018 by Craig Richard

GERMANY: The cost of stabilising the German grid reached a new high of €1.4 billion in 2017 as wind supplied record levels of pow

MONTEL

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Dutch TSO declares "system emergency" amid oversupply

(Montel) Dutch TSO Tennet declared a system emergency this weekend for the first time in three years following "tension problems" in its grid caused by excess solar generation, a spokeswoman said on Monday.

"If this occurs far more often, then maybe we need to contract more reactive power," said Eefje van Gorp.

The emergency arose on Sunday morning as there was "a lot of sun for a very long time" in several countries in northwest Europe, including the Netherlands, whereas demand was muted.

The Dutch day-ahead price settled as low as EUR 1.97/MWh in hour 11 on Sunday, while neighbouring countries – such as Germany and Belgium – saw negative prices for afternoon hours.

In Germany, combined wind and solar power generation reached a peak of just below 43 GW, while residual load – the amount of demand not covered by renewable energy – fell to -1.24 GW, indicating an oversupplied system in which consumers were being paid to off-take electricity, according to Montel's Energy Quantified.

National issue, local solution

80%
of
renewables connected
to DSO grid

What is a market?

- A market is a place where buyers and sellers can meet to facilitate the exchange or transaction of goods and services.
- Markets establish the prices of goods and services that are determined by supply and demand.

www.investopedia.com

The framework for change

Electricity Directive (recast)

2009 Directive, plus rules on:

- reinforcing competitive energy markets
- consumer rights, including billing, metering, dynamic pricing, switching, using aggregators, comparison tools and addressing energy poverty
- framework for DSR and aggregation
- assessing alternatives (eg. DSR, storage) to new generation capacity
- enhanced role of DSOs, particularly in procurement of ancillary services, flexibility, data management and integration of electric vehicles
- "active customers/consumers" and "citizens' energy communities"
- reinforcement of NRA roles, including in regulation of ENTSO-E, EU-DSO and RCCs★

Market principles

Competitive energy markets:

- market-based prices
- equal treatment of generation, demand-side response (DSR) and storage; aggregation of consumers, generators and demand response permitted
- enhance development of more flexible generation and demand★
- measures to enhance independence of NRAs★

Focus on flexibility

- No DSO/TSO ownership of storage (limited exceptions★)
- Demand response – active customers and aggregators to be able to act without consent of suppliers, to be balance responsible and to compensate suppliers
- NRAs, TSOs, DSOs to ensure that DSR can participate fully
- Member States to incentivise DSOs to procure flexibility

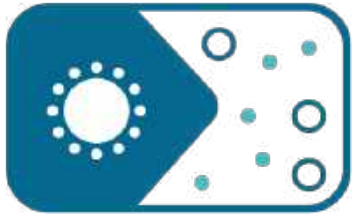
https://www.twobirds.com/en/news/articles/2016/global/eu-electricity-winter-package

Flexibility is key

NODES

Trends

Conventional → Renewable



Centralised → Decentralised

Fixes → Occasional

Challenges

Grid instability

Grid congestion(s)

Volatile markets

Solutions

Smart(er) Grids

Intelligent Markets

Key

Flexibility

Flexibility available to all levels of the grid

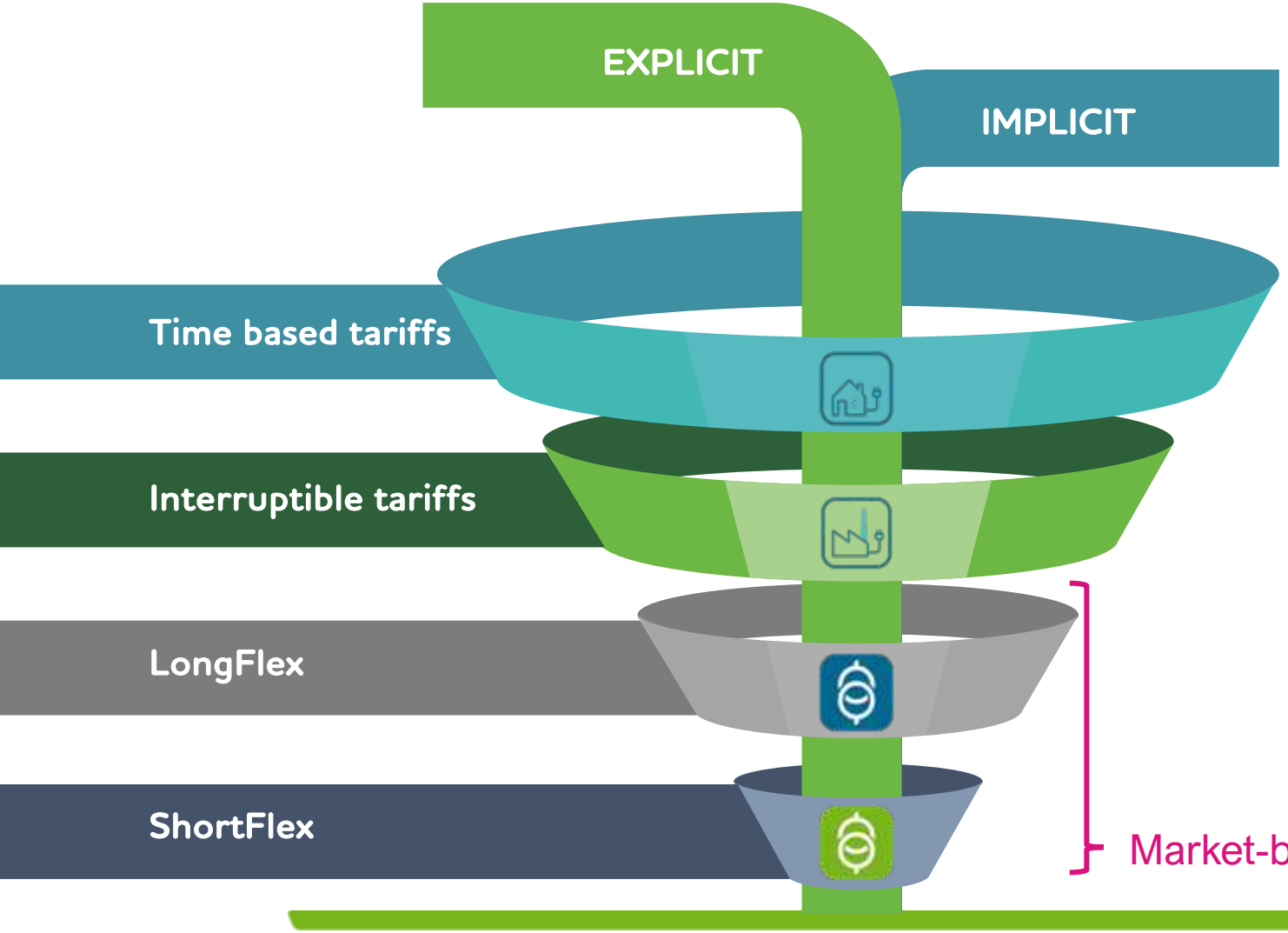
TSO

DSO
REGIONAL

DSO
LOCAL

Microgrid

Why market-based flexibility?



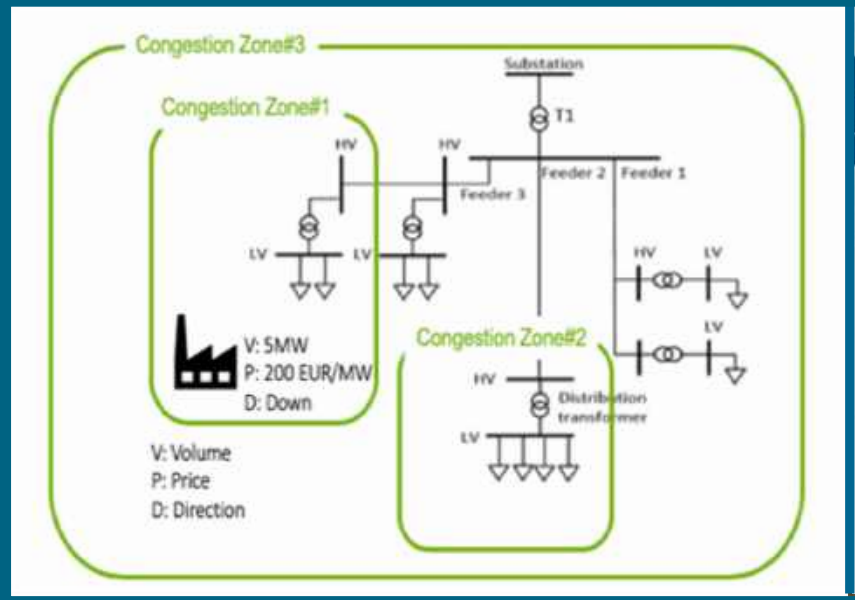
Implicit flexibility can be released by imposing a time based or dynamic tariff scheme on the customer.

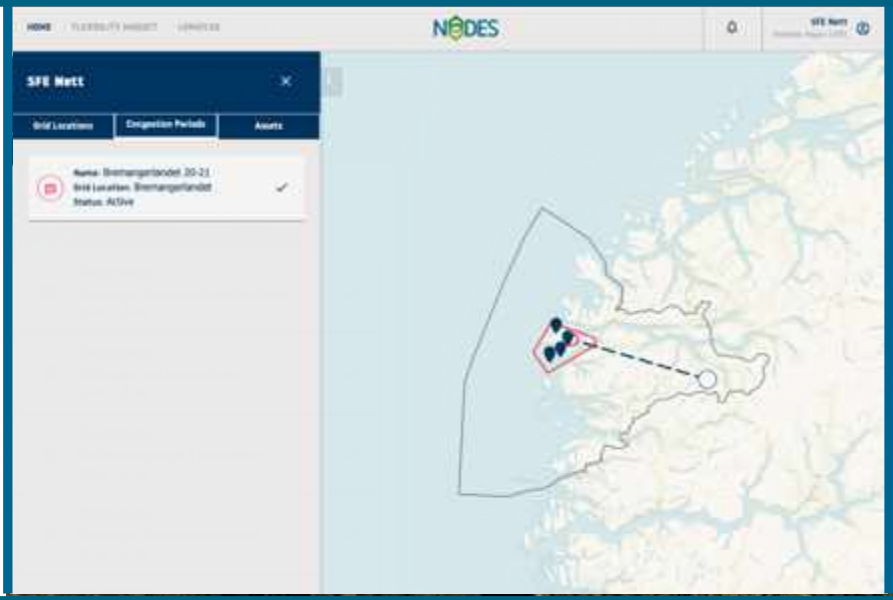
Explicit flexibility can be released by;

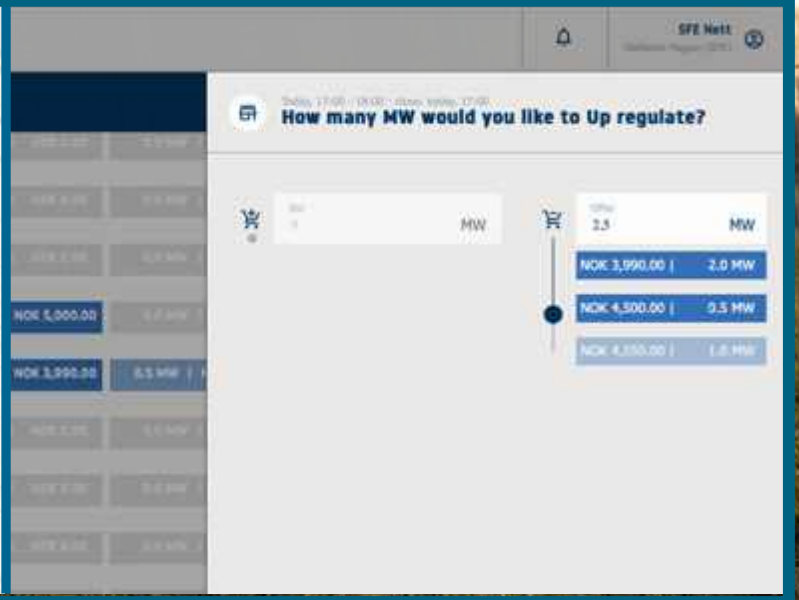
- discount schemes (**interruptible tariffs**) towards customers which are willing to be interrupted.
- Market-based solution for buying **LongFlex** (availability contracts) will allow the grid operator to secure flexibility for future activation, or
- **ShortFlex** which is flexibility payed at activation price in the intraday time frame.

Market-based solution unlocks the true value of flexibility!

Congestion zones → Grid locations → Order book

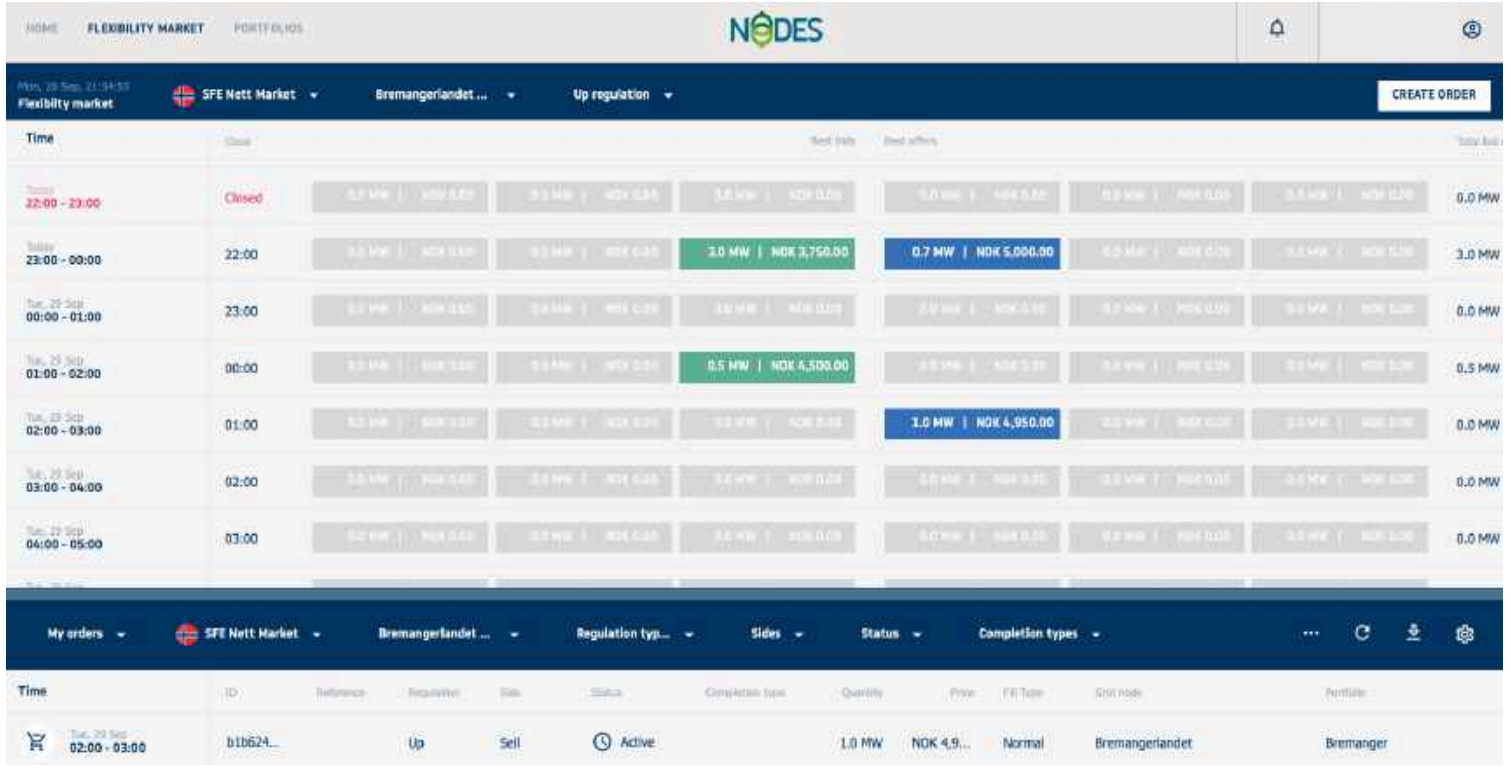






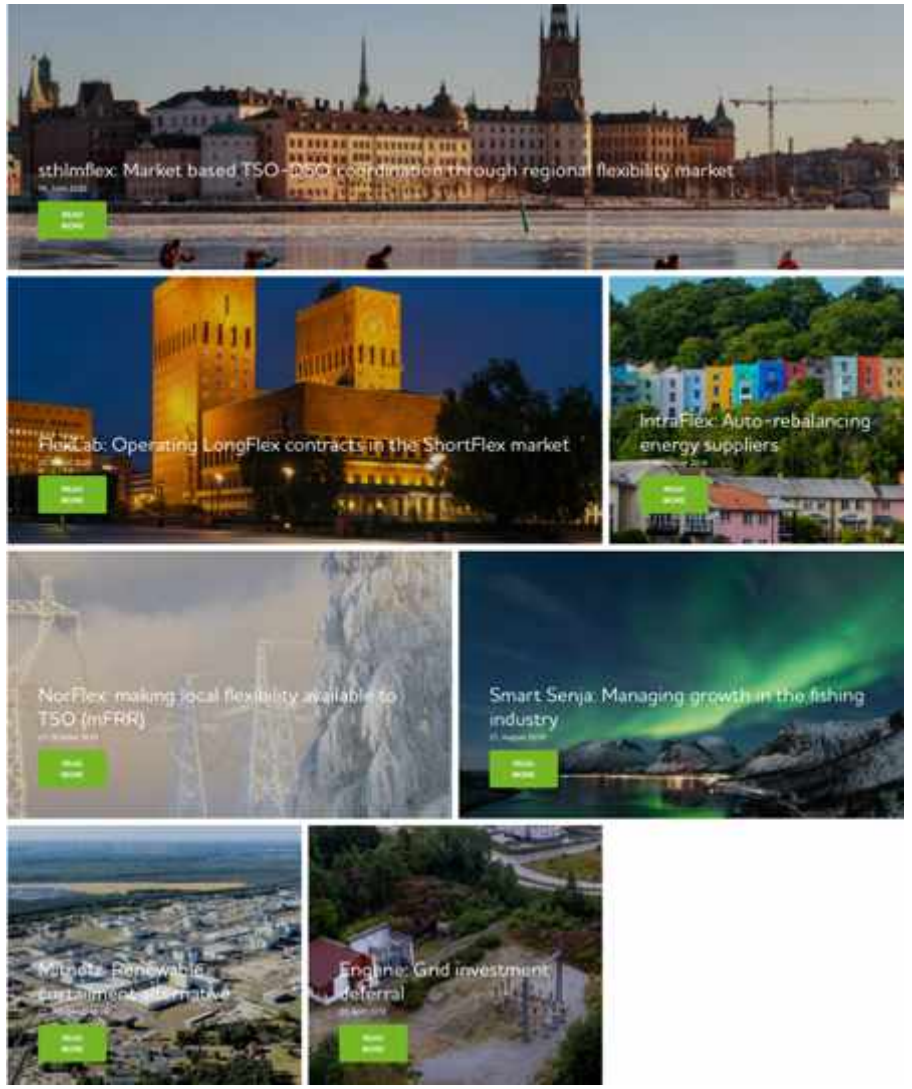
Creating a market, where different types of flexibility can compete on a level playing field, where the right type of flexibility can be procured at the right price, in the right location at the right time.

Operated by NODES



Developing through cooperation

- CINELDI
- sthlmflex
- IntraFlex
- Mitnetz
- NorFlex
- EUniversal
- SmartSenja
- FlexLab
- Engene



We facilitate so you can innovate!

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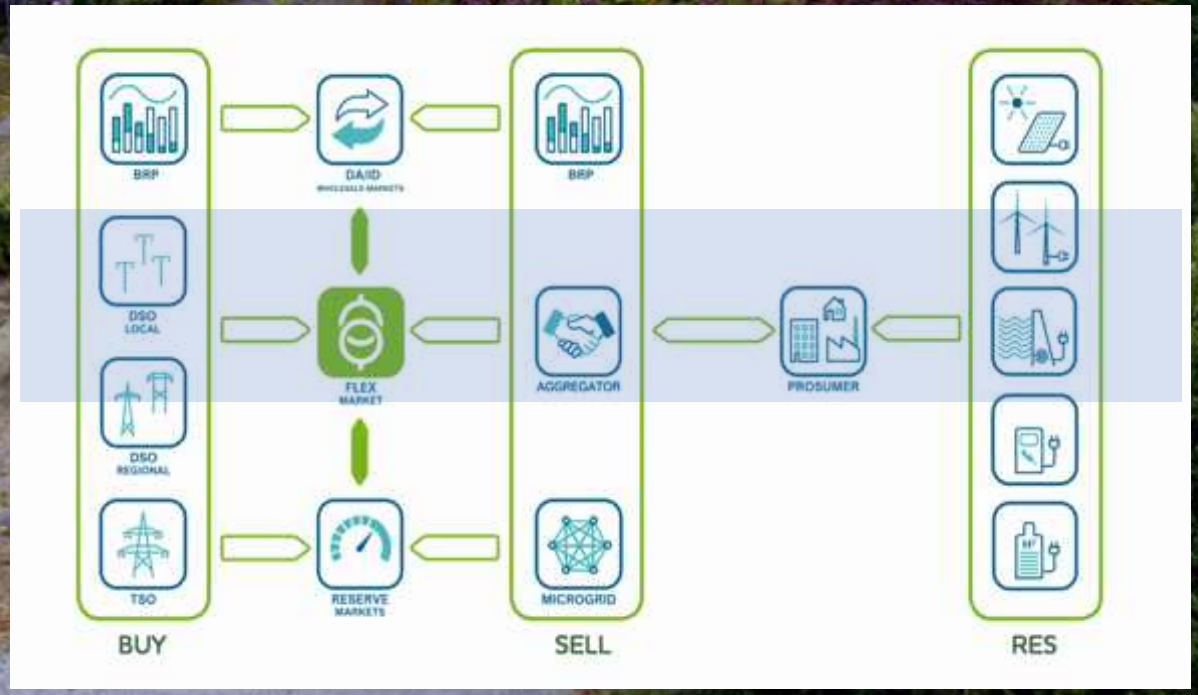
Engene:
Grid investment deferral



Engene:
Highlighted the need for independent marketplace

Agder Energi and Microsoft receiving
the *Innovative Star of Energy Efficiency Award 2018*

Buyers

GridTools

Marketplace

Market Platform

Sellers

FlexTools

Flexibility value chain

Buyers

Gridtools

Grid analysis

Simulation

Forecasting

Optimisation

Congestion management

Buy flexibility

flex trade

Marketplace

Market Platform

Open

Transparent

Independent

Provide visuality and matching

Be cost effective and automatic

Connect to other markets

flex trade

Sellers

Flextools

Forecasting

Optimization

Aggregation

Activation

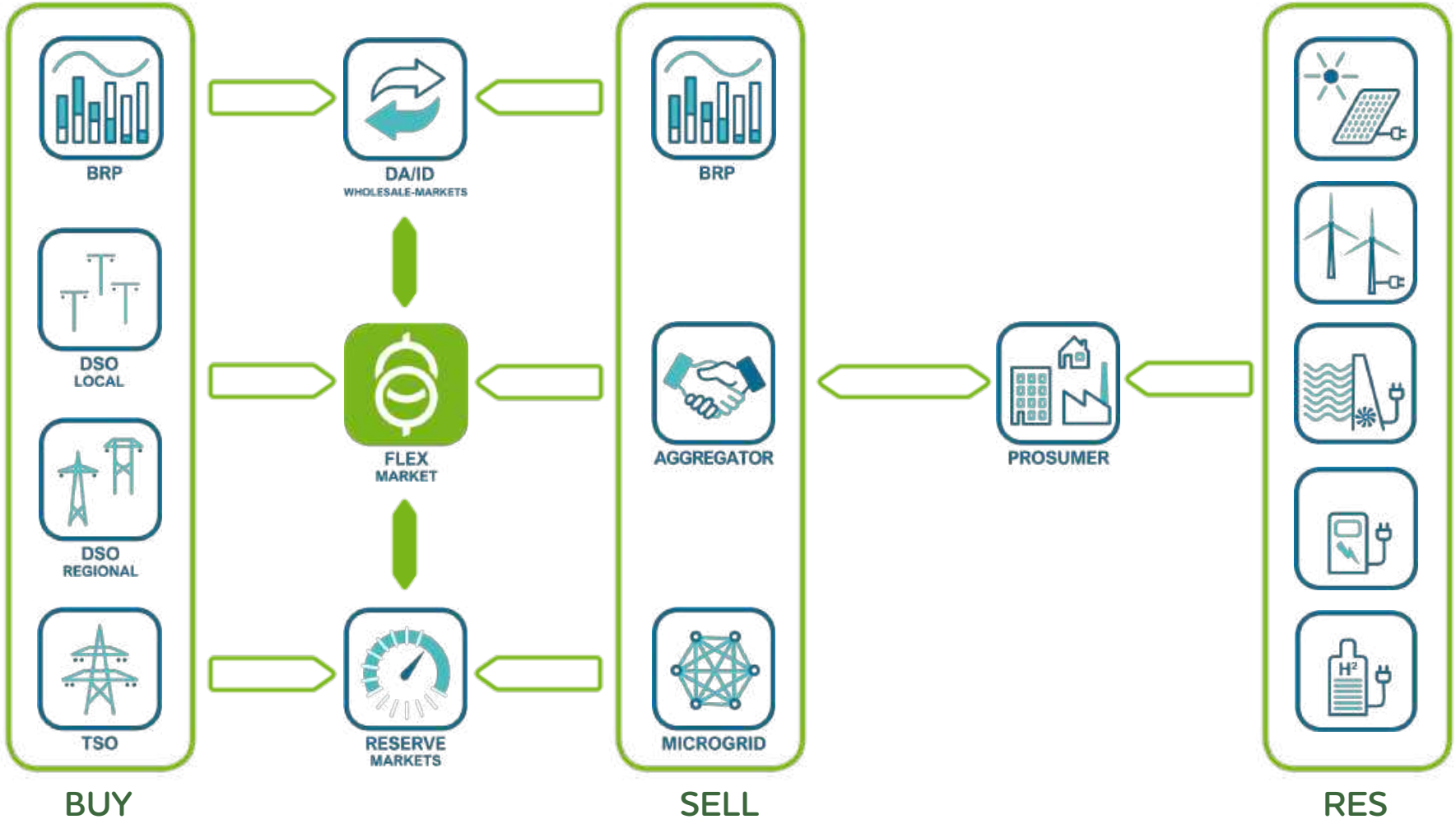
Verification

Re-balancing

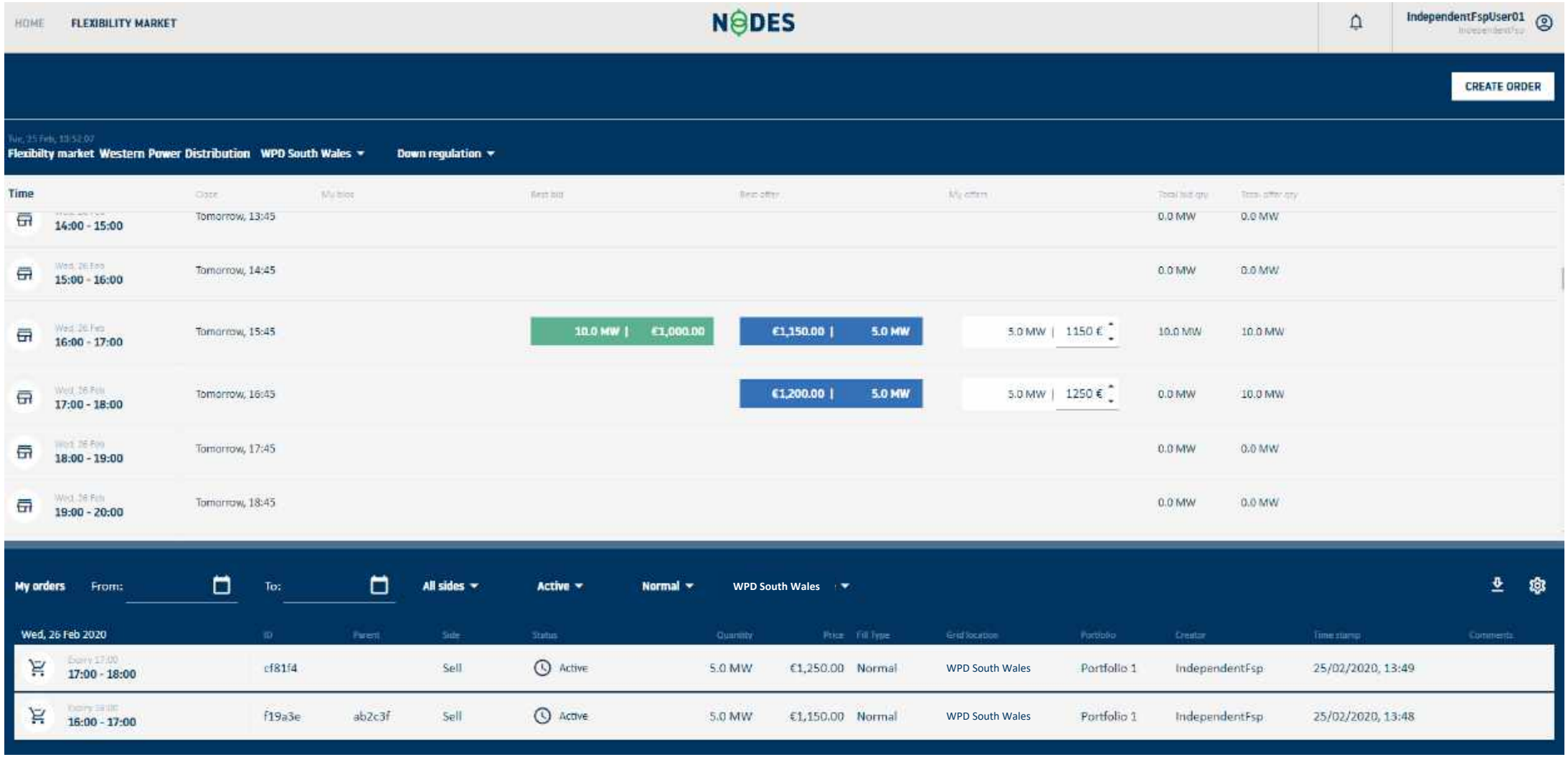
Portfolio optimisation

Sell flexibility

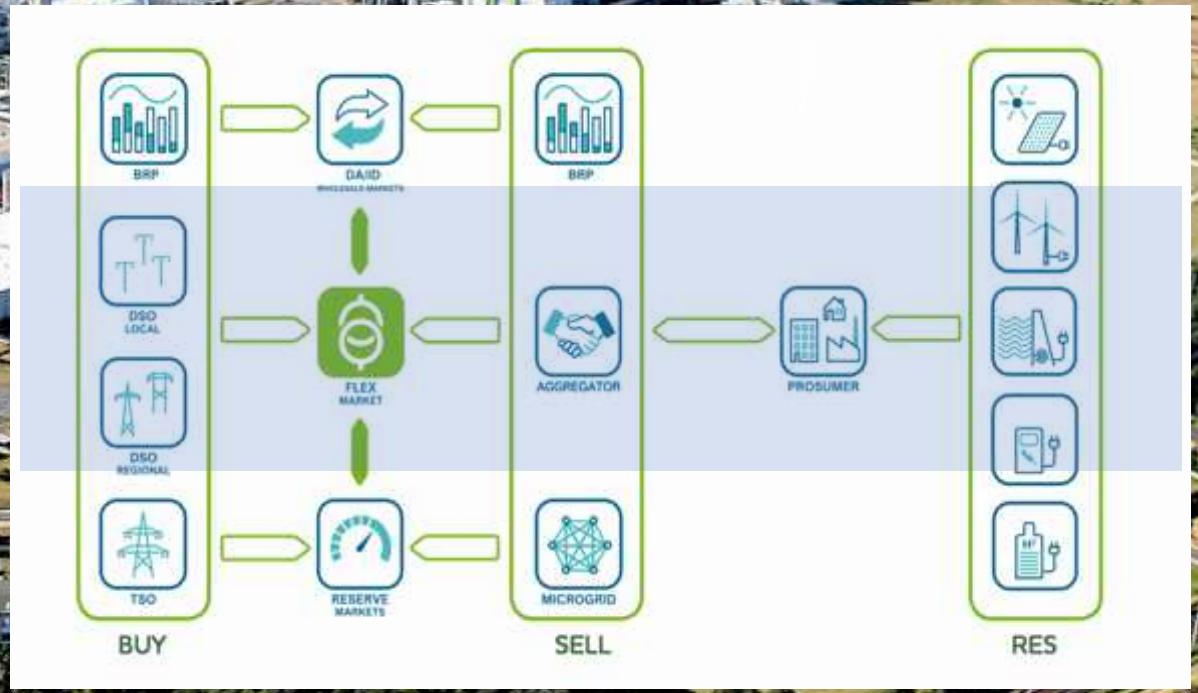
Bottom up – integrated market design



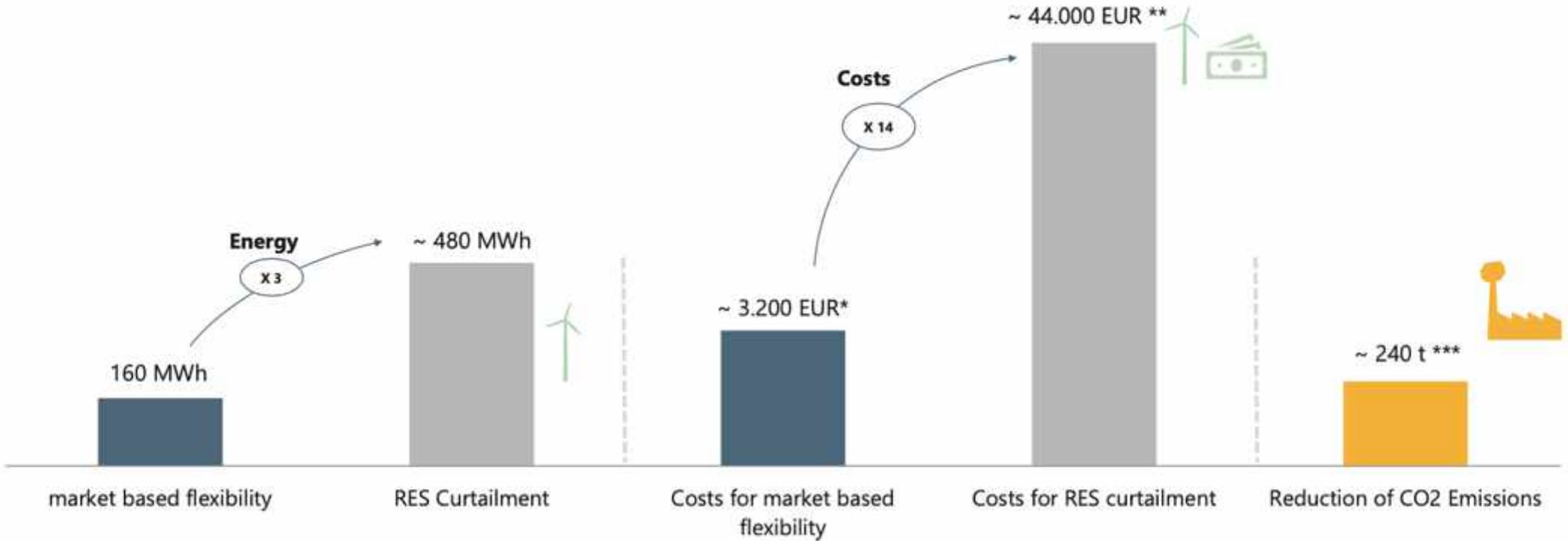
Continues market, pay as bid, parameterised



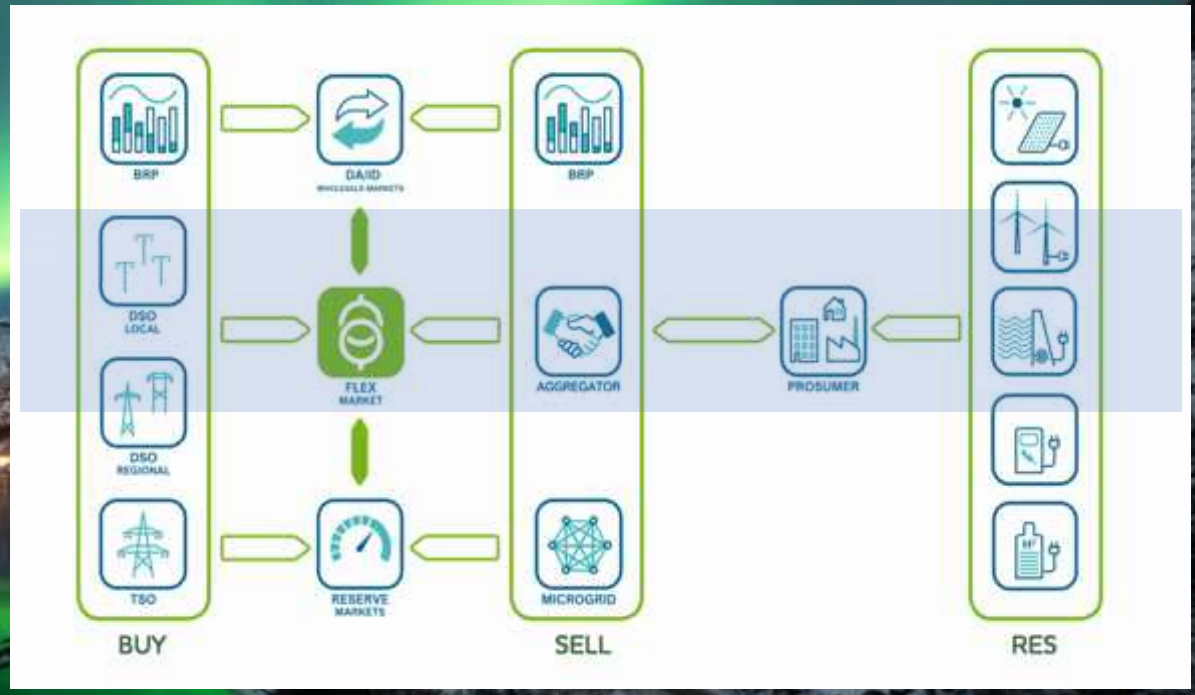
Mitnetz:
Renewable curtailment alternative



Mitnetz:
Demonstrated the value of demand response flexibility



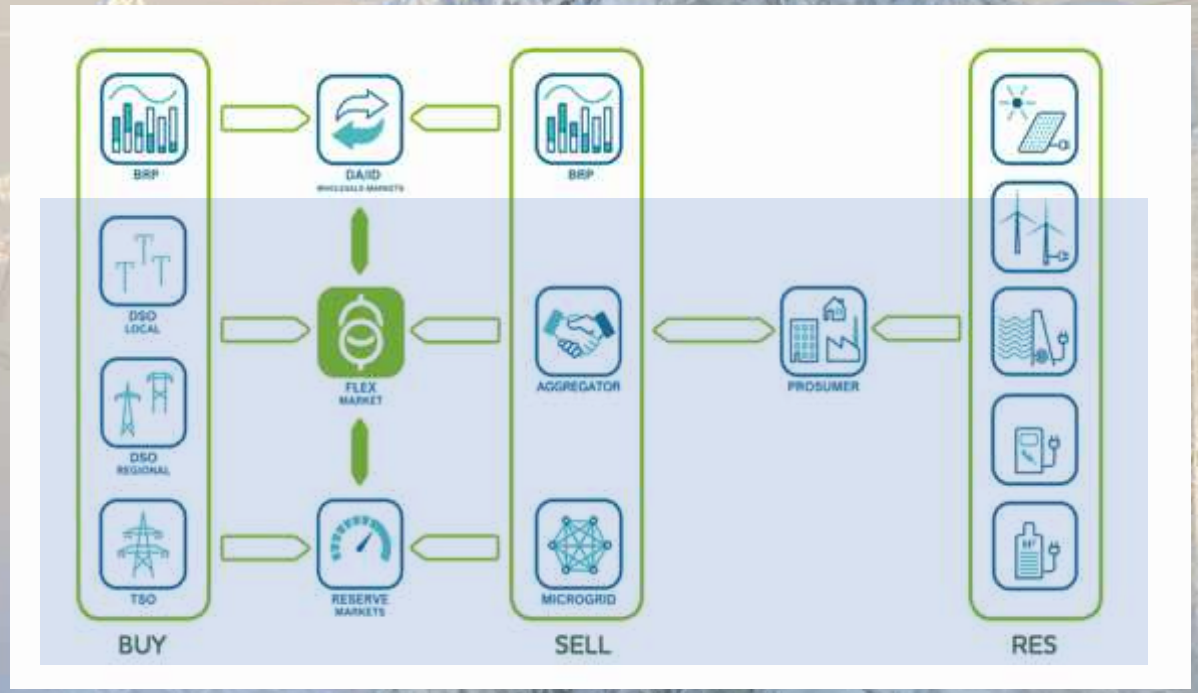
Smart Senja:
Managing growth in the fishing industry



Smart Senja:
Research project creating local engagement

BR. KARLSEN
TROMS KRAFT PRODUKSJON
TROMS KRAFT
NERGÅRD
Ishavskraft
EATON
Enfo
ARCTIC CENTRE FOR SUSTAINABLE ENERGY
powel
NODES

NorFlex:
Making local flexibility available to TSO (mFRR)



NorFlex - Demo Agder:
Scaling up the local market!

Flexibility providers

futurehome · NOOVA · tibber · Entelios · Ishavskraft · MESHCRAFTS · ISTADKRAFT

Up to 17 M NOK for flexibility

Flexibility sources

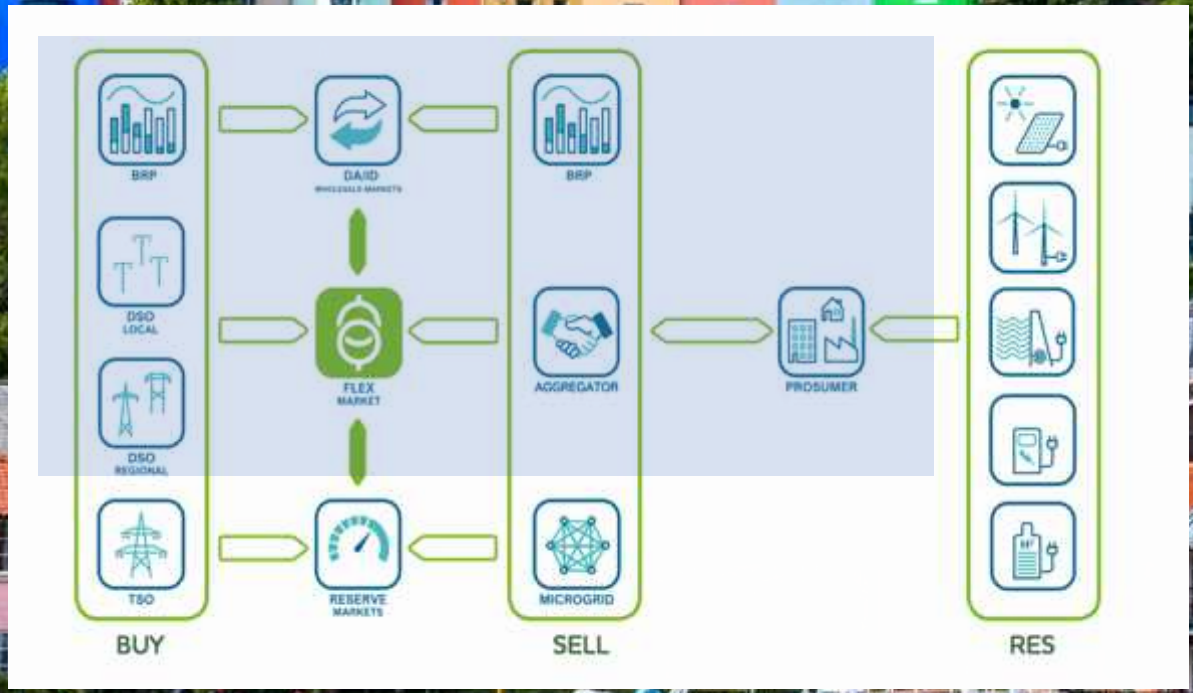
0,5 MW .... 29,1 MW

Technology platforms

Enfo · iot SOLUTIONS · ECOSTOR · geo · NEAS · PIXII · Noova Market AS · tibber · SENTIENT · Ringerikskraft · thecla

agder energi · GLITRE ENERGI · NOR FLEX · NODES · Statnett

IntraFlex:
Auto-rebalancing energy suppliers

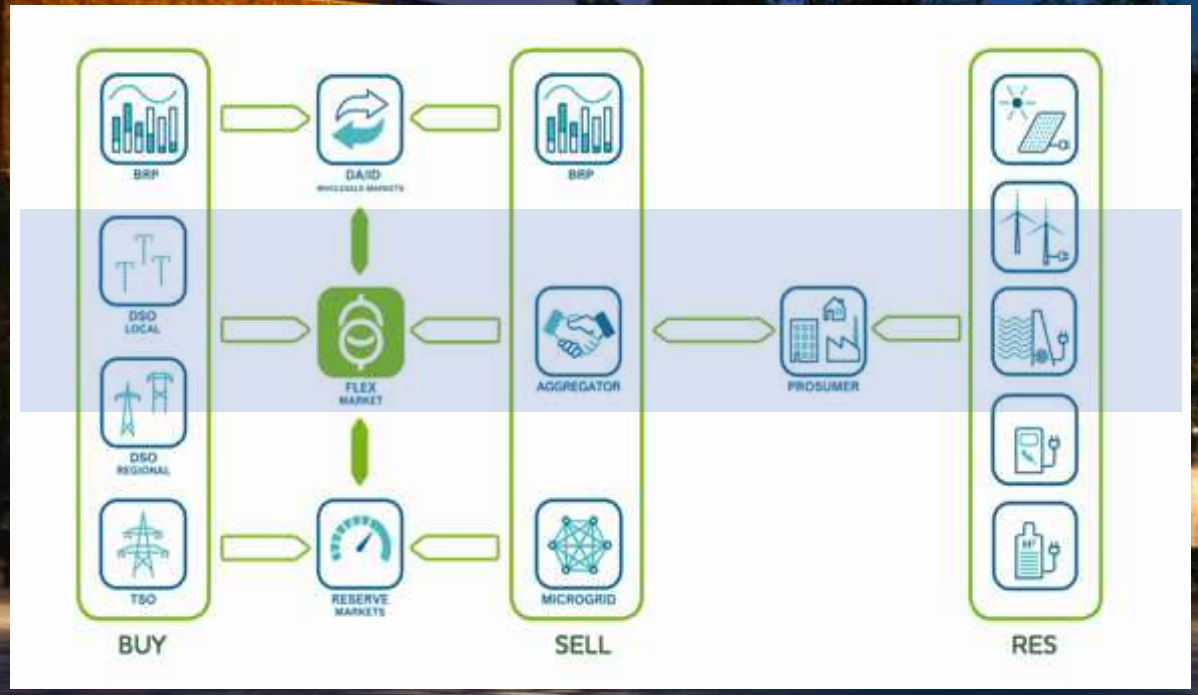


IntraFlex:
Close to real-time (ShortFlex) & rebalancing service

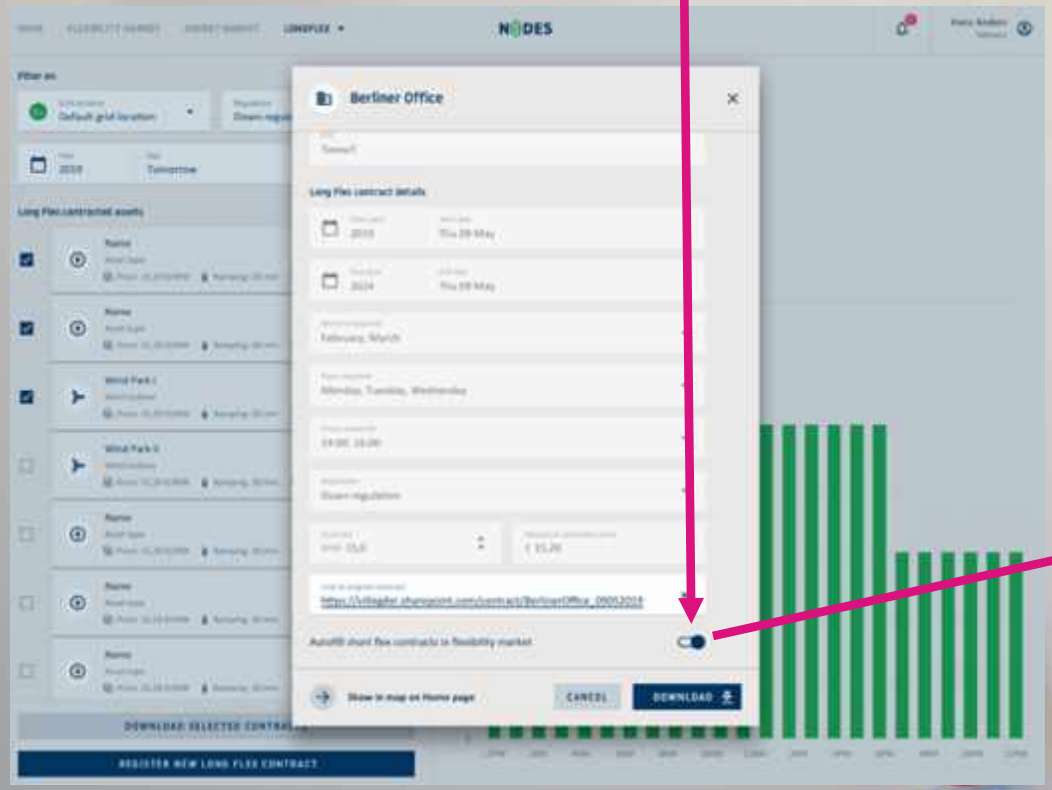
Average price UK:

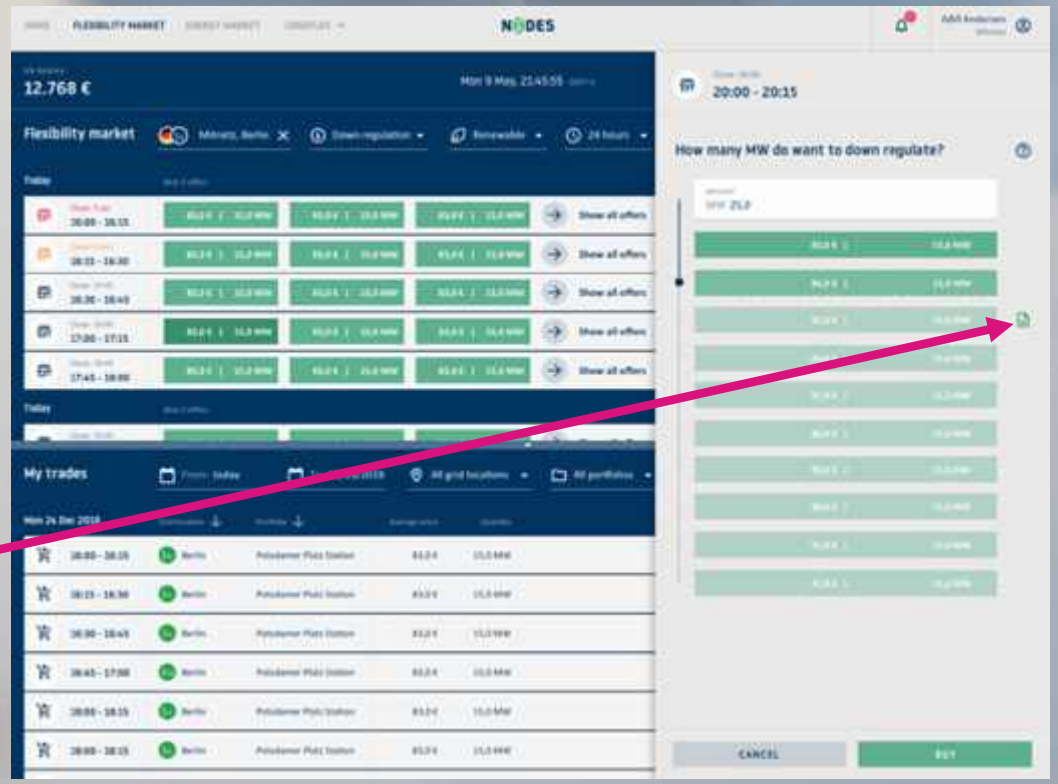
Week 40 (21.-30.9.20):	166.98 GBP/MW/HH
Week 39 (17.-23.9.20):	150.23 GBP/MW/HH
Week 38 (10.-16.9.20):	162.00 GBP/MW/HH
Week 37 (3.-9.9.20):	158.00 GBP/MW/HH
Week 36 (27.8-2.9.20):	150.00 GBP/MW/HH

FlexLab:
Operating LongFlex contracts in the ShortFlex market



Interruptible tariffs – automated dispatch





TSO-DSO Coordination

TSO-DSO Coordination for acquiring ancillary services from distribution grids.

Horizon 2020 Smart Net project, May 2019

		Integrated flexibility market	Local ancillary services market	Shared balancing responsibility	Common TSO-DSO market	Centralised ancillary services market
SO interaction	Adequacy of existing communication channels	Medium	Medium	Medium	Low	High
Grid operation	Respecting distribution grid constraints	High	High	High	High	Low
	Use of DER by TSO	High	Medium	Low	High	High
	Recognition of evolving role of DSO	High	High	High	High	Low
Market operation	Possibility to lower market operation costs	Medium	Low	Low	Medium	High
	Liquidity	High	Low	Low	Medium	Medium
	Economies of scale	High	Low	Low	High	Medium

Source: Gerard, H., Rivero Puente, E.I., Six, D., 2018. *Coordination between transmission and distribution system operators in the electricity sector: A conceptual framework*. Utilities Policy 50, 40–48.

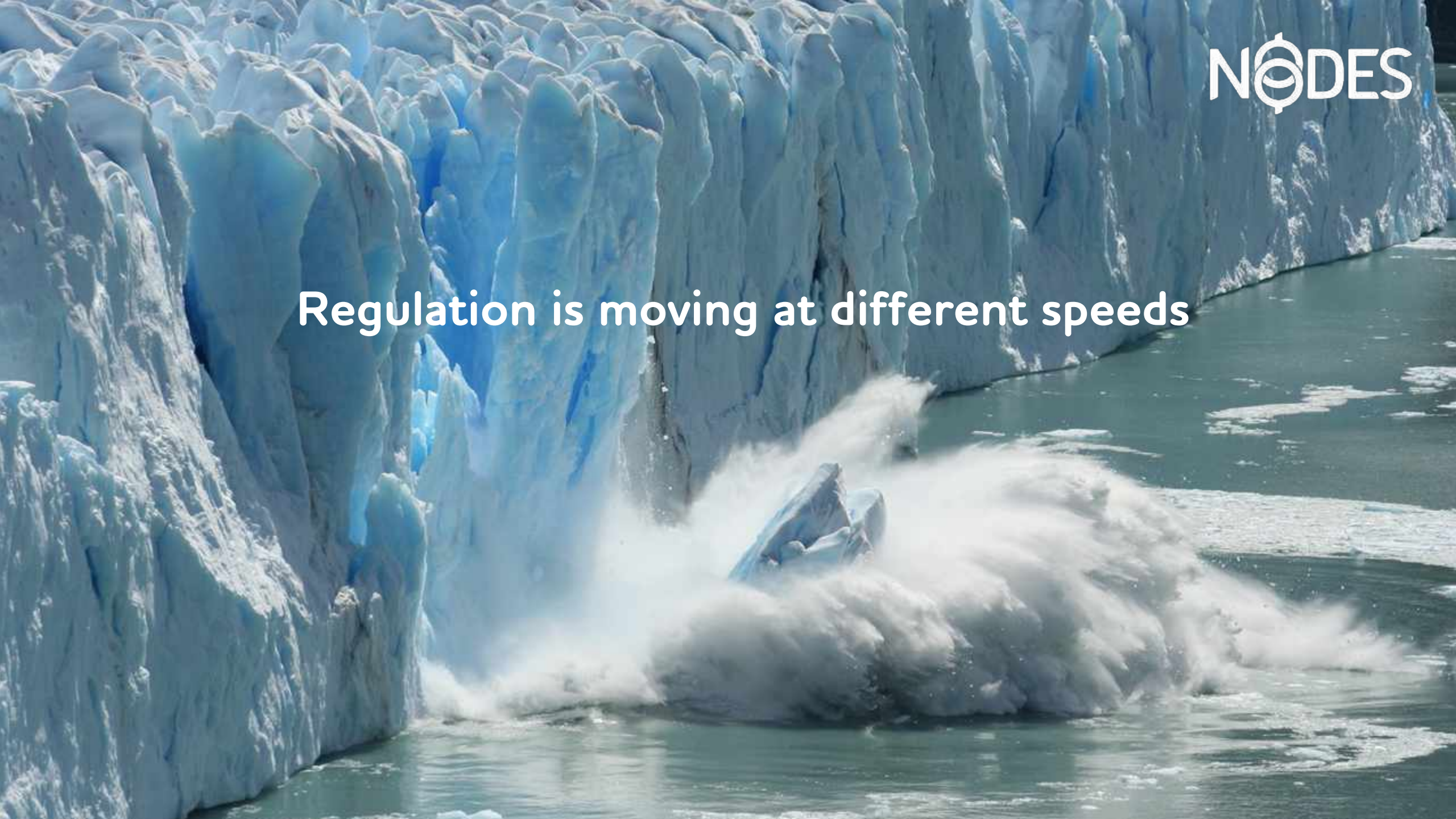
sthlmflex:
Market based TSO-DSO coordination through regional flexibility market

ELLEVIO

SVENSKA KRAFTNÄT

VATTENFALL

Vattenfall Eldistribution


NODES
Regulation is moving at different speeds

Flexibility first principle

Western Power Distribution
11,316 followers
2w • Edited •

We're all about 'flexibility first'! Our engineers are always looking for ways to manage demand and make the network more flexible for the future.
As part of our 'flexibility first' principle, we are seeking to procure 334MW ...see more

Tim McManan-Smith • 2nd
Editor: The Energyst; Director Energyst Media Ltd
3w •

https://lnkd.in/e67HqAW #dsr #smartgrid #batterystorage #netzero

Ofgem: DNOs must make progress with flexibility this year

theenergyst.com

Elements that contribute to the use of flexibility

- Industry commitment to test flexibility before grid enforcement
- Innovation stimulus; fund DSO to buy flexibility
- TOTEX “total expenditure”; CAPEX and OPEX equally treated

NODESconnect Partnership Programme

- Aimed at 3rd party independent software providers (ISPs)
- Encourage collaboration in creating local sustainable flexibility markets
- Cooperate in the business of Marketing, Branding, Technical integration and Market Communication
- Partner commit to maintain API connectivity to NODES
- NODES gives early access to technical information and test systems
- Partnership is non-exclusive and NODES will seek to grow the number of ISPs that connects to the API and sign up to NODESconnect