

February 28<sup>th</sup>, 2023

## **Energistyrelsen - Forum for fleksibilitet**

**Hvordan kan vi fremme et  
fleksibilitetsmarked, der skaber værdi  
for nettet og tillid  
hos både køber og sælger?**

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CEO Agder Energi Flexibilitet AS**

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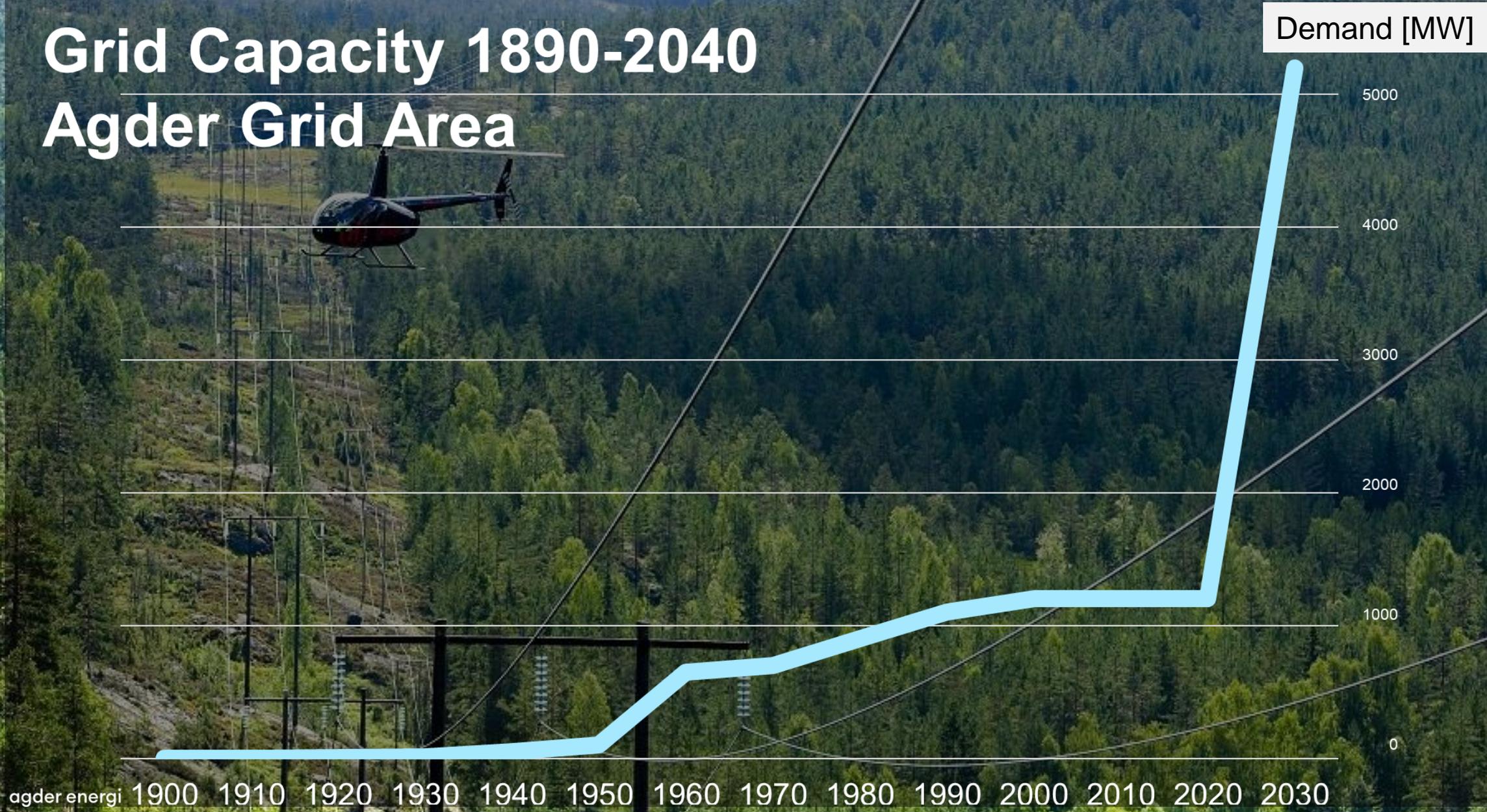


# **NOR FLEX**

**Creating the power grid of the future  
by facilitating more flexible power  
consumption**

# Grid Capacity 1890-2040

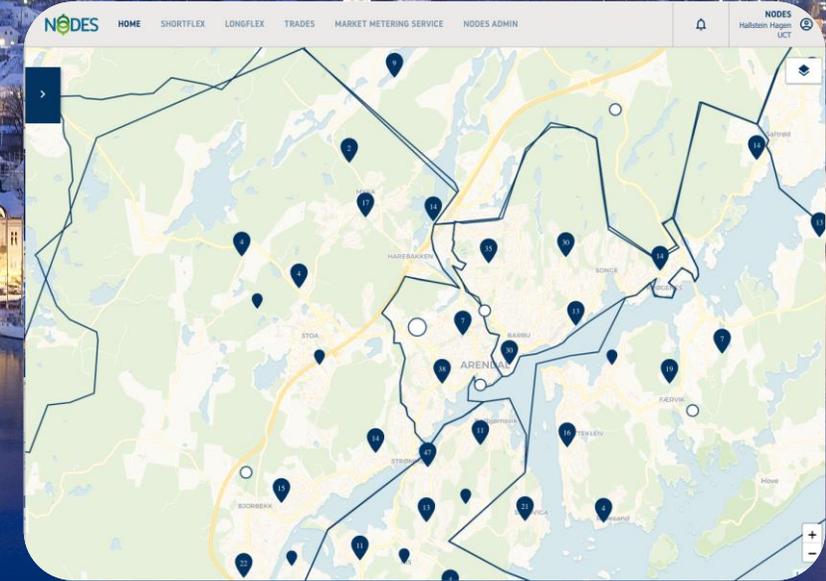
## Agder Grid Area



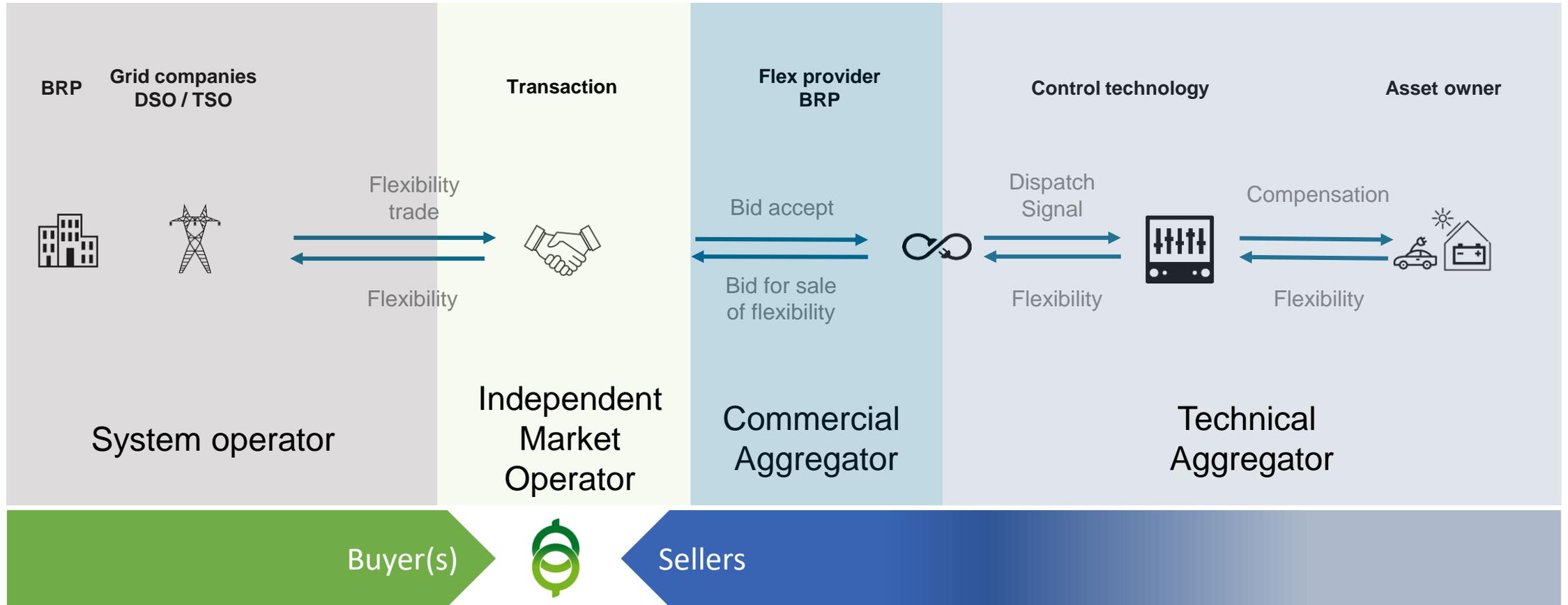
# Large scale demonstration project 2019 - 2023



- New digital flexibility value chain
- Verification of market model
- Facilitating new business models
- Level playing field for all asset types
- Industrial, commercial and household assets
- Value stacking, aggregation DSO - TSO



# New digital flexibility value chain



# Facilitating new business models - sellers



- New opportunities for flexibility providers
- Example: Tibber (CIRED paper #1316, 2022)

CIRED workshop on E-mobility and power distribution systems Porto, 2-3 June 2022  
Paper 1316

**NORFLEX: ACCOMMODATING E-MOBILITY IN THE DISTRIBUTION GRID. UTILISING A FLEXIBILITY MARKET TO MANAGE GRID CONGESTION**

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**ABSTRACT**  
In Norway more than 64% of all new car registrations in 2021 were electric vehicles (EVs). We have investigated the opportunities, challenges, and potential value of E-mobility as part of a flexible energy system. This paper provides insight into how to accommodate E-mobility in the local distribution grid, in addition to functioning as an asset to manage grid congestion and system services with a market-based approach.

The project has developed and tested technology and business models enabling more efficient and sustainable power grid operations. This includes utilizing market-based flexibility from the growing number of domestic EV chargers, and hence accommodating E-mobility in the distribution grid.

Key to this project is NODES and its innovative approach as an integrated market design that allows for the reservation (LongFlex) and activation (ShortFlex) of local flexibility to be transacted between Flexibility Service Providers (FSPs) and the DSO & TSO.

infrastructure. Today Norway has a network of fast chargers on the major corridors. The public fast (50kW) and ultrastat (150kW) charging points are accessible 24/7 and open to all types of EVs. In addition to CPOs developing fast chargers, other companies are developing AC charging at home and building complexes.

We see new business models developing. CPOs are offering energy and energy companies are offering CPO services even with limited public funding.

Norway is the frontrunner in terms of EV adoption, boasting a 65% market share of new-sales last year, displayed in Figure 1 (Elbil.no, 2022).

Not charging  
A car is connected, but it is not charging. Latest charging session was 28.31 kWh.

Charging at home in September: 56 kWh

Smart charging: On



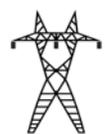
Grid companies  
DSO / TSO

Transaction

Flex Service Provider  
FSP/BRP

Control technology

Asset owner



Flexibility trade



Flexibility



Trade confirmation



Sales Bid



Dispatch signal



Flexibility



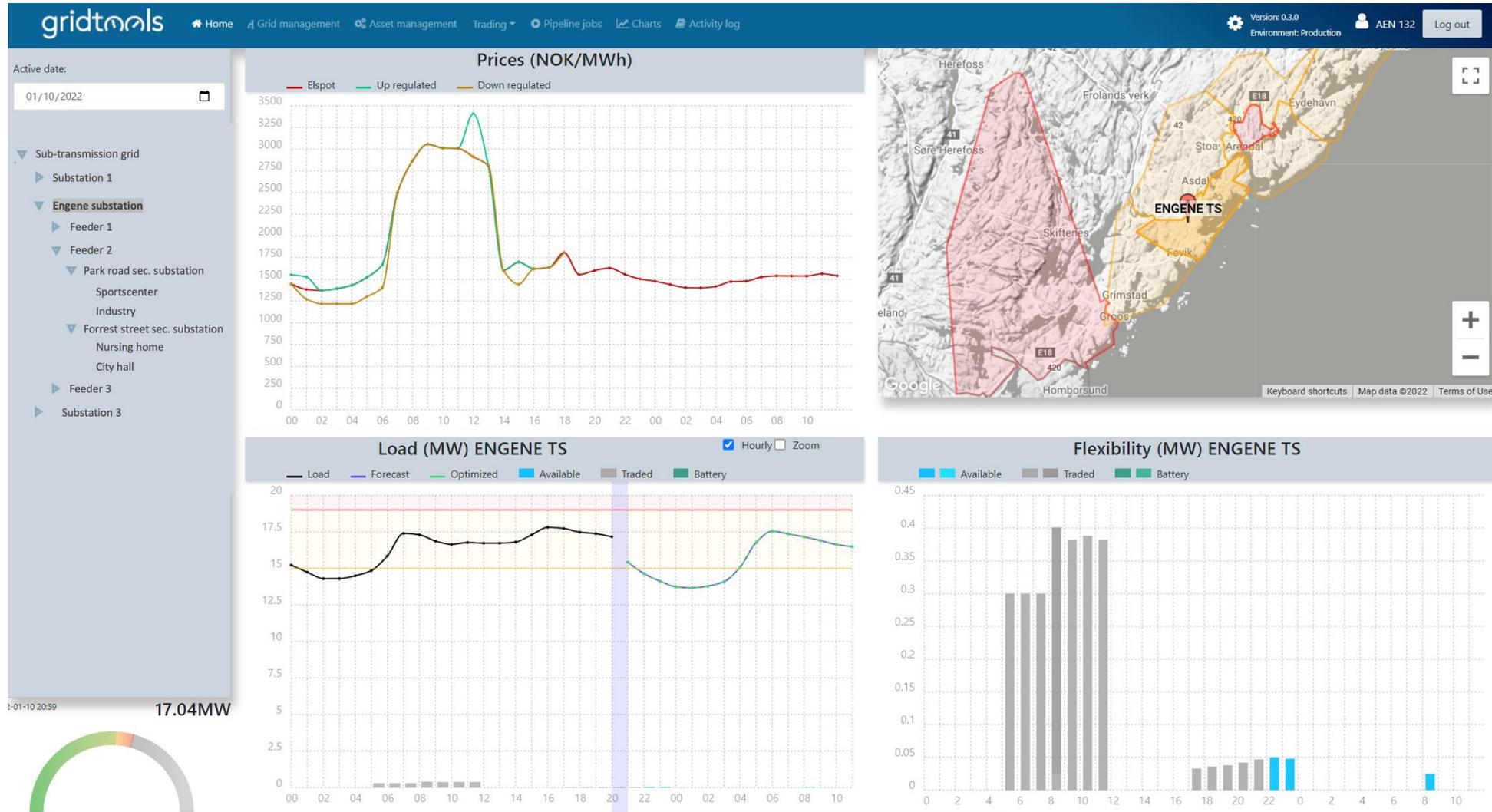
Compensation



Flexibility



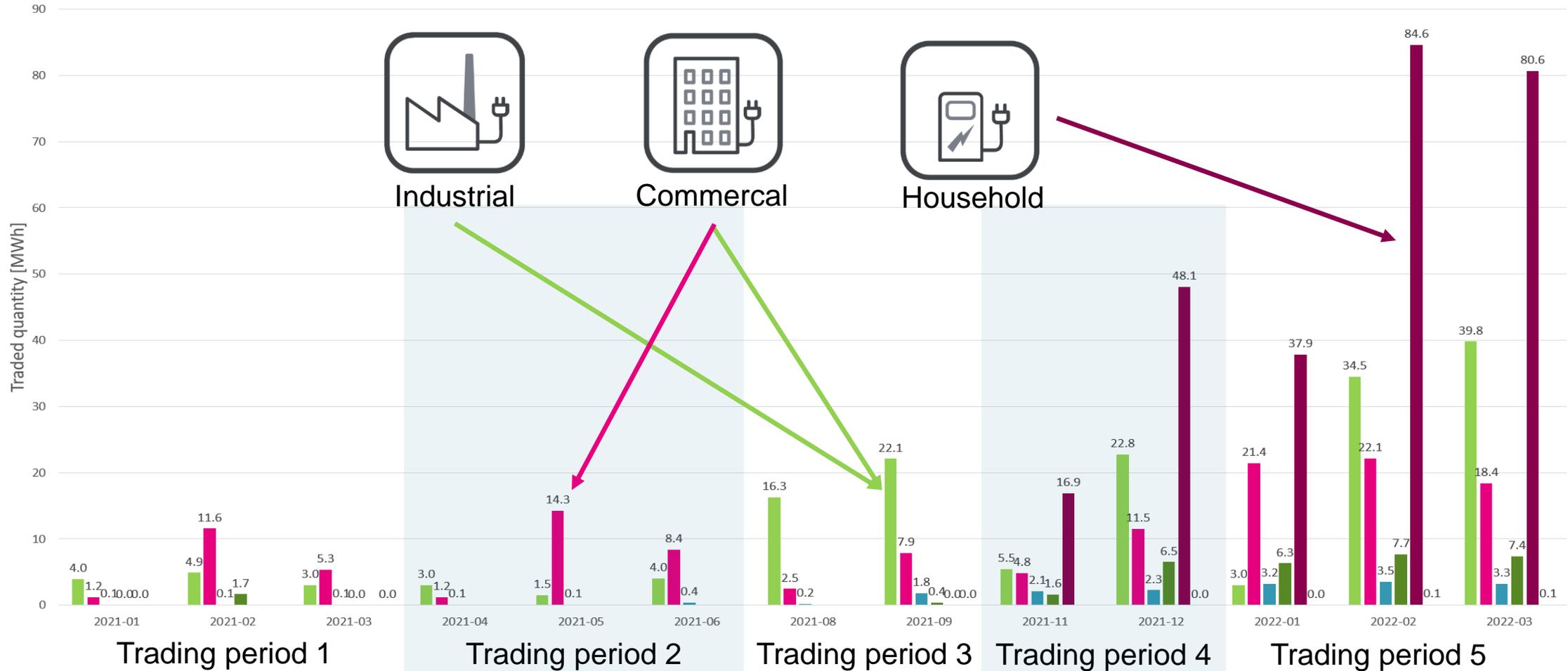
# GridTools - Flexibility assessment & optimisation tool



# Level playing field for all asset types



## ShortFlex - Activation contracts



agder energi

GLITRE ENERGI

NODES

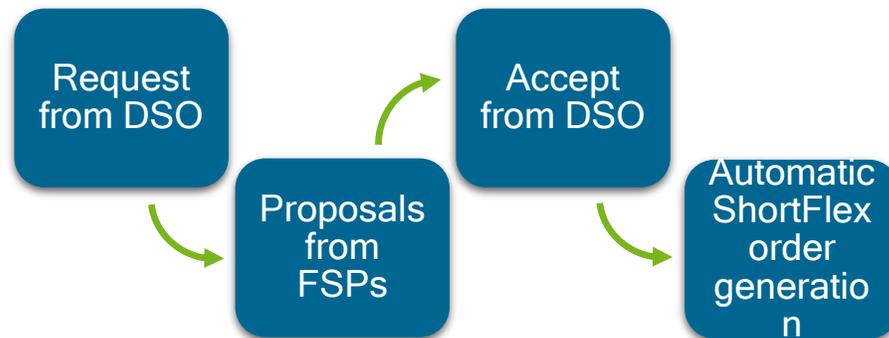
Statnett

ENOVA

# LongFlex – availability contracts



Item	Value	Unit
Number of contracts	44	Contracts
LongFlex week	23	Contracts
LongFlex season	21	Contracts
Contracted capacity	23.4	MW
Contracted energy	366	MWh
Volume weighted average price	494	NOK/MWh
Max activation price	5000-16000	NOK/MW



✕
LongFlex Week

LongFlex contract details

Original Contract:

Buyer:

Seller:

Name:

Comment:

Quantity:

Max Activation Price:

Availability Price:

Regulation Type:

Location

Market:

Grid Node:

Asset Portfolio:

Schedule

Period From:

Period To:

Months:

Days:

Hours:

Market's TimeZone:

ShortFlex Order Expiry:

✕
LongFlex Season 2022

LongFlex contract details

Original Contract: LongFlex Season 2022

Buyer: Agder Energi Nett

Seller:

Name: LongFlex Season 2022

Comment: Week 5-13. For all existing assets

Quantity: 0.02 MW

Max Activation Price: NOK 8,700.00 / MW

Availability Price: NOK 75.00 / MW

Regulation Type: Up

Location

Market: Agder Energi Nett Market

Grid Node: Timenes

Asset Portfolio:

Schedule

Period From: Tue, 1 Feb 2022

Period To: Thu, 31 Mar 2022

Months: February, March

Days: Monday, Tuesday, Wednesday, Thursday, Friday

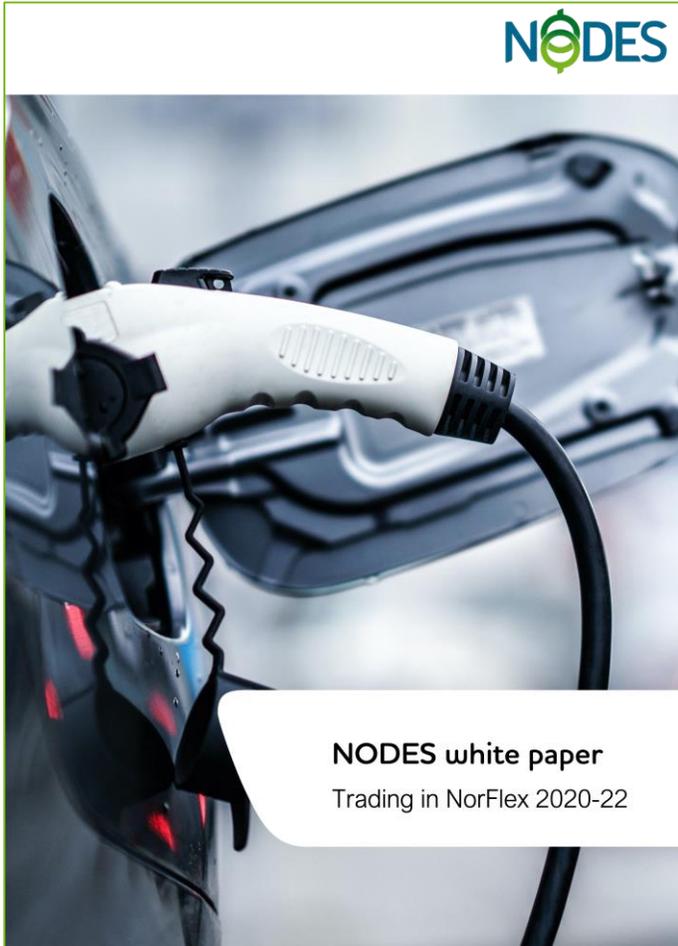
Hours: 16, 17, 18, 19, 20 (06, 07, 08, 09, 10)

Market's TimeZone: Europe/Oslo

ShortFlex Order Expiry: 00:00h

CANCEL

# Results



**NODES**

**NODES white paper**  
Trading in NorFlex 2020-22

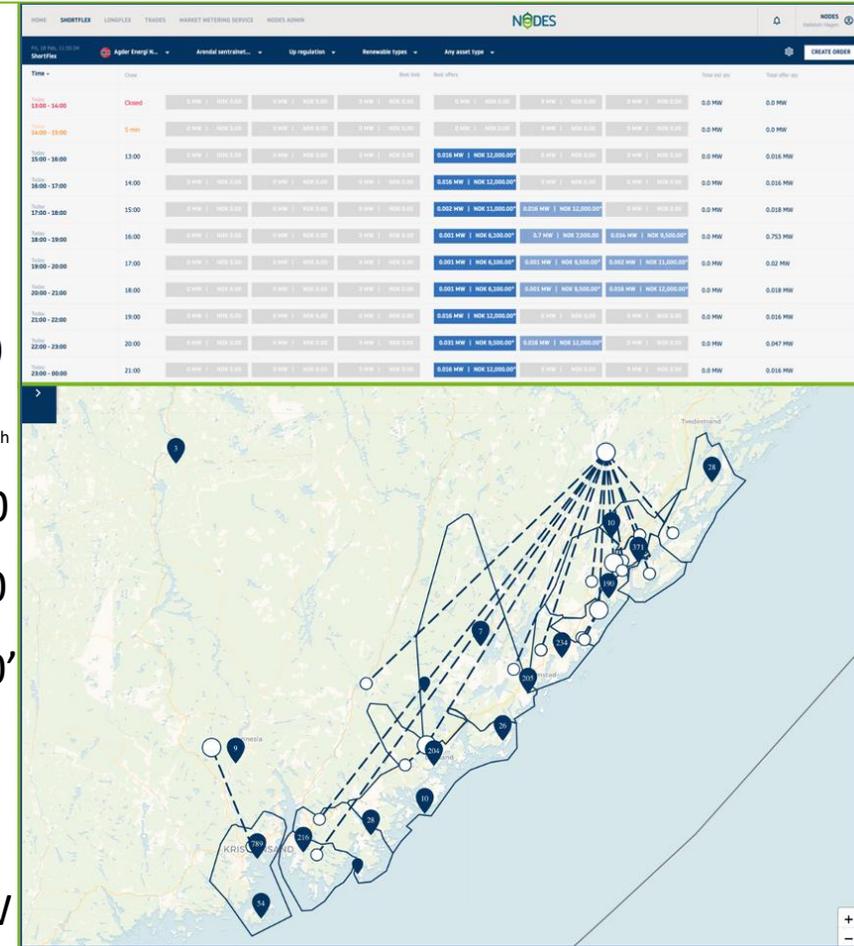
## Trading statistics

Jan 2021 – Mar 2022



+ Oct - Feb

# aggregators	<b>8</b>	
# assets	<b>&gt; 2 400</b>	6000
traded volume	<b>&gt; 600 MW*h</b>	1132 <sub>MWh</sub>
# trades	<b>&gt; 12 000</b>	25000
average price	<b>850 EUR/MW*h</b>	900
total contracted value	<b>&gt; 510 000 EUR</b>	1000'
smallest order	<b>1 kW*h</b>	
largest order	<b>5,4 MW*h</b>	
highest volume pr hour	<b>7 MW</b>	12,4 MW

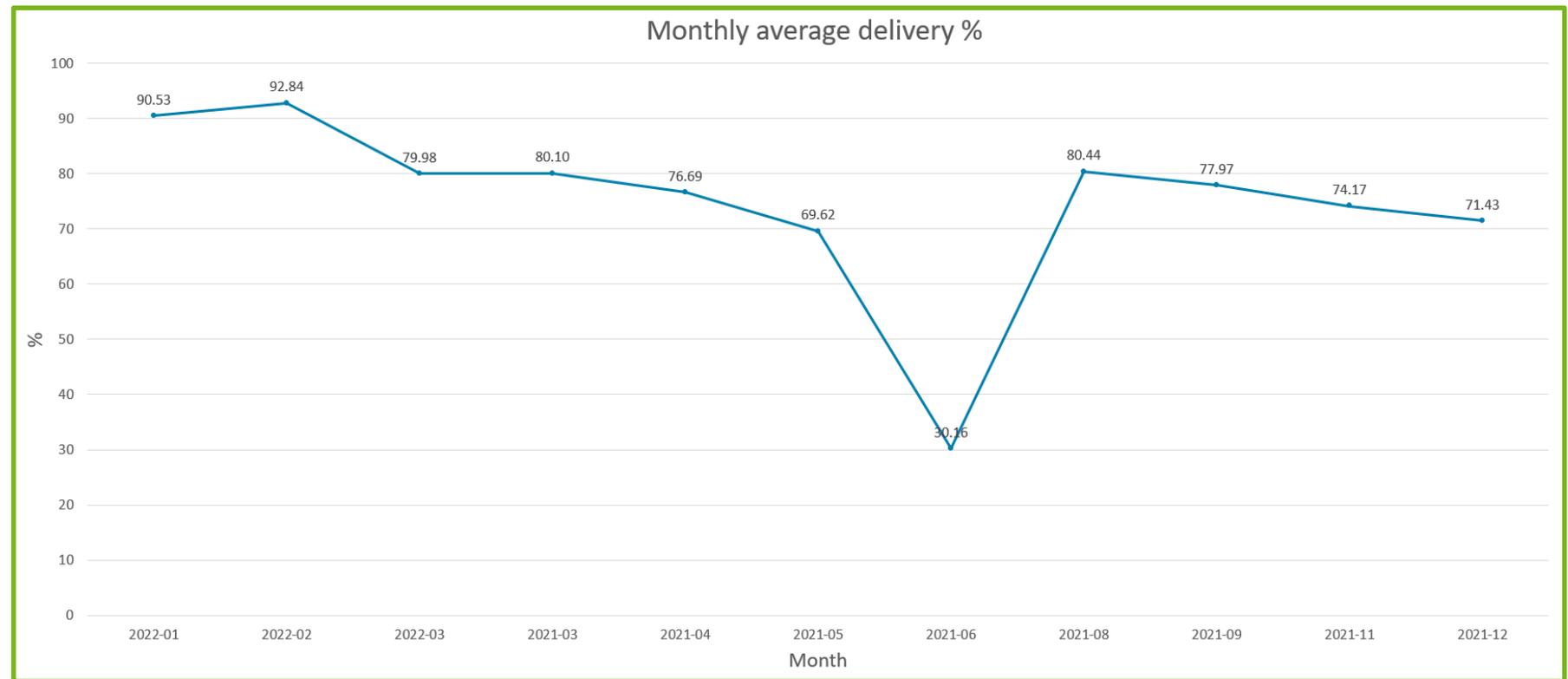


<https://nodesmarket.com/publications/>

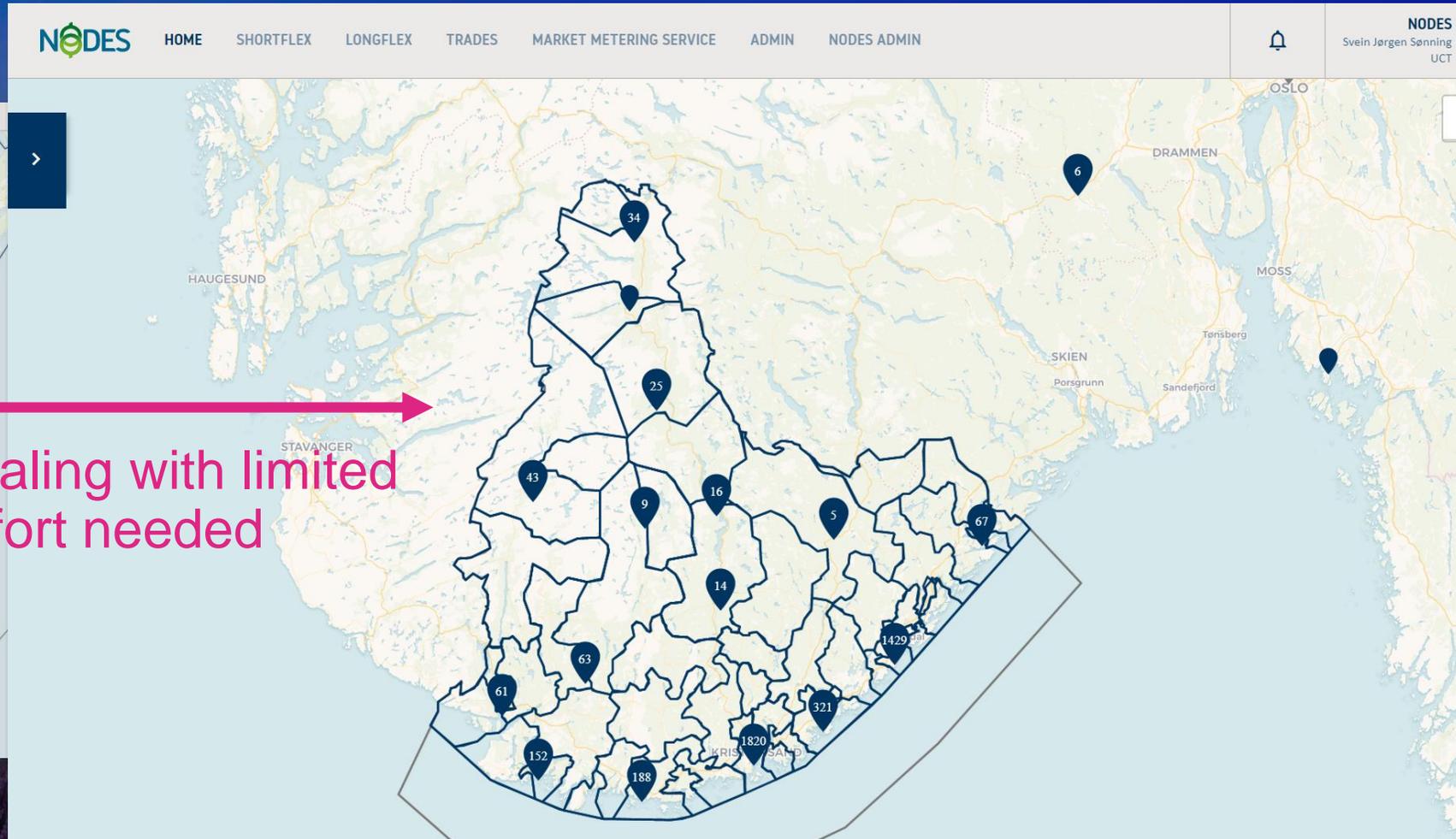
# Flexibility asset register and datahub (AssetHub)



- Validation and settlement (by NODES)
- Baseline
- Meter data (AssetHub)



# ... and we are continuing!



**Thank you!**



**NOR  
FLEX**

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CEO Agder Energi Flexibilitet AS ( Å Energi  
)**

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**Creating the power grid of the future  
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The new company formed by the **merger** of Norwegian utilities **Agder Energi** and **Glitre Energi** will be called **Å Energi**

- 11,3 TWh Annual Production
- 72 Power Stations
- 30,000 km Power Grid Lines, with 310 000 end users
- >30 TWh renewables managed annually
- Retail Private > 200 000 customers
- Retail Commercial, largest in Norway

