

# Regional flexibility markets demonstrated in Sweden sthlmflex & CoordiNet

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Power System Flexibility Campaign & 3DEN

Joint Expert Webinar – Strategies for Digitalisation of Electricity Systems

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# Vattenfall Distribution

Leading owner and operator of electricity distribution networks in Sweden and Berlin, Germany

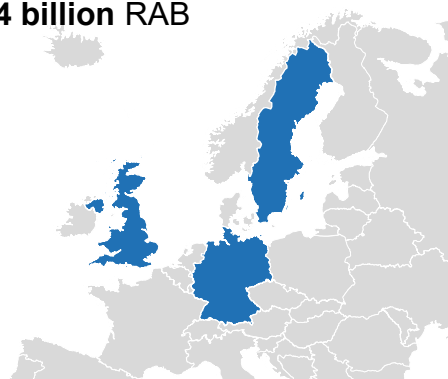
- Largest operator of regional electricity distribution networks in Sweden and top-3 position in local networks
- Enabler of the energy transition by connecting renewable production to the grid
- Demand set to grow – Vattenfall grids are located in areas with population growth and strong demand for industrial electrification
- High operational efficiency compared to industry average
- Our positioning across the whole energy value chain enables us to take advantage of our networks using both demand and supply side flexibility

**3.3 million** household and business customers

**>155,000 km** of electricity grids

**SEK 7.2 billion** in investments 2019

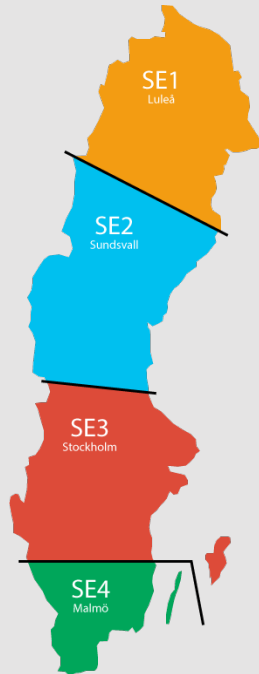
**SEK 64 billion** RAB



Vattenfall Distribution is a part of Vattenfall

- Vattenfall is a leading European energy company
- We want to make **fossil-free living possible within one generation**
- We are driving the transition to a more sustainable energy system **100 per cent owned by the Swedish State**

# Short facts about the Swedish energy system



Sweden has 4 electricity trading areas that are connected to trading areas in Norway, Finland, Denmark, Germany, Polen and the baltic countries

In 2020 Sweden exported 37 TWh and imported 12 TWh electricity. Swedens total energy use was 134 TWh.

Energy production in Sweden: hydro 41%, nuclear 40%, wind 10% and CHP 9 %

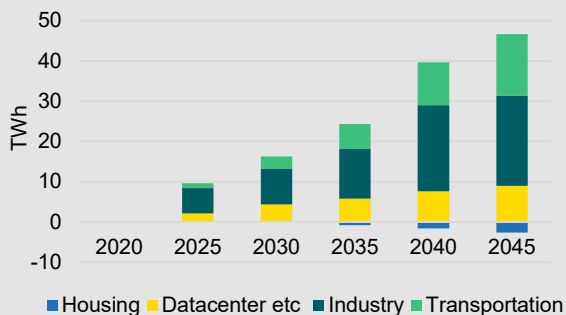
Swedish TSO maintains a balancing energy market together with the other Nordic transmission system operators

TSO and DSO:s are unbundled from other energy actors

# Swedish 2<sup>nd</sup> electrification wave

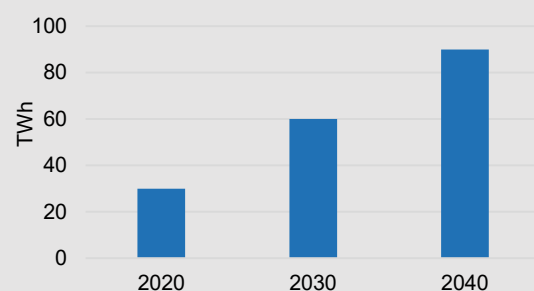
Electricity demand set to grow due to electrification and new electricity intensive businesses

Forecast – Change in electricity demand (Sweden)<sup>1</sup>



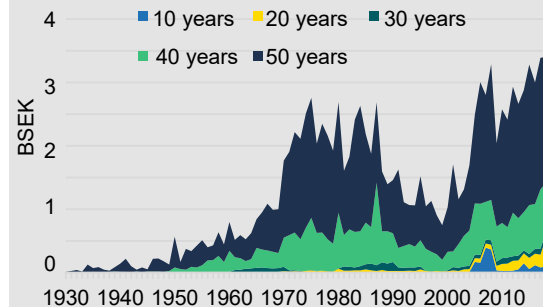
Installed wind capacity continues to grow

Forecast - installed wind capacity (Sweden)<sup>2</sup>

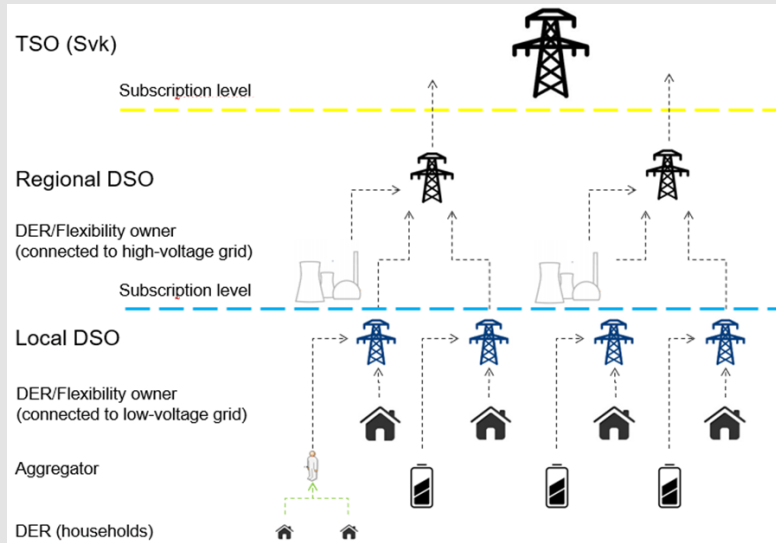


Existing network assets are increasingly in need of reinvestments

Asset age structure – Vattenfall Eldistribution<sup>3</sup>



# The capacity challenge in Sweden



The power level is limited by subscription levels between the local DSO and regional DSO and between the regional DSO and TSO

Violations of subscription limits subject to cost, and may be denied

The DSO utilizes flexibility services to lower peak demand in the grid during the winter season November to March

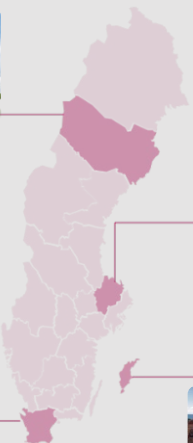
A grid state forecast makes it possible to call for flexibility day-ahead working proactively to alleviate grid congestion that has strong correlation with temperature

# 2 regional flexibility markets

## CoordiNet & sthlmflex



Peer to peer  
marknad



Uppland



Gotland

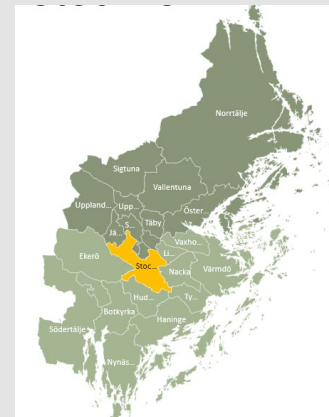


Skåne

EU-financed Horizon 2020-project  
DSO Vattenfall Eldistribution, DSO EON  
Energidistribution, TSO Svenska Kraftnät,  
Expektra, Uppsala kommun och Energiforsk  
Market platform and flextool: EON Energidistribution



R&D project sthlmflex (Stockholm)  
TSO Svenska Kraftnät in cooperation with DSO:s  
Vattenfall Eldistribution och Ellevio  
Market operator: NODES  
Flextool operator: EON Energidistribution





# Flexibility resources in Uppsala

## Industries



## Reserve gensets



## Battery Storage 20 MWh



Sweden's largest battery storage park goes into operation

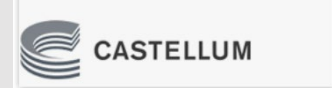
## District heating



## Hydropower



## Aggregated commercial and residential buildings



# Market data 20210125 - 20210224

CoordiNet  
Uppland



## Senaste 30 dagarna

2021-01-25 - 2021-02-24

### Day ahead

Tot. erbjuden volym: **11 930,35** MWh

Tot. såld volym: **4 030,61** MWh

Högsta clearingpris: **2 500** kr

Lägsta clearingpris: **150** kr

Genomsnittspris: **242** kr

sthlmflex North

## Senaste 30 dagarna

2021-01-25 - 2021-02-24

### Intraday

Tot. erbjuden volym: **5 856,5** MWh

Tot. såld volym: **574,8** MWh

Högsta clearingpris: **5 000** kr

Lägsta clearingpris: **242** kr

Genomsnittspris: **713** kr

sthlmflex South

## Senaste 30 dagarna

2021-01-25 - 2021-02-24

### Intraday

Tot. erbjuden volym: **18 854,8** MWh

Tot. såld volym: **1 441,4** MWh

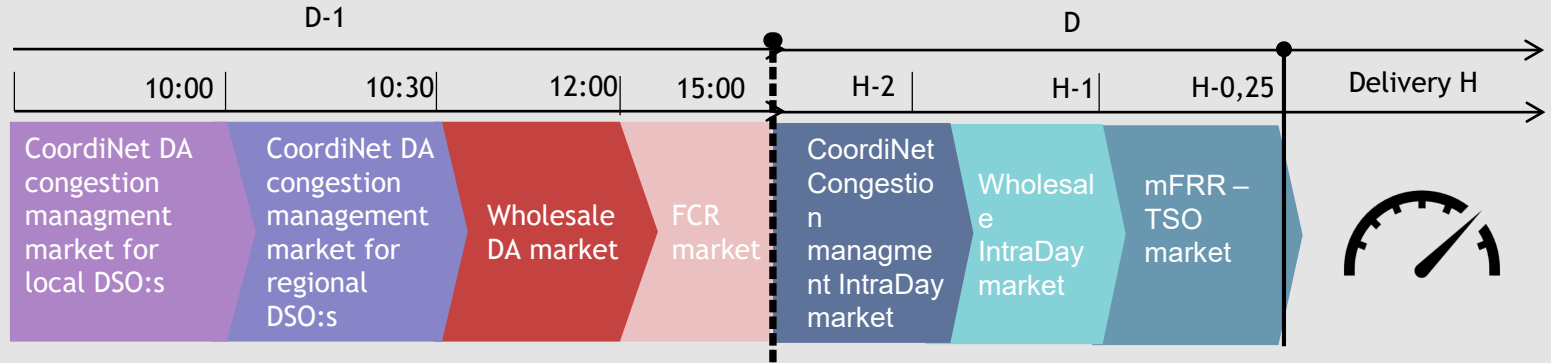
Högsta clearingpris: **2 000** kr

Lägsta clearingpris: **200** kr

Genomsnittspris: **570** kr



# Market design: time coordination



- Very important to put the DSO/TSO markets in the timeframes of the current energy markets without interference
- The coordination scheme with cascading market closing times worked well
- But to fully unlock the potential of flexibility the day-ahead market needs to be complemented with an intraday market
- An additional benefit during the project was that the dialogue between DSO and TSO created new values in understanding how better coordination can lead to a more efficient grid use



# Coordination with other markets

## Existing markets in Sweden:

**Day-ahead wholesale market:** At 10:00 CET available capacities on interconnectors and in the grid are published - buyers and sellers have until 12:00 CET day-ahead to submit their final bids (Source: )

**Intraday wholesale market:** Opening time of 15:00 CET D-1 continuous market, with trading taking place every day around the clock **until one hour before delivery**

**Balancing (frequency markets):** mFRR: voluntary energy bids and can be submitted until 45 minutes before the operational period

## Coordination with other markets:

Coordinated day-ahead should close before 10:30 a.m. so as to not interfere with national day ahead market

Coordinated Intraday should open at 15:00 to be in line with national day-ahead market

Coordinated Intraday closes two hours before delivery, to allow for BRP to balance themselves on national market

If prequalified with TSO for mFRR, remaining bids are forwarded to TSO an hour before delivery hour

# Most important take-aways

Time coordination with other markets works

The lead time for becoming an flexibility service provider varied between a few weeks and an entire year, depending on the type of flexibility resource

The business case for FSPs must as well be predictable as covering the FSPs expenses. A conclusion is that a business case alone will not be enough to attract FSPs.

Local flexibility markets → important with bidding functions as set time, maximum delivery time, block bid and recovery time for an efficient use of flexibility resources

Standards for communication and power of attorney are key



Drivers for flexibility service providers

# For more information

## Project homepages

### CoordiNet

[EU financed Horizon 2020 project CoordiNet](#)

### sthlmflex

[FoU-projektet sthlmflex](#)

## Contact Svenska kraftnät

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[CoordiNet – Svenska Kraftnät](#)

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[CoordiNet – Vattenfall Eldistribution](#)

[sthlmflex - Vattenfall Eldistribution](#)

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[SWITCH | En lösning på kapacitetsbristen - E.ON](#)

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[Kapacitetsbrist elnät | Ellevio](#)

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