



June 2020

# LOCAL FLEXIBILITY PROJECTS IN THE NORDICS

Experiences on R&D, pilot projects and local DSO-TSO cooperation

FINGRID

ENERGINET

Statnett

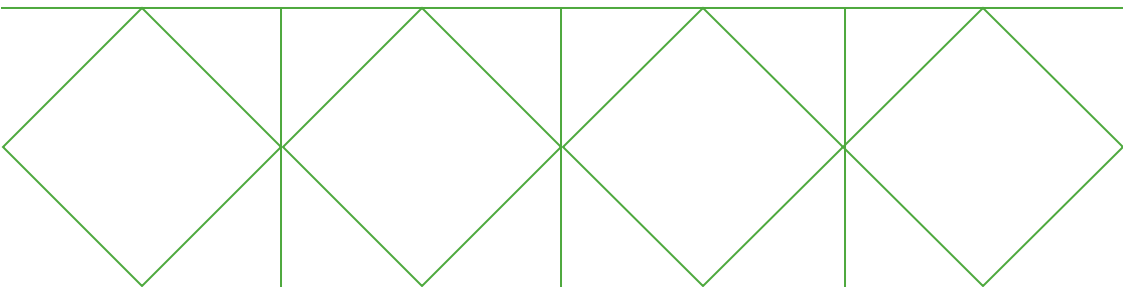


# FLEXIBILITY PROJECTS IN THE NORDIC COUNTRIES

The Nordic power system is changing at a high pace. The renewable generation - often small-scale, intermittent and distributed - is increasing fast, while the share of thermal power is decreasing. Also, the customers are expected to be more active and increasingly engage in demand response. The energy transition results in a power system with different properties and new challenges. New market players and digitalisation, however, also provide opportunities. One key question is how to support the transition by utilising flexibility and making it available to the DSOs and TSOs for congestion management and balancing.

To address the need for local flexibility and explore how to successfully establish local flexibility markets and other TSO-DSO coordination activities, there are a number of pilot projects initiated in the Nordic countries. Pilot projects give the opportunity to explore new solutions and gain experience within well-defined boundaries and also clarify what areas are in need of further developments and improvements. Furthermore, they provide insight in how different solutions work in different contexts – the Nordic countries have different preconditions for TSO-DSO cooperation. For example roles and responsibilities for operating the system and local markets vary in the different countries, which is reflected in the projects.

This publication gives an overview of a number of those initiatives. The projects are quite different in terms of size, scope and detailed purpose. However, to a large extent they share the same overall objective, being to explore new solutions and unlock flexibility which in turn requires further coordinate between TSOs and DSOs to address often similar challenges such as local congestions. As the projects continue, it is expected it will be increasingly apparent what are best practices for establishing TSO-DSO cooperation and possibilities to complement grid reinforcements with flexibility solutions.



# KEY CHALLENGE: UNLOCKING LOCAL FLEXIBILITY

Electrification is one of the cornerstones in a successful transition to a decarbonised energy system. Today, green electricity production contributes significantly to the electricity production in the Nordics and the share is increasing year by year. Moving energy consumption to electricity consumption where possible is a logical first step towards a 100 percent decarbonised society, but it does not come without challenges.

In order to increase the electricity consumption without a corresponding increase in new transmission lines, the electricity consumption must both match the decarbonised production and be distributed more evenly throughout a single day and between seasons. To manage this, the consumption needs to be flexible and react to signals about both decarbonised electricity availability and electricity grid capacity. Achieving this balance with a high share of intermittent production and increased demand calls for innovation.

The electricity markets have already undergone a huge transformation during the last years. International trade has been strengthened, trading has been digitalised and moved closer to real time and the markets have been optimized to secure fair consumer prices and effective grid operations. Most of this development has been horizontal and between TSOs and international partners.

The new challenges following the energy transition, is to unlock the potential of consumption flexibility and to find efficient ways of working together in order to optimize the total electricity system. This requires cooperation between the national transmission and distribution grids, which also plays a significant role in the new European energy rulebook, Clean Energy Package. The law package seeks to shape the establishment of a modern electricity market, adapted to the new realities of the market.

Both before and after the Clean Energy Package the movement towards a decarbonised system has led to a series of projects on local flexibility, many of them in cooperation of the transmission system operators (TSOs) and distribution system operators (DSOs).

The elementary challenges are alike across the Nordics but the projects are developed to work with the existing national solutions. However, knowledge sharing is highly prioritized and harmonized future solutions can coexist and support efficient trade with electricity across the Nordics. This report is a result of the Nordic TSOs' cooperation and provides an overview of 12 projects in the Nordics on local flexibility including TSO-DSO projects related to developing new solutions for a decarbonised system.

## CHALLENGE 1

Develop, test and get hands-on experience with market designs, roles and processes to unlock local flexibility while respecting grid constraints at distribution and transmission level

## CHALLENGE 2

Coordination of the various needs of the flexibility users and provers in an market-based way. Maximising the value of customers' flexible assets.

## CHALLENGE 3

Adapting the current market products to support the occurring need for faster reaction and the inclusion of smaller units

## CHALLENGE 4

Evaluate and optimize grid stability and security of supply with new market solutions offering both a higher time resolution, more units in the market and a finer geographical resolution of supply.

# PROJECT OVERVIEW

The projects described in this report can roughly be divided into three groups:

- 1) Large, European R&D-projects, lasting for several years, having high budgets and many participants. In addition to TSOs and DSOs, there are normally partners from academia, research institutions and suppliers. These projects are developing and testing concepts, methods and framework, aiming for pan-European solutions. They will typically result in a more general foundation that needs to be adapted locally before it can be implemented. This report contains two such projects: INTERFACE and COORDINET.
- 2) Concept projects, analysing and demonstrating possible solutions to specific challenges. They are usually aiming to result in national or regional arrangements. Most of these projects last for several years and involve other partners in addition to the TSO and DSO(s). A part of the project results are to describe what needs to be done in order to implement the solution and the effects of an implementation. TSO-DSO Tariffs, Norflex and Ifleks can be categorized as such projects.
- 3) Local projects aiming to pilot solutions to specific problems. If the solution turns out to work well, it can usually be implemented quite fast. These projects generally involve few or no other participants than the TSO and a DSO. The solution can however be generalized and implemented in other places, possibly with local adjustments. This report contains five such projects: StockholmFlex, pilot on Lolland and the three TSO/DSO-pilots.

## EUROPEAN R&D PROJECTS



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## CONCEPT PROJECTS

TSO-DSO COOPERATION

Ifleks

TSO-DSO Tariff



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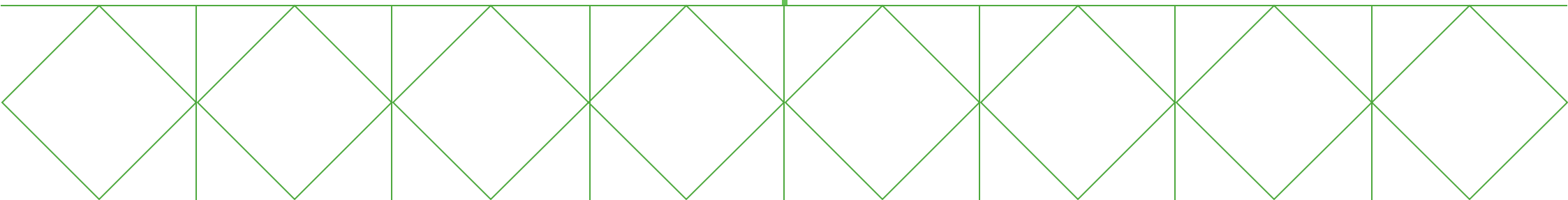
## PILOT PROJECTS

Three TSO/DSO-pilots

StockholmFlex

Trading with local flexibility

Pilot on aggregators use of existing meters





## EUROPEAN R&D PROJECT INTERFACE

TSO-DSO-Consumer INTERFACE Architecture to Provide Innovative Grid services For An Efficient Power System

### Project description and goal

The goal of the project is to create a common architecture that connects market platforms to establish a seamless pan-European electricity exchange linking wholesale and retail markets. In practice, this will be realized by implementing IT-architecture, i.e. the IEGSA (Interoperable pan-European Grid Service Architecture).

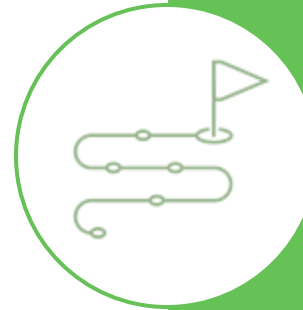
In the Finnish-Baltic regional demonstrator the goal is to create a market framework for the use of flexibility for balancing and congestion management. This includes implementing an IT solution that enables TSO-DSO coordination. Flexibility is planned to be procured from existing liquid markets (i.e. mFRR and Intraday) by enabling the use of exact locational information in the bids by referring to a common Flexibility Register. It hosts information about resources capable of providing flexibility and it will also be included the IT-solution implemented in the project. The Flexibility register is also planned to support the validation and settlement of locational trades.

The main task of the TSO-DSO Coordination Platform is to help system operators to procure local flexibility from multiple markets and to make sure that flexibility activations won't cause problems in other system operator's networks.

More information: <http://www.interface.eu/>



INTERFACE



### THE PROJECT IN SHORT

Partners: 42 partners across Europe. Finnish-Baltic demo includes: Fingrid, Elenia, Elering, Elektrilevi, AST, Cybernetica, Empower IM, Riga Technical University, University of Tampere

Period: 2019 - 2022

Budget (project): 20,9 M€

Funded by: EU Commission's Horizon 2020



### EXPECTED RESULTS

Results of the Finnish-Baltic demonstrator: First demonstration of working TSO-DSO coordination and flexibility register. Connecting operating market platforms to the facilitating systems is essential result that is in the aim.

One important expected result is also to have a first version of the TSO-DSO coordination process to optimize the use of flexibility between system operators and other flexibility users. This will include exchanging information about network status and coordinating activations based on it.



### FUTURE PERSPECTIVE

The value of the project regarding future perspective is to gain understanding about structure of the whole electricity market landscape and what tools, IT-systems and information exchange will be needed in a flexible power system.

Also, it brings value to understand what kind of products are traded on the markets to fill the needs of both the market participants and system operators.



## EUROPEAN R&D PROJECT COORDINET

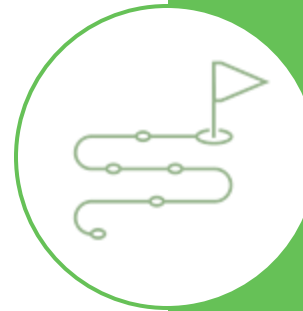
### Project description and goal

CoordiNet is a European project under Horizon 2020 including demonstrations on TSO-DSO coordination and local flexibility markets in Greece, Spain and Sweden. The Swedish demonstration is a cooperation between Vattenfall Eldistribution (demonstration leader), E.ON Energidistribution, Svenska kraftnät and a few other partners.

The concept of the Swedish demonstration is to use a market platform, developed by E.ON Energidistribution, to address challenges in four different areas in Sweden: Västernorrland/Jämtland, Uppland, Gotland and Malmö. The challenges are quite different - Uppland (Uppsala) and Malmö are relatively big and growing cities where the distribution grid needs to increase the subscription towards the transmission grid with a high pace that has been challenging to accommodate by transmission grid reinforcements due to the substantial lead times. Gotland is an island in the Baltic Sea facing various challenges, e.g. high renewable energy production - mostly wind power - and limitations in the possibility to export excess power to the Swedish mainland. The challenges to be addressed in Västernorrland are related to grid maintenance causing limitations in the local wind and hydro production possibilities.

The overall goal of CoordiNet is to help to demonstrate how DSOs and TSOs shall act in a coordinated manner and use the same pool of resources to procure grid services in the most reliable and efficient way through the implementation of large scale "TSO-DSO-Consumer" demonstrations, in cooperation with market participants (and end users). The goal of the Swedish demonstration is to address the above mentioned challenges by using a market platform to unlock local flexibility.

More information: <https://coordinet-project.eu/>



### THE PROJECT IN SHORT

Partners : On project level: 23 from Academia, TSOs, DSOs, industry, aggregators, service providers, municipalities. In Sweden: Svenska kraftnät, Vattenfall Eldistribution, E.ON Energidistribution and 6 partners

Period: 1 January 2019 - 30 June 2022

Funded by: European Commission – Horizon 2020



### EXPECTED RESULTS

For the Swedish part of the project, one important result is to increase the available flexibility in the Uppsala and Malmö region. Both of these regions are experiencing challenges to meet their increasing demand from the transmission grid. Further it is expected to gain experience on how flexibility solutions can help solving challenges in a geographically limited system such as the Island of Gotland.

Another important expected result from the Swedish demo is to utilise the flexibility as mFRR if it is not used locally or regionally by the DSOs.



### FUTURE PERSPECTIVE

The aim for the winter period of 2020/2021 is to utilize mFRR of the flexibility bids that were not used locally or regionally by the DSOs. Also it is foreseen to test a peer-to-peer market in the Västernorrland/Jämtland area.

The project will continue until 2022, but the market platform can continue further. The idea is also to continuously develop and reassess the market design and the platform features as experience is gathered.



## CONCEPT PROJECT IFLEKS – PRICE ELASTICITY OF END-USERS

### Project description and goal

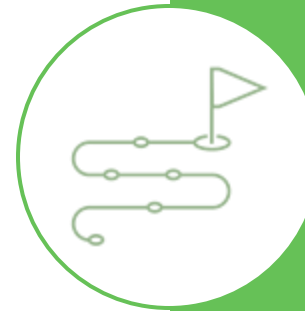
Consumption forecasts and future peak load are estimated by Statnett to predict the level of future network investments. But we lack the knowledge about future price sensitivity, and this could lead to over-investment. Statnett must be able to predict at least 10 years ahead and cannot wait and see how price sensitivity develops.

The main part of this project is an experiment with a representative selection of households and commercial buildings in the big cities. We need to measure their actual response to price signals. The experiment will provide empirical data that will lead to general and transferable results for Norway. In addition, we would like to collect participants' metadata in order to analyze what is most important for price sensitivity.

Goal:

Quantify how variable power prices to end users affect their electricity demand and therewith the peak demand in the grid.

More information: <https://www.statnett.no/om-statnett/fou-og-teknologiutvikling/vare-sentrale-fou-prosjekter/ifleks---prisfolsomhet/>



### THE PROJECT IN SHORT

Partners Year1: Entelios, Energi Salg Norge, Futurehome, Smartly/Lyse.

Partners Year 2: As for Year 1 + preferably more direct electricity suppliers

Period: 2019-2021

Budget: 10 MNOK

Funded by: Statnett



### EXPECTED RESULTS

Quantified amount of demand response of different end user groups triggered by price signals (price elasticity of households and office buildings)

Results on the realistic flexibility potential in urban regions as a function of possible monetary savings/earnings of the end users



### FUTURE PERSPECTIVE

The project has tested different price signals with a few groups the winter 2019/20. The goal is to extend the number of end users and partners in phase 2 to allow for a large scale price experiment with several thousand end users in different climate zones and over a longer period.

The ultimate aim is to have a price estimate for the flexibility of different end users which can be generalized in combination with different factors to all households and office buildings in Norway.



## CONCEPT PROJECT FRAMEWORK FOR TSO-DSO COOPERATION

### Project description and goal

The TSOs and the DSOs are increasingly facing some of the same challenges; system stability, power flow control, integration of demand side resources, managing data, empowering consumers, unlocking flexibility and optimizing storage.

The increasing penetration of intermittent and distributed energy resources in the distribution system increases the role of the DSOs and thus increasing the interfaces between TSOs and DSOs. A positive side effect of this development is the growing potential for using both resources and information across the distribution and the transmission grid to support the operation and balancing of the power system. This development is also emphasized in the Clean Energy Package that intensifies the importance of the DSOs in the future not least the DSO-TSO cooperation.

The focus on increased TSO-DSO cooperation was acknowledged in 2017 and from 2018 a new framework for TSO-DSO cooperation was established. TSO-DSO Grid Cooperation already existed so the new parts were TSO-DSO Coordination Committee and TSO-DSO market cooperation Committee and the establishment of a formalized structure where more strategic and long-term perspectives could be discussed.

#### TSO-DSO Coordination Committee

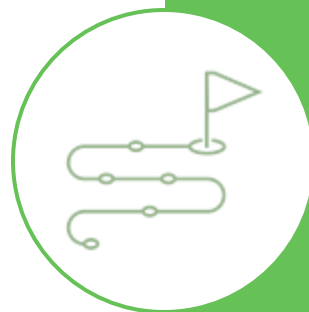
- Uncover common goals
- Outline a strategic direction
- Coordinate across committees
- Trendspotting

#### TSO-DSO Grid Cooperation Committee

- Existed prior to the new structure
- Technical issues
- Input to Coordination Committee
- Discusses subjects related to operation and planning of the system, e.g. connections of large consumers, reactive effect and network codes.

#### TSO-DSO Market Cooperation Committee

- Market facilitating issues
- Input to Coordination Committee
- Focuses on the TSO-DSO monopoly tasks as neutral market facilitators, e. g. data management, market framework for distributed flexibility and tariff design.



### THE PROJECT IN SHORT

Partners : Energinet, Danish Energy Association, DSOs.

Period: Ongoing, started 2018



### RESULTS

The cooperation has led to a closer and more formal dialogue and an increased and shared focus on how future developments will affect the grid and our role as neutral market facilitators.

Also the cooperation has launched several joint projects, e.g. on more harmonization of tariff structure, markets for local flexibility to solve local congestions for the TSO.

Thus, the Danish experiences with enhanced TSO-DSO cooperation are very positive.



### FUTURE PERSPECTIVE

- Ensuring optimal use of the distribution – and the transmission grid to safeguard security of supply
- Reduction of barriers for new technologies to enhance market development
- Identification of joint goals and determination of the strategic direction for TSO-DSO cooperation
- Developing the best solution fit for the national regulation





## CONCEPT PROJECT NORFLEX

### Project description and goal

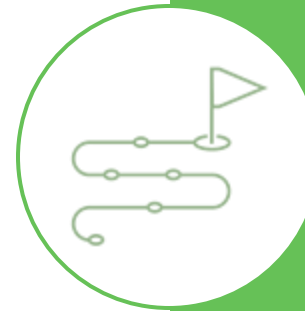
Norflex's objective is to develop the power grid of the future by facilitating more flexible power consumption. The project is going to demonstrate how flexibility trade in the distribution grid can be aggregated and offered to TSO, DSOs and other market actors. The project will demonstrate four different ways of aggregating flexibility:

- From few to many providers of flexibility to verify technology- and market development.
- From one to multiple grid locations to demonstrate how distributed flexibility can be used to handle grid challenges.
- From one to multiple grid levels to test how distributed flexibility can be made available for both TSO and DSO without causing problems for each other.
- From separate to interconnected grid locations by using a common market place for flexibility and geographical information.

Developing new knowledge of the usage of distributed flexibility may for example contribute to reduce new investments, safer network operations and spin off to new innovations.

More information: <https://www.enova.no/om-enova/om-organisasjonen/teknologiportefolien/norflex/>

<https://www.ae.no/var-virksomhet/fornyelse/norflex-prosjektet/>



### THE PROJECT IN SHORT

Partners: Agder Energi, Glitre Energi, NODES, Statnett

Period: 2019-2022

Budget: 55 MNOK

Funded by: The project partners and ENOVA



### EXPECTED RESULTS

Develop knowledge about how a market based solution for distributed flexibility can be utilized for TSO and DSOs. Explore how different technologies can provide flexibility and how DSOs can utilize it, including avoiding congestions, reducing voltage problems and improve grid planning. Look into methods for verifying deliverance and carrying out settlements. Test aggregating bids from the marketplatform and providing them to the mFRR market, without creating congestions at the distribution level.

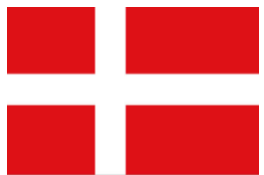


### FUTURE PERSPECTIVE

The project aim to use the experiences from the testing to learn about the actors' interests, behaviour, need for coordination etc.

Current legislation and IT-systems are not prepared for the new role a flexibility platform represent.

There seems to be a need for some kind of a flexibility register tracking amongst others the assets' BSPs and BRPs.



## CONCEPT PROJECT

# TSO-DSO TARIFF PROJECT

### Project description and goal

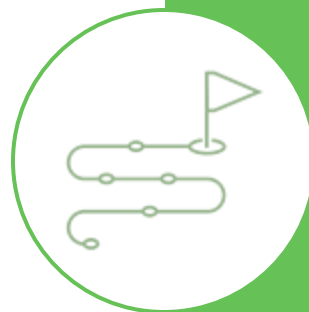
The goal of the project is to develop a new tariff model for both TSO and DSO tariffs which is coherent between the different levels, as well as more cost-reflective. The intention is also to support a socio-economic efficient expansion of the grids through more precise price signals regarding grid costs to the end-users.

A key objective for the TSO and DSOs is to coordinate their tariffs. For now the end-users are exposed to the TSO-tariffs another approach is to let the DSOs be exposed to the TSO-tariffs. Pros and cons of the two different models are examined.

A cornerstone of the project is to ensure continuous stakeholder involvement both among market actors and governmental authorities.

Results so far has been development of road maps for the future tariff designs in close coordination between DSOs and TSOs e.g. using same principles to ensure transparent and cost reflective tariffs.

The concept phase of the joint project will conclude mid 2020 with the proposal for a DSO tariff-model. In the next phase the TSO and DSO's will prepare adjustments to their tariff models and seek approval of these with the Danish Energy Regulator.



## THE PROJECT IN SHORT

Partners: Energinet, Danish Energy Association and DSOs

Period: 2018-2022

Funded by: Energinet and Danish Energy Association



## EXPECTED RESULTS

It is expected that a new tariff model will be consistent across the different levels of the electricity system and include a capacity payment for larger consumers and generally more utilization of time of use differentiation.

The different changes to the tariff models are expected to be phased in over the period of 2021 to 2023.



## FUTURE PERSPECTIVE

The developments of the tariffs will continue after 2022 to secure, they support the green transition. After seeing the effect of the new TSO and DSOs tariffs the need for further action will be evaluated. Other elements to be reflected in the tariffs could be geographic differentiation when large generators or demands are deciding where to be connected to the grid. Dynamic tariffs is also expected to be examined in the future.



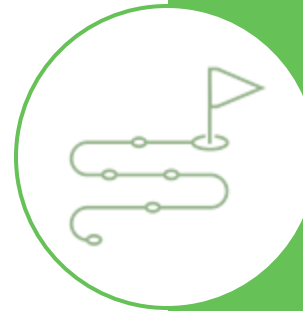
## PILOT PROJECT STOCKHOLMFLEX

### Project description and goal

StockholmFlex is an R&D project that has the purpose to develop knowledge and experience on local flexibility solutions and to provide a solution for the Stockholm area, where the distribution grids are facing challenges with a fast-increasing need to increase the subscription from the transmission grid due to local power shortage and growth. Until ongoing grid reinforcements are completed there are only limited possibilities to increase the subscription levels from the transmission grid.

The idea is to use a market platform developed by Nodes which has some possibilities and features that has already been developed for other local flexibility markets. One of the main features of the platform is to support continuous trade, somewhat similar to the current trade on the Intraday market. When compared to the CoordiNet project, one of the bigger differences is that StockholmFlex includes coordination between two DSOs and Svenska kraftnät in the same geographical area. This requires a different kind of coordination and other solutions than what is planned in CoordiNet. One important concept that will be tested in StockholmFlex is the ability to temporarily move the subscription between DSOs.

The overall goal of the StockholmFlex project is to develop knowledge on local flexibility solutions and provide an applicable solution to address the challenges in the Stockholm area.



### THE PROJECT IN SHORT

Partners : Svenska kraftnät, Vattenfall Eldistribution and Ellevio. The market platform is provided by NODES and the DSO/TSO flex tool by E.ON Energidistribution.

Period: Planning and market platform development until November 2020. The first phase of the pilot is planned between December 2020 and March 2021.



### EXPECTED RESULTS

The main expected result is to utilise local flexibility in the Stockholm area in order to meet the increasing demand. One important aspect is to include and when necessary adapt solutions that have been developed for other local flex markets. It is foreseen that the platform will enable continuous trade.



### FUTURE PERSPECTIVE

The project is an R&D project and one important purpose is to learn and gather experience for the future, but at the same time provide solutions to existing challenges. The expectation is also that a permanent local flexibility market can be part of the solutions for the constraints in the Stockholm area.



## PILOT PROJECT TRADING WITH LOCAL FLEXIBILITY

### Project description and goal

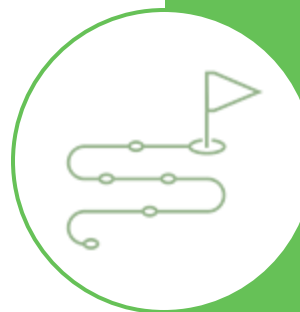
Energinet experiences local congestion problems in the transmission grid connecting Lolland to the rest of the bidding zone DK2 which existing market mechanisms are not designed to handle. Currently Energinet's only opportunity is to order increase of consumption or decrease of production in the congested area. Energinet aims to reduce the use of orders and in this pilot project a concept of market-based trade with local flexibility is tested. The objective is for future downward regulation of generation from renewable energy to be realised using a local market, where competition will determine which generation will be regulated downwards or which consumption can be increased.

The pilot will be using the existing market and integrate the local market into the current setup by adding a specific geographical location to the bids. The specific geographical locations are the nearest substations in the transmission grid. The project pilot is planned to be launched in Q2 2020 and run until Q4 2020. In the pilot period data is gathered to evaluate if the solution is suitable for permanent use.

A summary report comprising all relevant project findings will be publicised by Energinet to share knowledge acquired.

*"A local flexibility market represents an extra business opportunity for market participants, giving them a competitive platform where possibilities to provide local flexibility are clearly identifiable. This pilot will give Energinet experience of reporting demand in cooperation with the DSOs, and participants will gain experience of local bid reporting and subsequent settlement. The project has been set up in cooperation with Danish Energy, DSOs and market participants within the framework of the DSO/TSO cooperation between Energinet, Danish Energy and the Danish grid companies." - Peter Markussen, head of Flexibility and Ancillary Services in Energinet's Electricity System Operator*

[Read more here](#)



### THE PROJECT IN SHORT

Partners (TSO, DSO, BRP, BSP, tech.partners):

Energinet and Dansk Energi

Period: 2019-2021

Funded by: Energinet, Dansk Energi and pilot project market participants



### EXPECTED RESULTS

Implementing a concept of trade in local flexibility is a complex task in terms of the security of supply of Energinet and utility companies, market liquidity and information/communication requirements.

The pilot project results in hands on experience with the developed market setup. Within the test period, it must be possible to get sufficient operational experience to make a conclusive evaluation of the pilot project.



### FUTURE PERSPECTIVE

If the pilot project results in a successful test of a market design able to activate the local flexibility and no further obstacles has appeared Energinet will submit a method notification and implement the concept in the market.

The implementation depends on achieving the necessary allowance from the Danish Energy Agency.



## PILOT PROJECT THREE TSO/DSO-PILOTS

Three pilots focusing on operational issues in the regional distribution grid

### Project description and goal

The project consisted of three independent pilots:

#### Pilot to test new processes for handling of regional bottlenecks (Mørenett):

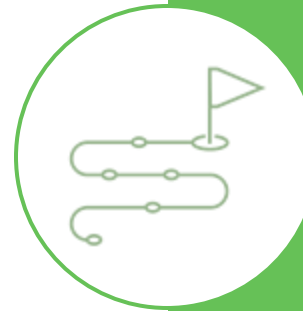
The main purpose of the pilot is to test changes in tasks and interaction between the TSO/Statnett and the DSO/Mørenett in the handling of bottlenecks in the regional distribution grid. In the pilot, Mørenett monitors and handle bottlenecks using mFRR and/or changing grid configuration.

#### Pilot to test new processes for regional operational support (Tensio):

The main purpose of the pilot is to test new processes and additional analysis to enhance the security of supply for the Fosen area, an area facing old and weak regional grid, several new wind power parks and new consumption. Through tight cooperation and adjusted processes between the two regional DSOs, and towards the TSO, operation planning (> 2 days ahead), including outage management, was improved.

#### Pilot for better coordination of regional reactive power flow (Agder Energi Nett):

The main purpose is to test and quantify the benefits of new processes and information flows for better coordination of voltage control / reactive power flow in the regional distribution grid. In the pilot, Agder Energi Nett coordinates reactive power utilizing existing reactive components across all voltage levels: Capacitors in AEN's own network, voltage support by regional generators (mainly hydro power), as well as improved use of tap changers at transformers between the transmission and regional distribution network.



## THE PROJECT IN SHORT

Partners: Sub-projects where Statnett and three regional grid companies: Mørenett (congestion management), Tensio (regional operational support) and Agder Energi Nett (regional voltage coordination)

Period: Jan 2019 – April 2020

Budget (project): NA

Funded by: Statnett and the regional grid companies carries separate project costs.



## EXPECTED RESULTS

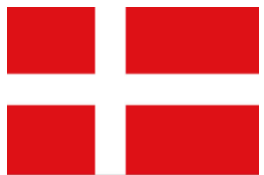
Demonstrate the need and opportunities for better coordination and information exchange, better planning tools and data exchange between the DSOs and the TSO.

In addition the pilots will provide a number of concrete results: Mørenett: Reduced used of mFRR; Tensio: Improved security of supply for the Fosen-area (as well as reduced use of mFRR); and Agder Energi Nett: Improved voltage quality, reduced grid losses (and in the longer run: reduced investments in new reactive components).



## FUTURE PERSPECTIVE

Experiences will be input to the Nordic Balancing Model related to handling of internal congestions, as well as the development of "traffic lights".



# PILOT PROJECT PILOT ON AGGREGATORS USE OF EXISTING METERS

## Project description and goal

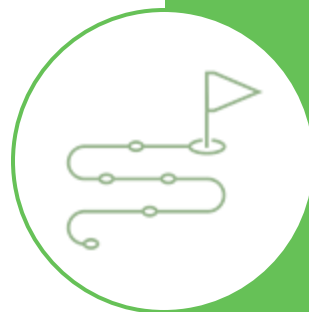
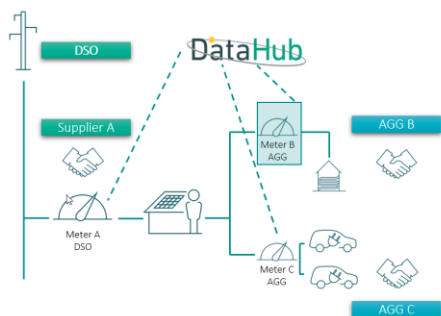
The purpose of the pilot is to test if aggregators can use existing meters originally installed in flexible demands as heat pumps and electrical vehicles.

The aggregator model tested is a serial setup and it is sought to use the DataHub to collect information as well as verifying the serial measurements.

This model comes with a several advantages:

1. The costs for the aggregators is reduced as there is no need for an additional meter from the grid company.
2. The aggregator has directly customer contact giving the possibility of offering innovative products based on i.e. the customers demand response.
3. Use of DataHub which process metered data and business processes for all 3.3 million Danish electricity consumers.
4. DataHub already supports a serial setup and an aggregator can easily be approved as a new market player.
5. The model is scalable so the customer can enter into agreement with several aggregators.

Realization of this model requires that the regulation is in place as well as the existing meter is compliant with the European Measuring Instruments Directive (MID).



## THE PROJECT IN SHORT

Partners Energinet and Danish Energy Association

Period: 2019-2020

Funded by: Energinet, Danish Energy Association and pilot project market participants



## EXPECTED RESULTS

Removal of entry barrier for the aggregators reducing both cost and complexity whereby the flexible demand/production from smaller units will be activated.

In 2021 it could be possible to act as an aggregator by using serial-measurements from existing meters.



## FUTURE PERSPECTIVE

If the test results from the pilot project are successful and the meters are approved by the authorities then the serial model could be one way the aggregators can operate in the Danish power market.

The suggested model could be implemented in market regulations and effective by end of 2021.

## EXPECTED 'LESSONS LEARNED'

Although all the projects described in this document are ongoing, some lessons learned could already be identified. Best practices for arranging TSO-DSO cooperation across the Nordics is clearly the most important outcome to be gained from the projects. This is valuable to guide the harmonizing of new processes across the region.

Also, new insight to how the use of flexibility markets can be extended to distribution level efficiently will be gained. This will be important for responding the already existing challenges with network constraints and for getting new tools for replacing or postponing grid investments by utilizing flexibility in the rapidly changing power system.

Understanding the need of new information exchange and IT-systems to facilitate an efficient flexibility market is also expected to grow in the projects. New insight will also be gained in understanding how these system will be developed and governed and what kind of new regulation is needed to enable this.

## FUTURE PERSPECTIVES

The Nordic TSOs are dependent on new processes, tools and flexibility to secure operations in our green future. Distributed flexibility will be increasingly more important, both for the TSOs and DSOs, and this report describes how we work together to find common solutions. We have all interest in stimulating new suppliers to offer their flexibility and to find solutions that optimize their usage.

The projects described in this report lay a solid foundation for our future solutions. New knowledge about challenges and how to handle them are essential when navigating into unknown water. Sharing experiences and learning from each other allow us to move faster towards a more sustainable future and to search for harmonized solutions.

Implementation of successful results require a close cooperation with our stakeholders, as new solutions usually require changes in, among other things, processes, IT systems, technology and national regulation. In the continuously changing landscape, we must move forward together. Our interdependency is a strength and contributes to innovations. It may however also lead to a certain delay before changes take place in daily operations.

The knowledge we gain from each other when cooperating in these projects is extremely valuable. Even though project results do not turn out to be as expected, we still believe other learnings have been gained. The Nordic TSOs will therefore continue to arrange and participate in such projects in the years to come. Our stakeholders are always welcome with suggestions on how to proceed.

FINGRID

ENERGINET

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