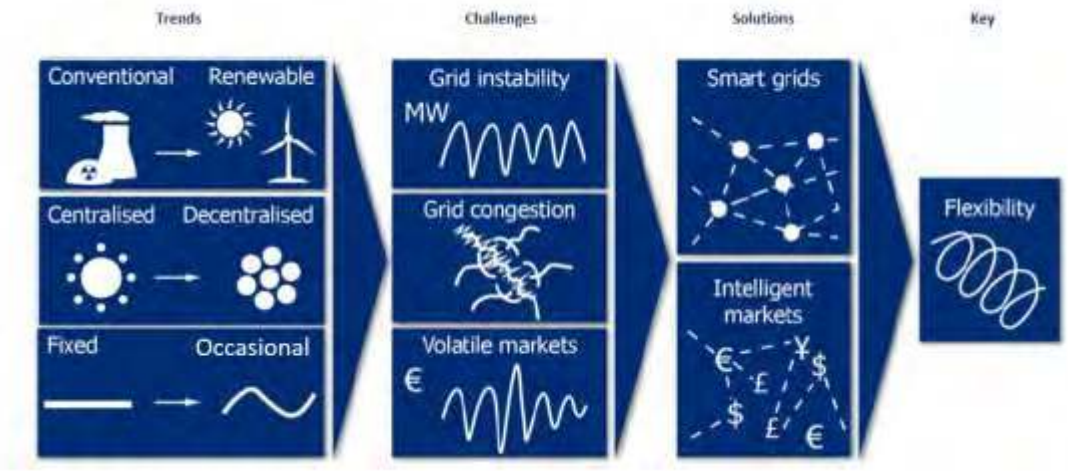
Decentral Flexibility Marketplace Investments in Energy Efficiency

Live Pilot Projects - expanding into the Baltics

Ragnar Ottosen, CEO Nordic Commodities and Enfo/ Entelios Baltic Representative

Trends are challenging power systems to be more flexible




REGIONALE "SMART MARKETS" KÖNNEN NETZKOSTEN SENKEN

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Pilot Project on Flexibility

- Cross functional project team
- Proven cloud technology
- Challenging existing value chains
- Creating new opportunities and solutions
- Linking technology, markets and consumer incentives

Microsoft

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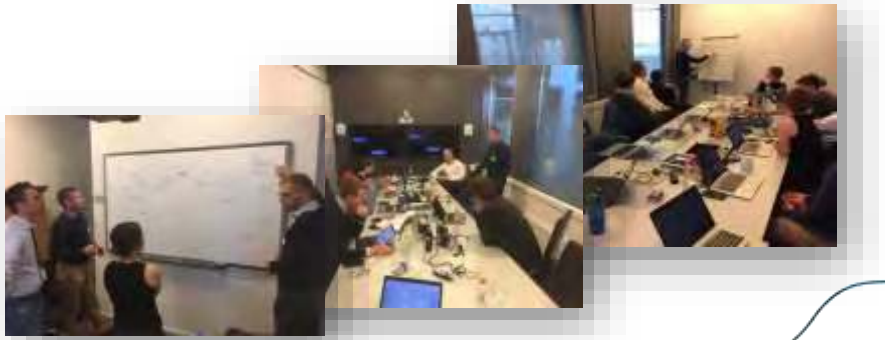
Enfo



Pilot project phases

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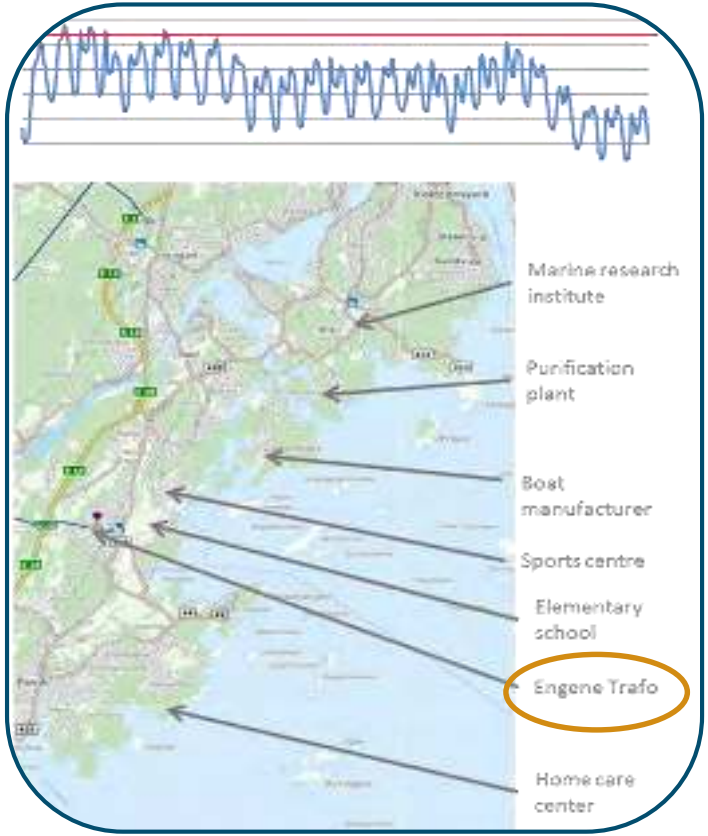
Pilot statement

Optimized decentral grid with demand response can be used to handle overload in an automated process that analyse and predicts loads and flexibility in the grid using cloud based technology and hence defer grid investments.

Phase 1

- Engene substation
- Alternative to grid investment
- Optimize load of transformer based on flexibility volume and price using weather data and load forecast for next 24 hrs
- Technical solution using Microsoft Azure platform



Available flexibility

Power BI interface

- IoT from Azure Platform
- Real time data updated every 5 min
- Next 25 hours forecasted
- Closed loop
- Machine learning
- Dispatch

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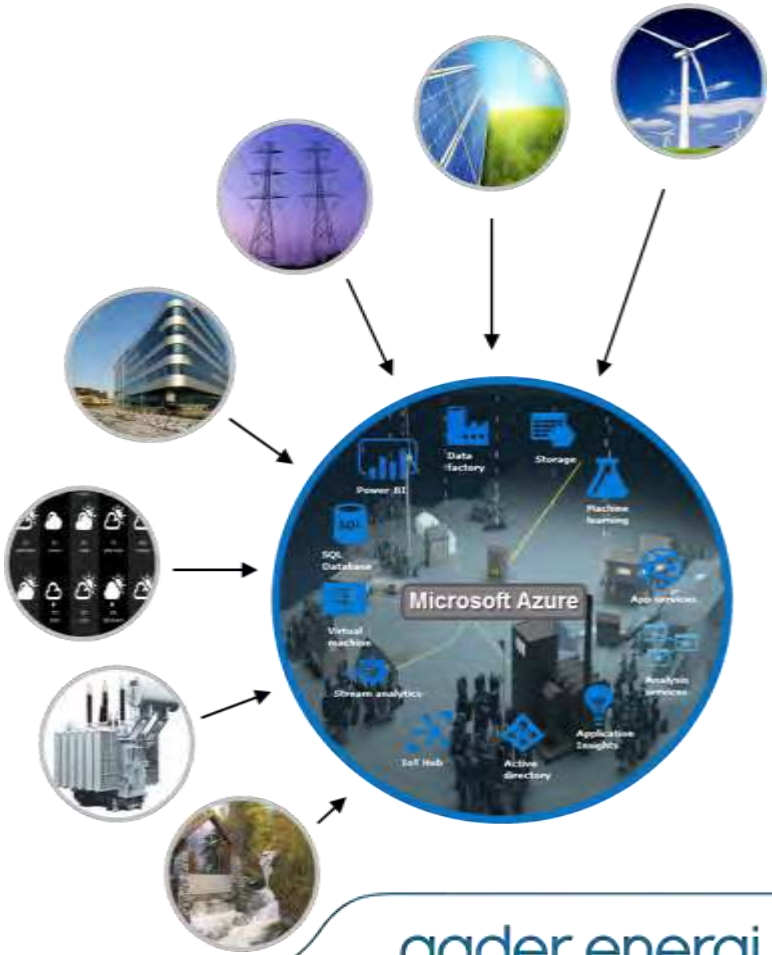
Pilot statement

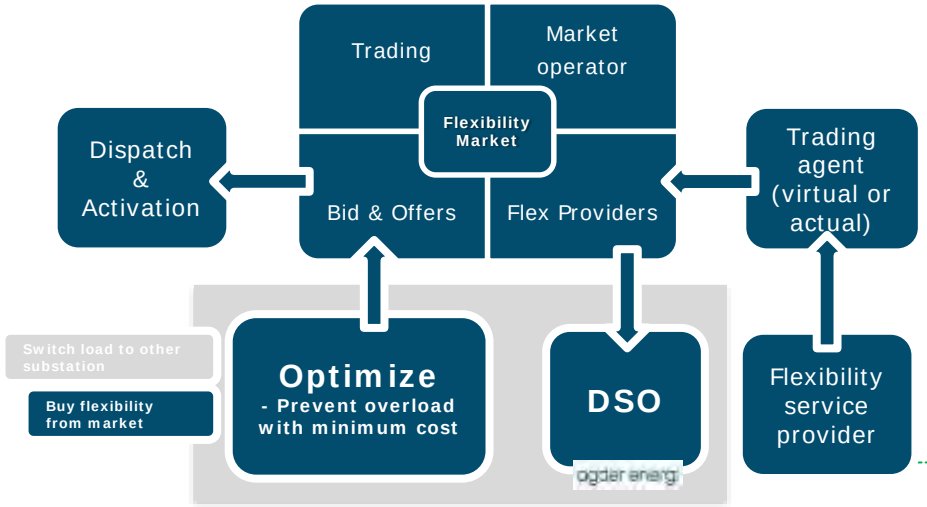
A local flexibility marketplace can provide scalable and optimal use of local flexibility giving both aggregator and DSO a choice of aggregation level and provide a transparent view using technology proven under phase 1.

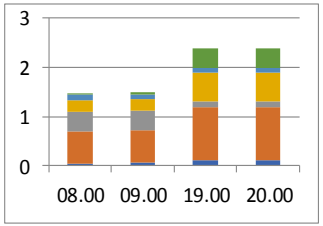
Phase 2

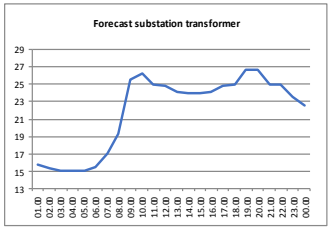
- Develop a prototype of the Decentral Flexibility Marketplace
- Increase physical assets connected to the pilot installation
- Install battery as a flexibility asset
- Develop business models and roles for a flexibility market.

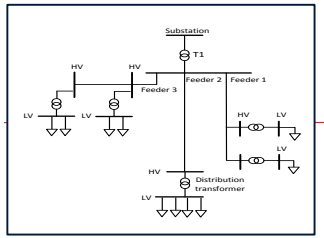


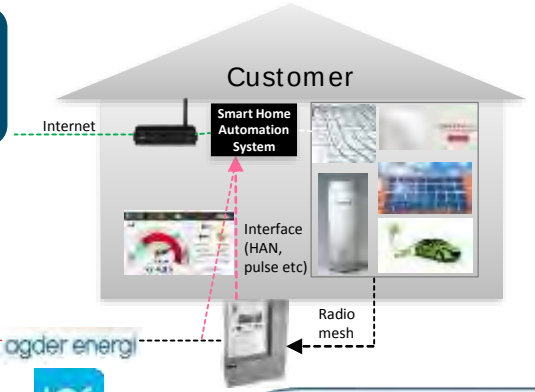
Flexibility market











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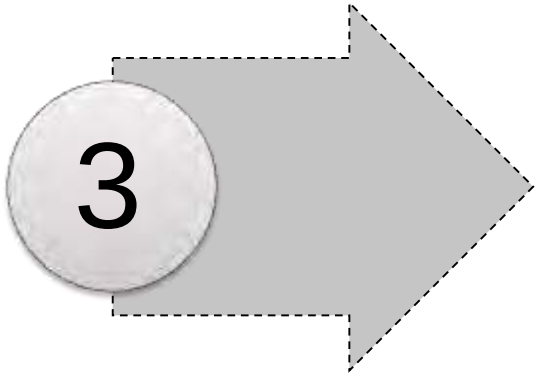
Pilot statement

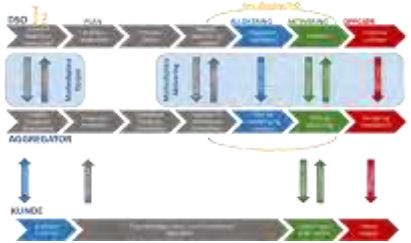


A local flexibility marketplace fully integrated with other markets can provide an optimal use of flexibility based on market prices and contribute to solving todays challenges in the power market.

Todays marketplaces must be automated and integrated with local DSO marketplaces for full use of available flexibility

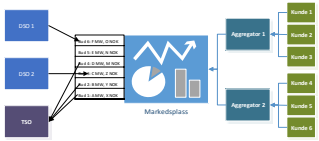
Bilatural agreement for long term purchase of flexibility reserves replaces tariffs for disconnected consumption

Establis a trafic light coordination between DSO and TSO



Establish local DSO marketplace(s) for flexibility trading

Automatic marketplace where DSO and Reserve market is integrated



Flexibility - future organization of monopoly and markets.

Enfo 2016 study for EnergiNorge

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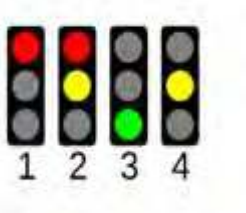
Phase 3 and beyond

- Expand pilot to Baltic countries
  - set up local marketplace pilot
- Develop pilot project at consumer site, incl investments in energy efficiency technologies and renewable energy based on innovative financing
- Demonstrate aggregation and “traffic lights”
- Future involvement with TSO
  - fully integrated markets



Pilot Project Investments in Energy Efficiency and Market Flexibility

- The introduction of new technologies and concepts in smart grid operations and market behaviour must be based on the incentives for each market participant.
- For energy efficiency a focus has to be on a commercial approach but also identify possible barriers that hinders the implementation of projects that are beneficial for the society.
- One of the key issues will be the financing of the large number of small projects needed to be implemented.
- Other key issues are introduction of the optimal technology and to finance these investments by a third party without risk for the consumer.
- The solution to be tested is therefore a combination of smart energy technology and smart financial systems, known as Fintech.
- Crowdfunding – the practice of funding a project or venture by raising monetary contributions from a large number of people
- The policy issues should be to link the development of both an efficient energy market in connection with an efficient financial market that links investors to small projects

The Partners and the experience

Nordic Commodities AS (Norway) - Norwegian project developer that works as advisor for investors and technology providers

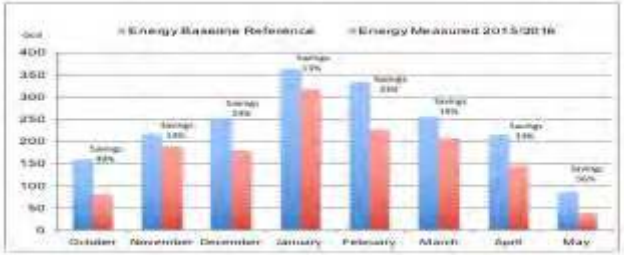
Enfo AS (Norway) – a leading Norwegian provider of Demand Side Response and Energy Management solutions

Green Energy One AS (Norway) - investment companies funding projects in Smart Technologies and energy efficiency

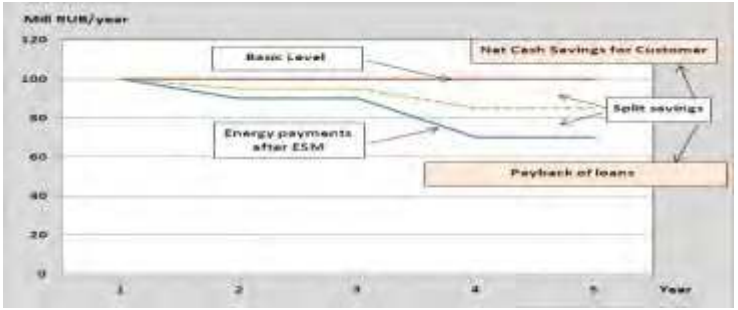
LED Dynamics (USA) – manufacturer of high quality LED lighting equipment

The Principles for Pilot Projects - ESCO

- Agreed split of documented savings
- Agreed ESM specifications and Investment
- Purchase of equipment and installation
- Delivery and acceptance
- Start up
- Metered consumption



- Agreed documentation of savings
- Invoice to customer for Documented savings
- Cash paid to ESCO company
- Payment to lender/credit institution



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Smart House and Smart Grids

- Smart Houses/ Smart Grids and Demand Side Response/Energy Management – to introduce optimization of electricity consumption, both the level and the pattern of consumption, based on communication with market prices and Energy Management Systems. EMS is used by customer to control, monitor and evaluate ESMs and the DSR in cooperation with large electricity consumers, grid company and electricity retailers,

- The Enfo eFlex unit is installed at the customers premises and connected to electric circuits

- The eFlex meters and sensors are connected to applications and managed automatically or operated by personnel

Nordic Commodities AS

LED Lighting

- LED lighting – to introduce LED technology in additional applications, including public buildings, parking houses, auditoriums, offices etc. Typical saving 40 % compared to other lighting technology. The LED units to be used are high quality and heavy duty equipment also suitable for demanding environments, like cooling and freezing, industrial buildings, outdoor lighting etc. The equipment has proven record from installations in 2007.

- The prices of High Quality LED lighting equipment has been reduced

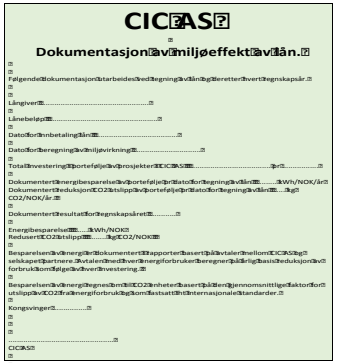
- Several providers will be used, also Heavy Duty equipment manufactured in USA

Nordic Commodities AS

Crowdfunding with documentation of CO2 emission reduction

- The Pilot Projects will develop the concept of financing solutions based on commercial incentives and to introduce Energy Service Contracts and private external financing into ESM and Smart technologies. This will take place in in cooperation with investment companies, banks and public funding institutions. The investors into the ESM will receive mission reduction documentation based on the reductions in CO2 emissions from the investment projects.

This CO2 emission reduction will be documented and environmental benefits calculated for investors, similar to CO2 emission quota calculations and based on a concept by CIC AS (Norway).



CIC AS

Dokumentasjon av miljøeffekt av lån.

Følgende dokumentasjon utarbeides ved tegning av lån og beretter hvert regnskapsår.

Långiver: .....

Lånebeløp: .....

Dato for innbetaling lån: .....

Dato for beregning av miljøvirkning: .....

Total investering i portefølje av prosjekter i CIC AS: ..... pr. .....

Dokumentert energibesparelse av portefølje pr. dato for tegning av lån: ..... kWh/NOK/år

Dokumentert reduksjon CO2 utslipp av portefølje pr. dato for tegning av lån: ..... kg CO2/NOK/år

Dokumentert resultat for regnskapsåret: .....

Energibesparelse: ..... kWh/NOK

Redusert CO2 utslipp: kgCO2/NOK

Besparelsen av energi er dokumentert i rapporter basert på avtalen mellom CICAS og selskapet (partnere). Avtalen med hver energiforbruker beregner på årlig basis reduksjon av forbruk som følge av hver investering.

Besparelsen av energi regnes om til CO2 enheter basert på den gjennomsnittlige faktor for utslipp av CO2 fra energiforbruk som fastsatt i internasjonale standarder.

Kongsvinger: .....

.....

CICAS

- The Pilot Project will cooperate with partner Easylend AS (Norway and Cyprus) to develop a crowdfunding solution

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Thank you!

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