Utsira Living Lab– status and opportunities

Maritime workshop Utsira, 12.02.2024

John Arild Arnø, Project manager/ Sustainability representative, Fagne AS


Trygt hjem
- Ta 2!
HAUGALAND KRAFT

Local ownership provides local value creation

Karmøy kommune

Haugesund kommune

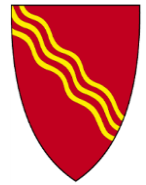
Tysvær kommune

Vindafjord kommune

Sveio kommune

Fitjar kommune

Utsira kommune



Suldal kommune

Bømlo kommune

Ullensvang kommune

Etne kommune

Sauda kommune

Our greatest contributions to UNs sustainability goals

Clean energy and a smarter society

Responsible production and reduced footprint

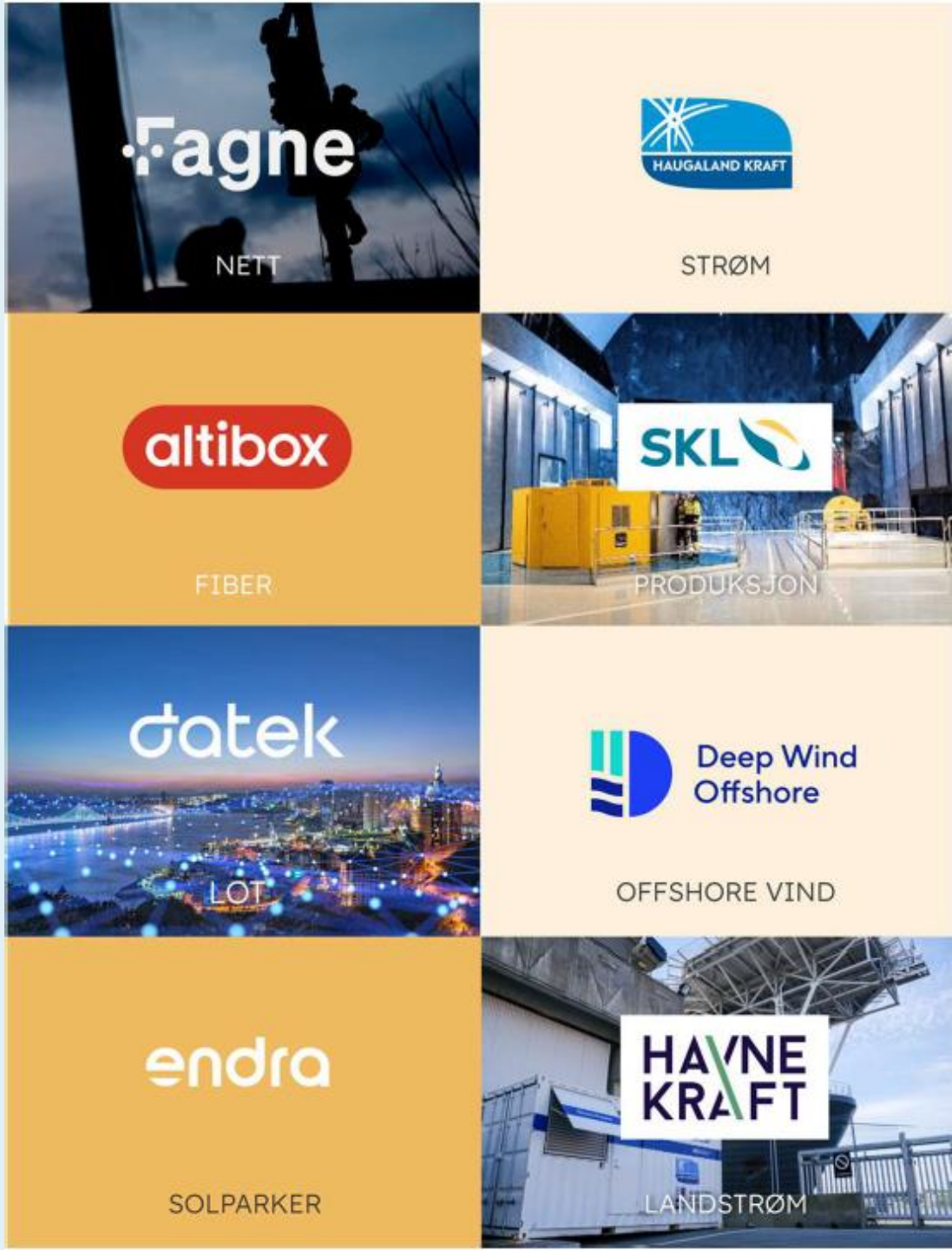
A safe and value-creating work environment

Being a solid cooperative partner for the region

HAUGALAND KRAFT

We give power to strong and sustainable communities

Client focused · willing to change · reliable · clear

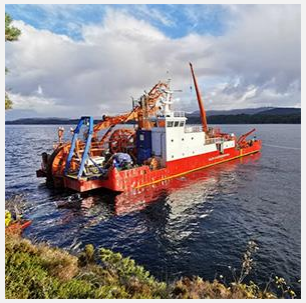


We are well positioned to contribute to the future…

More power




More grid





More efficient energy use




Readjusting to the new everyday of energy

National power deficit from 2027

Lack of grid and balancing challenges

High and volatile energy prices

New technology, new market opportunities

energiteknikk
energiteknikk.net – nettavisen for energibransjen

Om oss Annonser Abonner Kontakt

Les den digitale utgaven av Energiteknikk her

Seniorrådgiver Knut Styve Hornnes i Statnett orienterte tilhørerne på Smartgridsenterets fagdag 26. april om utfordringene med mye omformerbasert kraft i systemet. Foto: Atle Abelsen

Statnett advarer mot systemkollaps

Den voksende andelen sol og vind inn i kraftsystemet truer frekvensstabiliteten allerede om fire år, om vi ikke gjør noe i dag.

Atle Abelsen

TIRSDAG 2. MAI 2023 - 14:53

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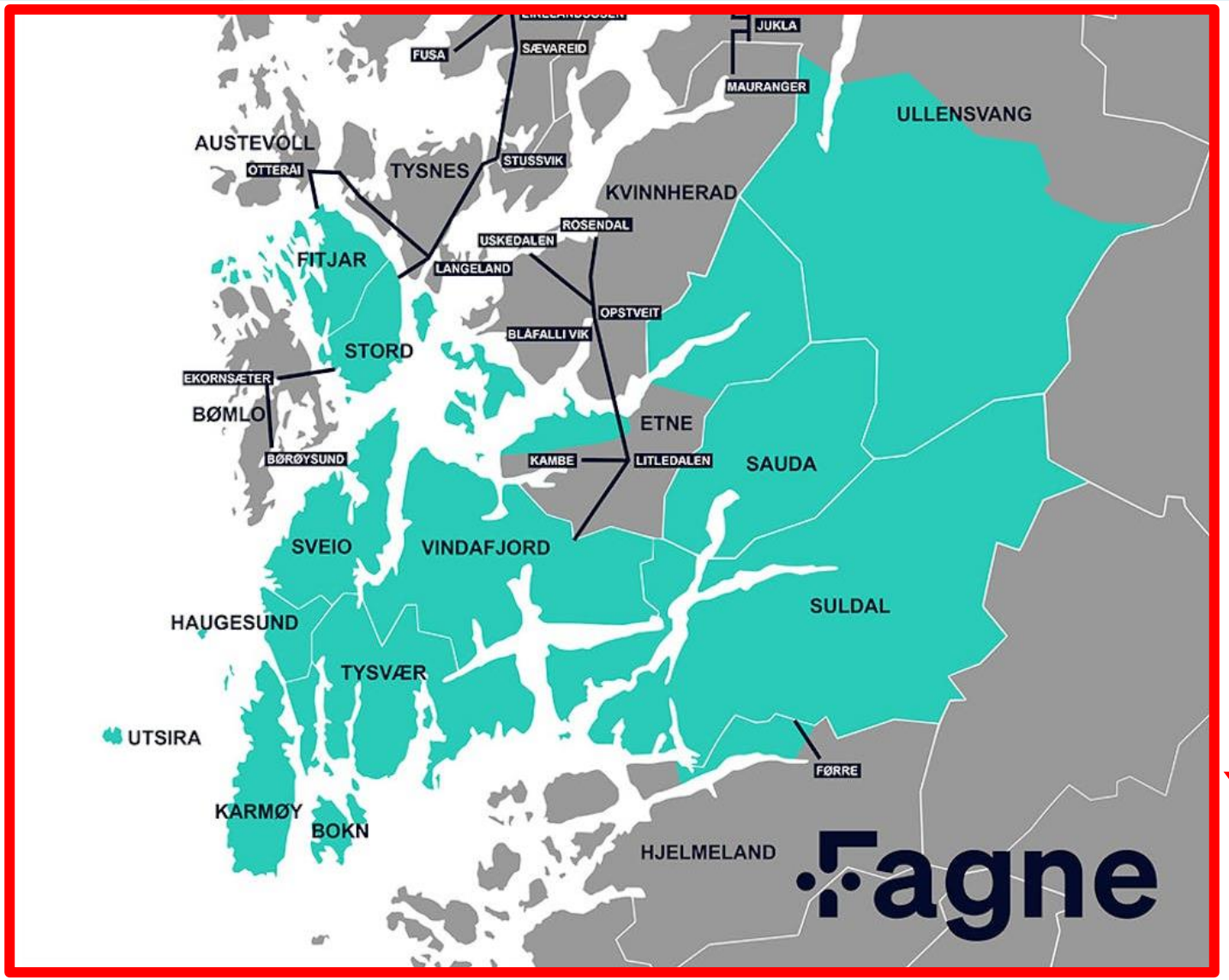
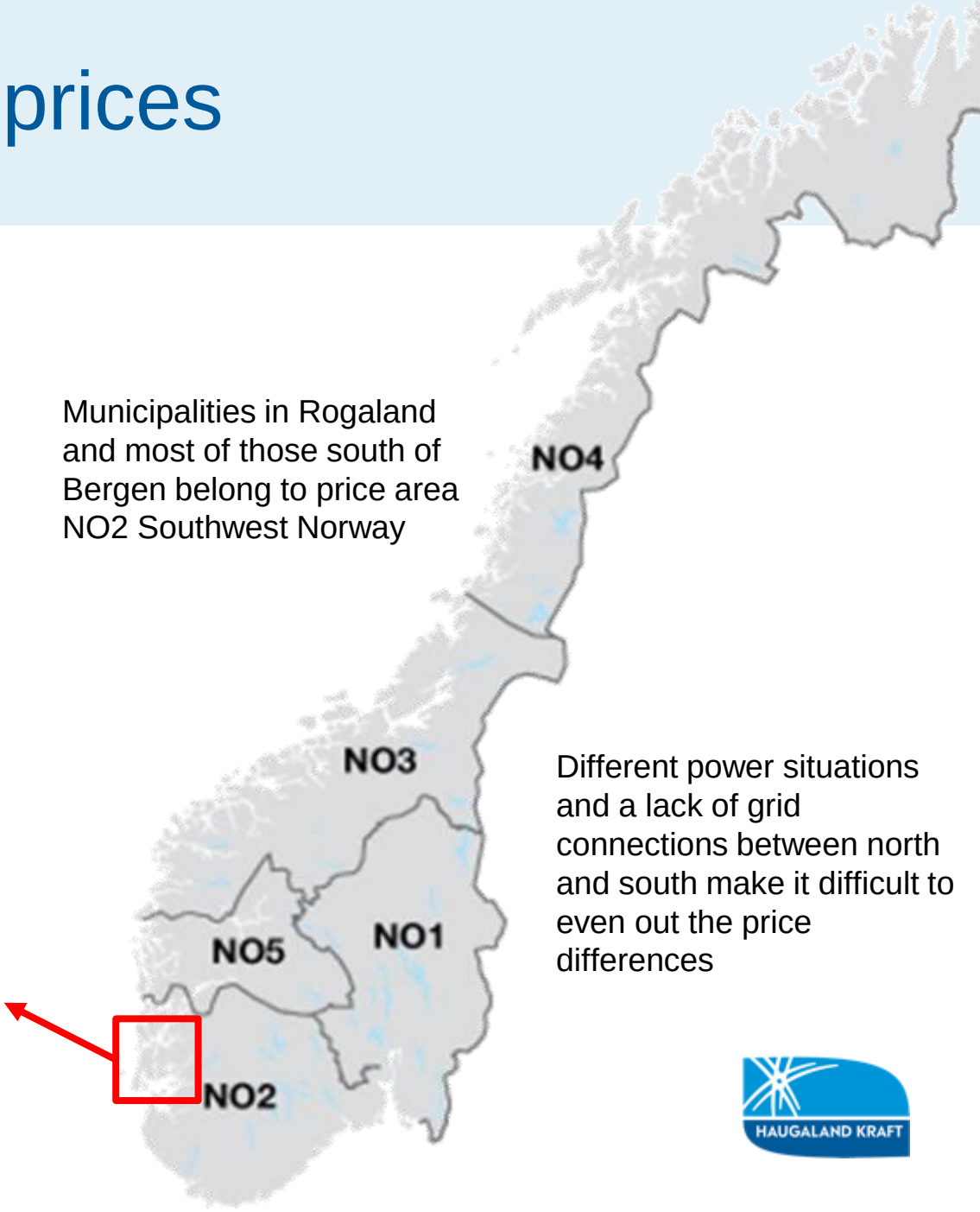
Great variations in electricity prices



Municipalities in Rogaland and most of those south of Bergen belong to price area NO2 Southwest Norway



Different power situations and a lack of grid connections between north and south make it difficult to even out the price differences

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From power shortage to vigor (power to act)

TU Tekjobb Nyhetsbrev Video Abonner Logg inn Meny

ENERGI

Øysamfunn blir grønn energi-lab og nasjonalt testsenter

Den vesle øykommunen Utsira skal bli selvforsynt med ren energi og dessuten bli testsenter for smarte og klimavennlige energiløsninger.

Island community to become green energy-lab and a national test centre

2017: Request for power to land based fish farming

2018-2019: Study of the potential for biogas production using fish sludge

2019: Utsira wins the innovation competition «Together for smart and sustainable cities and local communities» (DOGA, Nordic Edge, IN)

2020: Utsira «Living Lab» competition: Haugaland Kraft concept «Island Power»

2020: Governmental funding through Enova and big investments

The regional power company Haugaland Kraft, of which Utsira municipality owns 0.33 % is now investing at least NOK 20 million on the island. Utsira can become a national test centre for all actors who want to try out green solutions, that can either produce clean and renewable energy or that can effectively manage and control climate-friendly energy use in a closed network (micro grid).

2021: Additional support form the Ulla-Førre Fund

Haugaland Kraft AS – Awarded NOK 4.75 million from the Ulla-Førre Fund to further develop the "Utsira Living Lab“ concept into a national catapult test centre for sustainable energy solutions.

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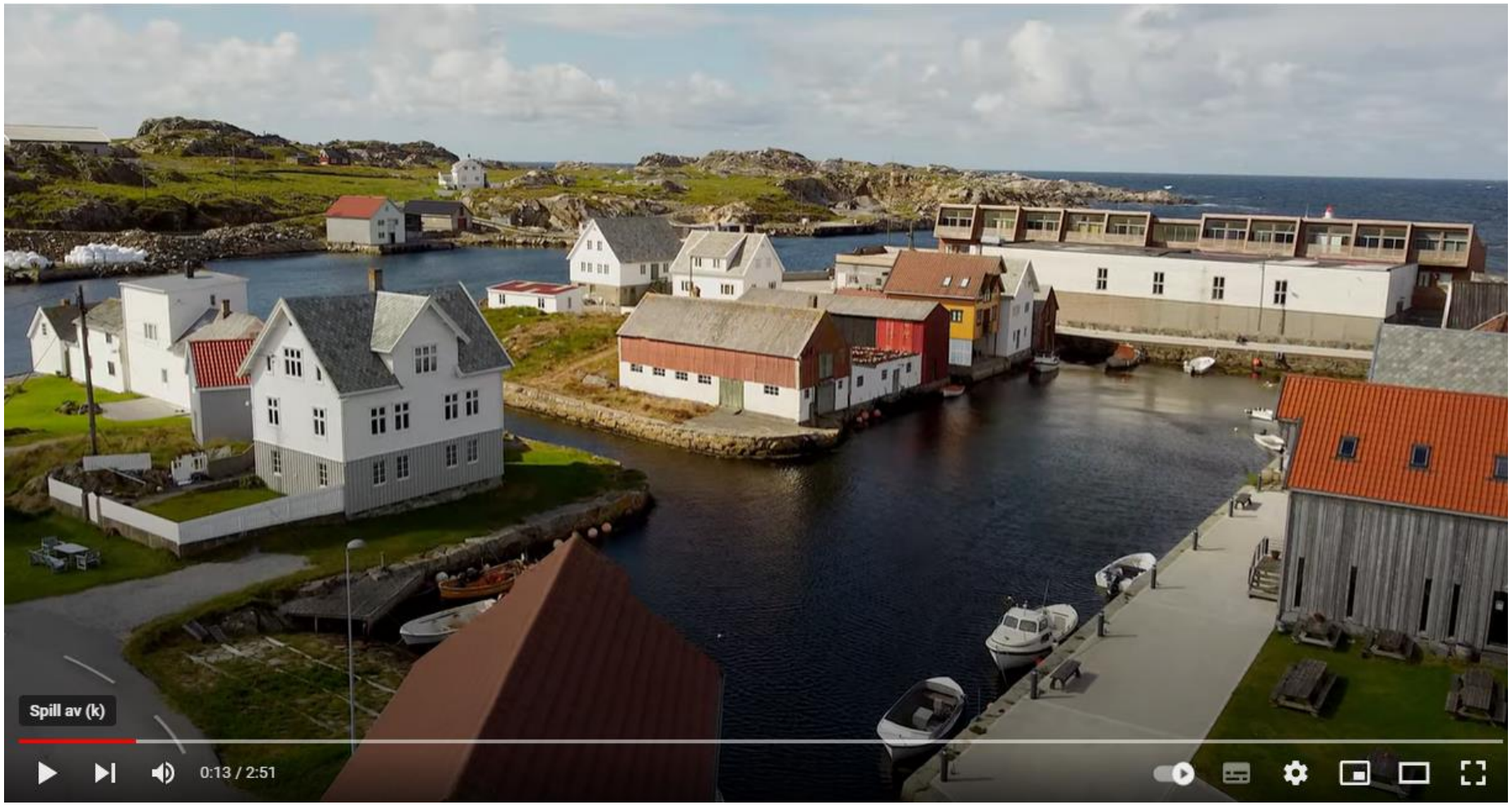
The smart, green island community



Norway's first island community self-sufficient in renewable energy?

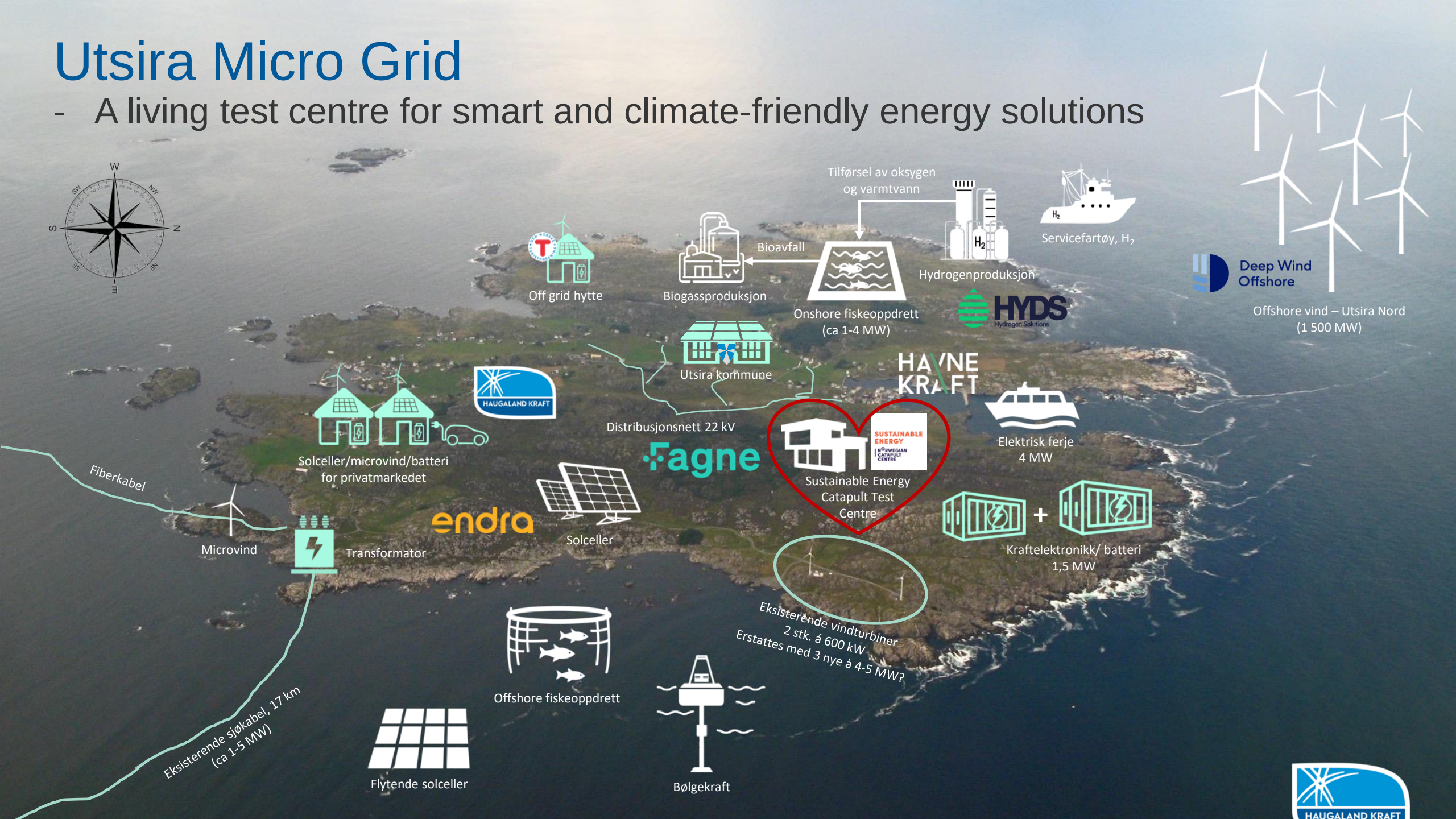
- Wind power
- Solar PV
- Energy storage
- Smart insight- and management systems

SMART Utsira - Vimeo


Haugaland Kraft - Utsira Living Lab Oct 2023 V8 UHD
Vestbris
UTSIRA
LIVING LAB
Haugaland Kraft | LinkedIn

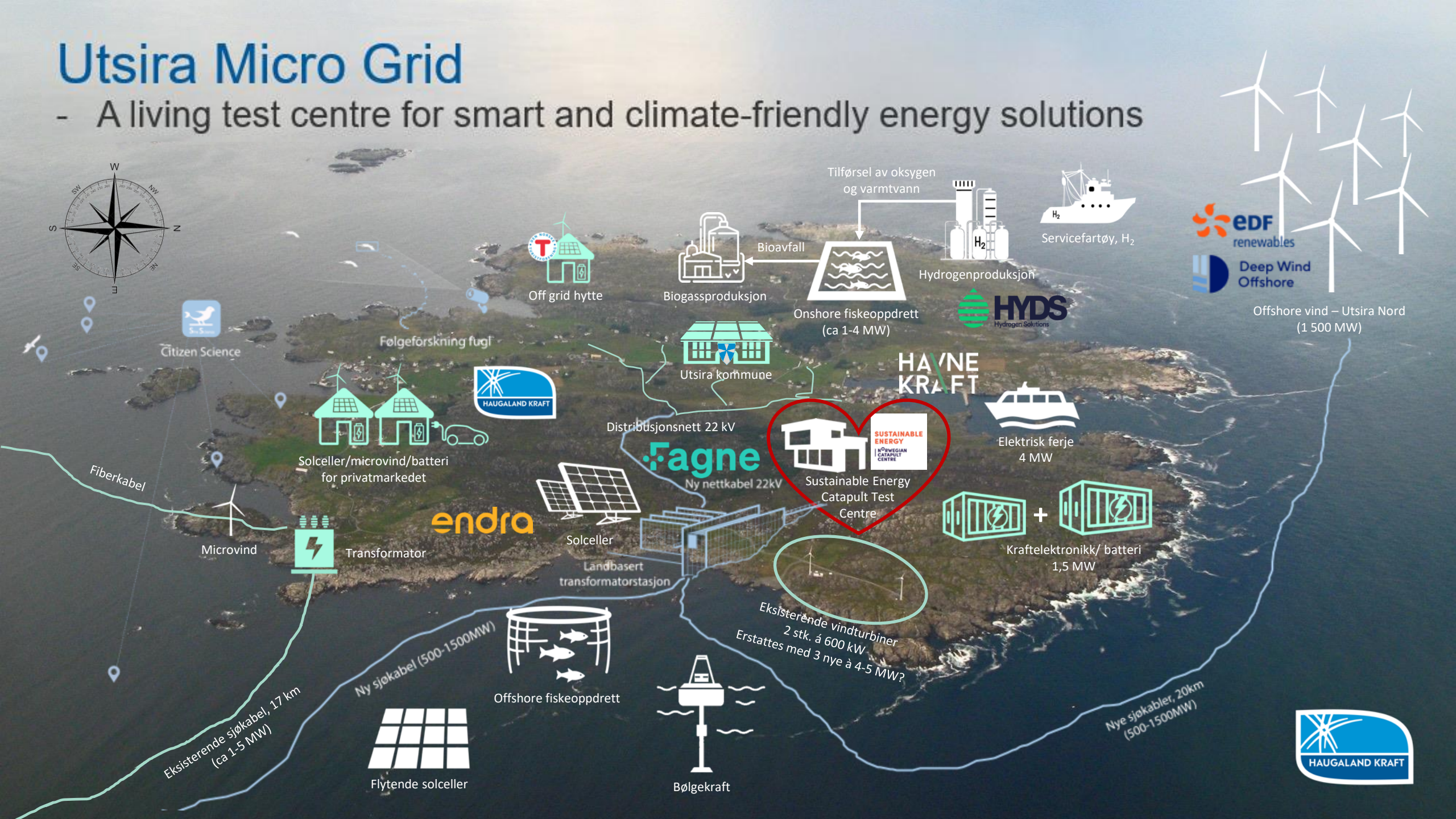
Utsira Micro Grid

- A living test centre for smart and climate-friendly energy solutions



Utsira Micro Grid

- A living test centre for smart and climate-friendly energy solutions



Battery and power electronics at Fagnes substation Nordevågen

- Reuse of technology from Wärtsila previously used for charging the electric ferry between Jektevik and Hodnanes.
- The battery pack consists of two containers – one with control centre and one with batteries on tot. 1.5 MW
- With the help of power electronics and smart control of production from the wind turbines, the transmission capacity of the subsea cable has more than doubled (from 1 to 2.5 MW).
- In the event of a power outage, the batteries will automatically take over the power supply so quickly that no one will notice that the power to Utsira is gone for half an hour.
- Then the batteries will run out of power, unless it is so windy that the electricity from the wind turbines continues to supply the island.

The new, interconnected system means that the power grid at Utsira today is more robust and stable than before.

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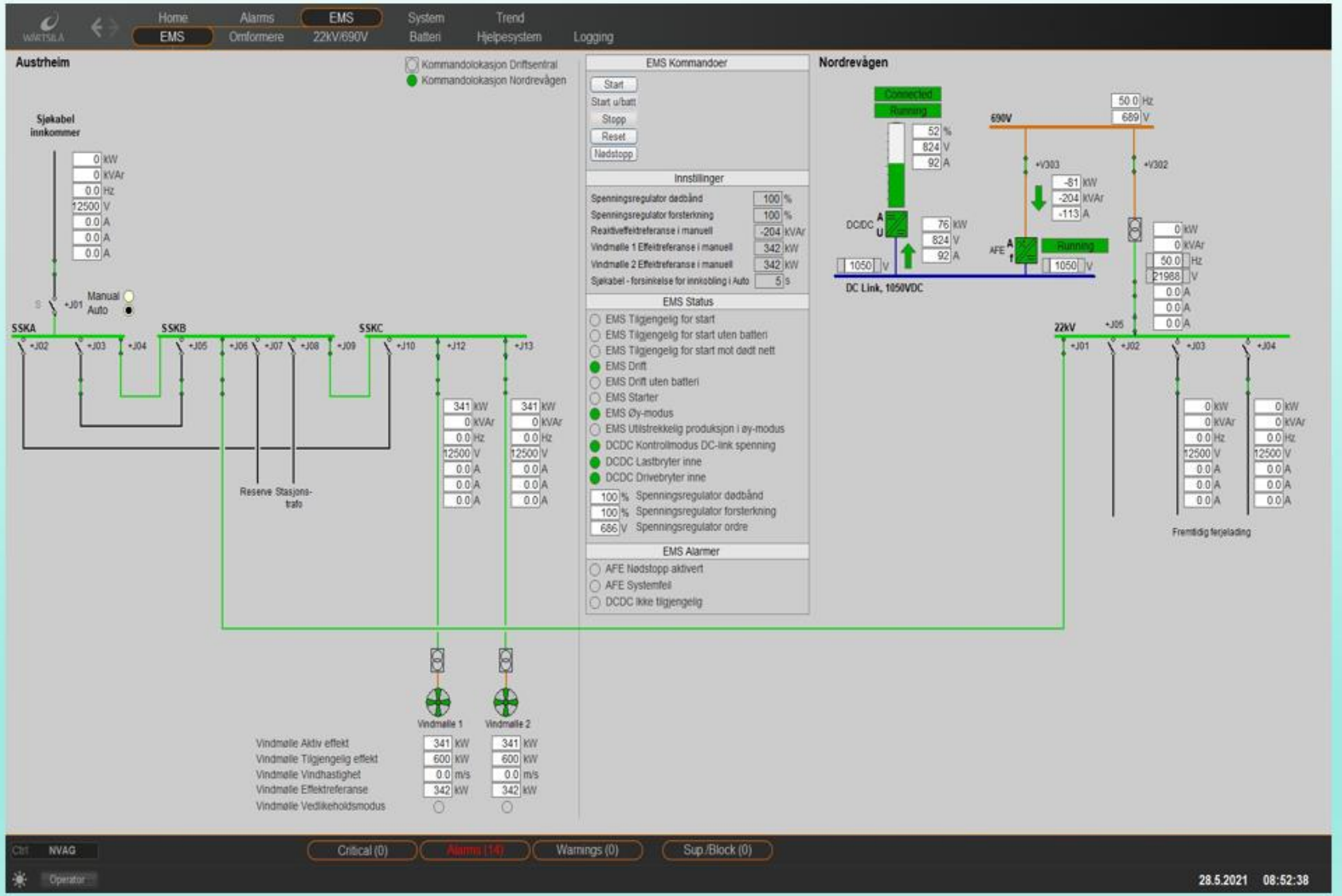
Øymodus

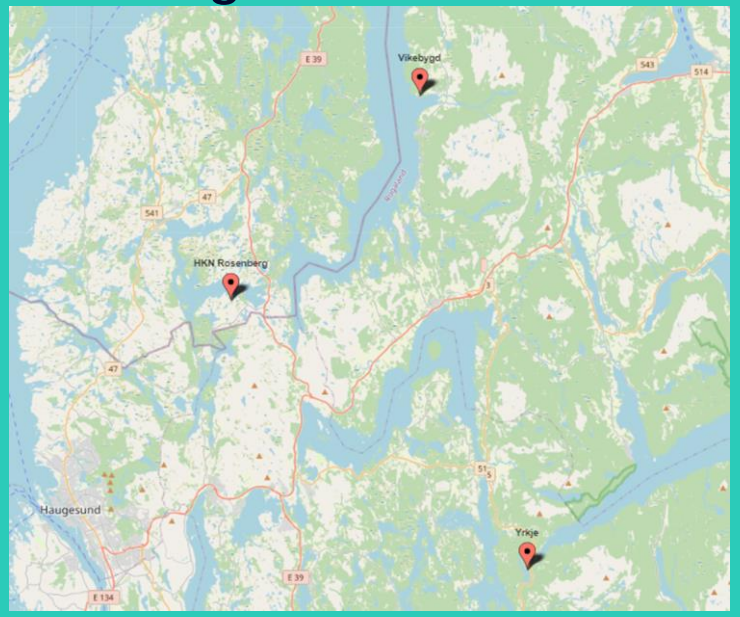
I øymodus er ikke sjøkabelen tilkoblet. Batterisystemet fungerer som energi-kilde for nettet på Utsira, inntil batteriet går tomt.

Dersom batteriet er tilkoblet vil systemet automatisk gå over til denne modusen i tilfelle bortfall av sjøkabelen, denne transisjonen vil skje uten bortfall av spenning på nettet.

- Avbruddsfri overgang til øymodus
- Holde frekvens og spenning
- Batterisystemet kan levere kontinuerlig 700-800kW
- Limitering av vindmølleproduksjon



Example of «spin off» R&D projects/pilots, batteries in low-voltage network



Battery in low-voltage distribution network

Common to all the locations where we have tested battery and power electronics is
that there were long low-voltage radials that supplied the areas.
This results in weak networks with associated low voltage quality and short-circuit performance.
Estimated cost > 2.5 mil. by conventional amplification

Farming with local production

- Before the deployment of the battery, the customer struggled with switching off the solar system, and low voltage in winter.
- Cabins at Yrkje - Cabins from the early 2000s, supply was satisfactory at the start.
- Changed consumption patterns and the connection of new installations in later years resulted in deviations in delivery quality.

What the two locations have in common over the years is that we now experience no deviations in delivery quality, satisfied customers.

Temp. plant in Vikebygd.

-In Vikebygd, we have a larger transformer circuit with large deviations in delivery quality.
- Reason for deviation is long low-voltage radial, changed consumption pattern and new connection/upgrade of existing installations.

Project management did not have the capacity to take on the case in 2022,
so the battery system was deployed before the summer.
Result: No customer complaints, minimal deviations, peace of mind to project a final solution.

Summary

- **Quickly**
- **Effectively**
- **Safe**
- **Economic**

Test center focusing on micro grids and smart control

Harsh climate at Utsira

Private installations on Utsira

Awareness and equipment | Energy management towards electricity bills and the flexibility market

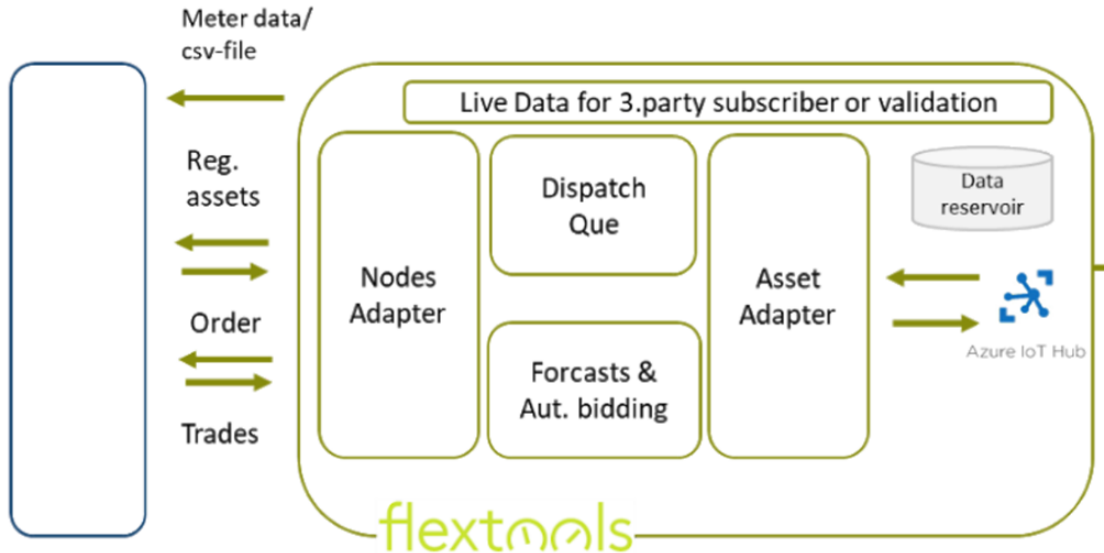
- 9 private installations, of which 3 with almost "full package" flexibility
  - 2 out of 3 with solar panels
  - 3 of 3 with hot water
  - 3 of 3 with heating solutions
  - 1 of 3 with a home battery
  - 1 in 3 with electric car charger

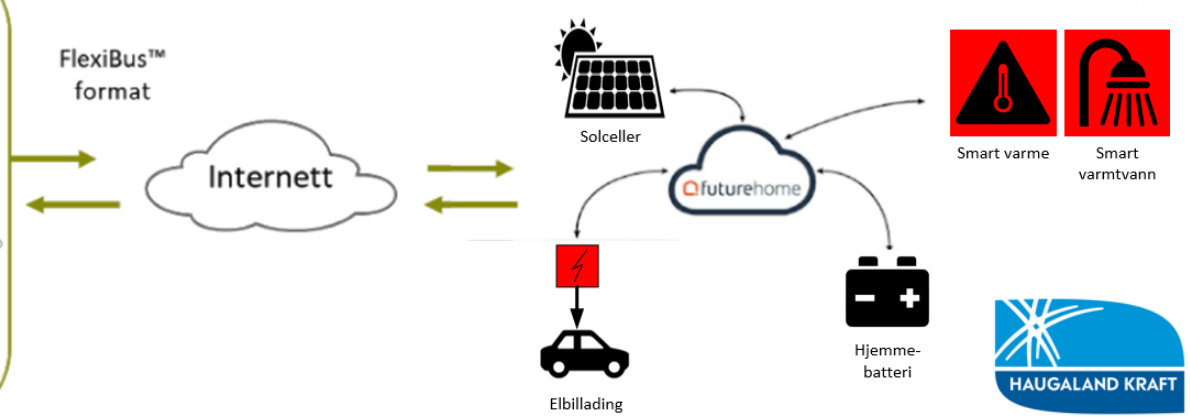
+ DNT Nordvikgården with solar PV and battery

+ Fagnes substation with two easee electric car chargers

NODES: an independent market operator that offers local trading venues for flexibility between DSOs and aggregators.

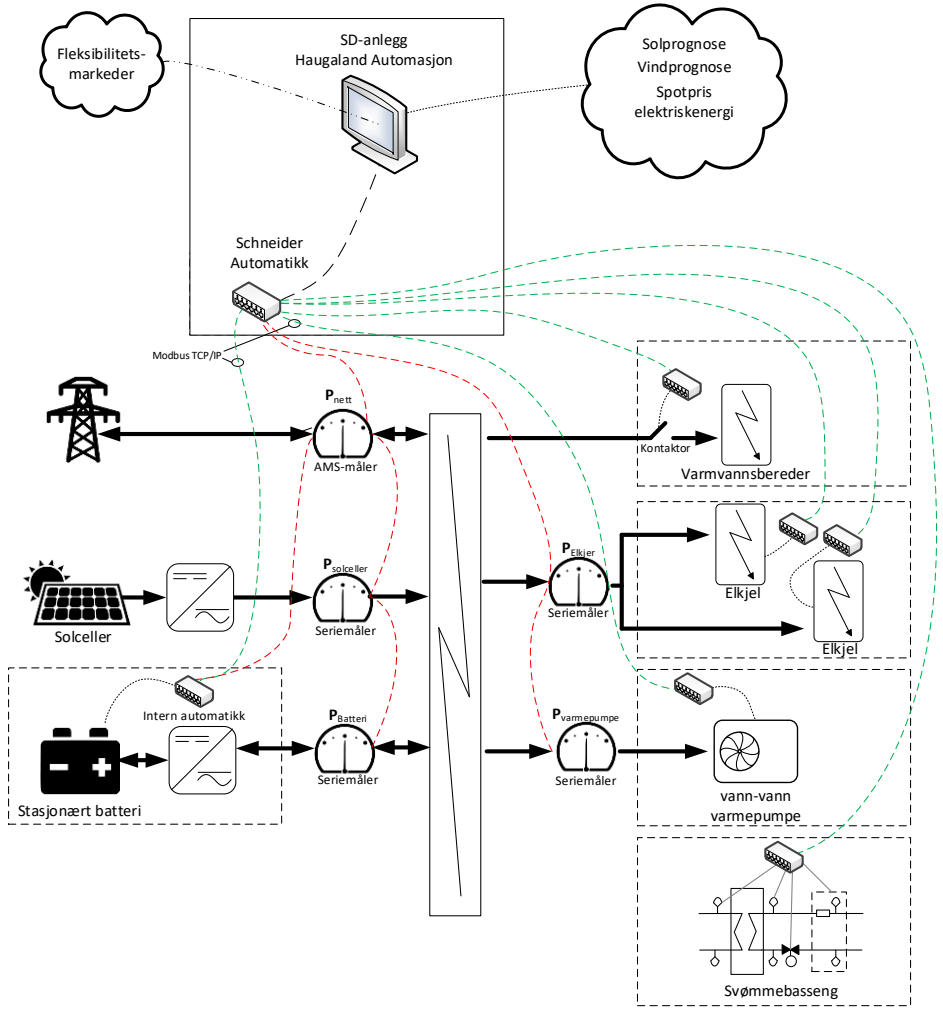
Flextools (formerly Enfo): technological solution for electricity customers who want to make money by freeing up capacity in the grid by making their flexible loads available to grid companies



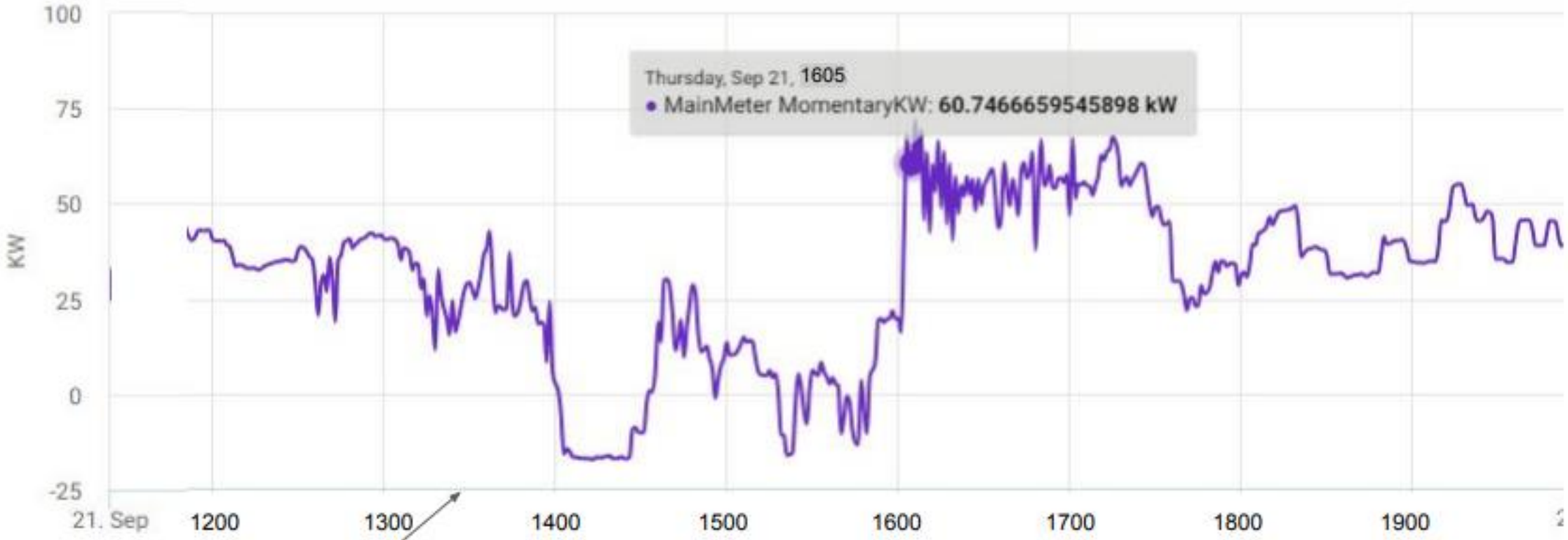


Energy concept Municipal House Siratun

Awareness and equipment | Energy management towards electricity bills and the flexibility market



Delivery	Provider
Managing the heating system incl. thermal storage in the swimming pool • 200 kW electric boiler • 50 kW heat pump • 150 m3 pool (capacity: 170 kWh/ΔHr) • About 10 kW water heater	Haugesund Automasjon, w/ subcontractor Schneider Electric
Solar PV • 48 kWp	Solcellespesialisten and local builder Arne Klovning
Battery with integrated automation 81 kWh / 36 kW	Solcellespesialisten
Overall Energy Mangement System (EMS)	Haugesund Automasjon, w/ subcontractor Schneider Electric
Overall visualization solution	Haugesund Automasjon, w/ subcontractor Schneider Electric
Flexibiliy market integration	Balcoo mot Nodes via Enfo



Setpoint of 60 kW Min_Guard sent 1:30 PM:

«Set minimum consumption to 60 kW between 4 and 5 PM»

The battery starts discharging two hours before Min_Guard of 60 kW is activated to empty the battery. Grid import is reduced, instead exporting electricity to grid.

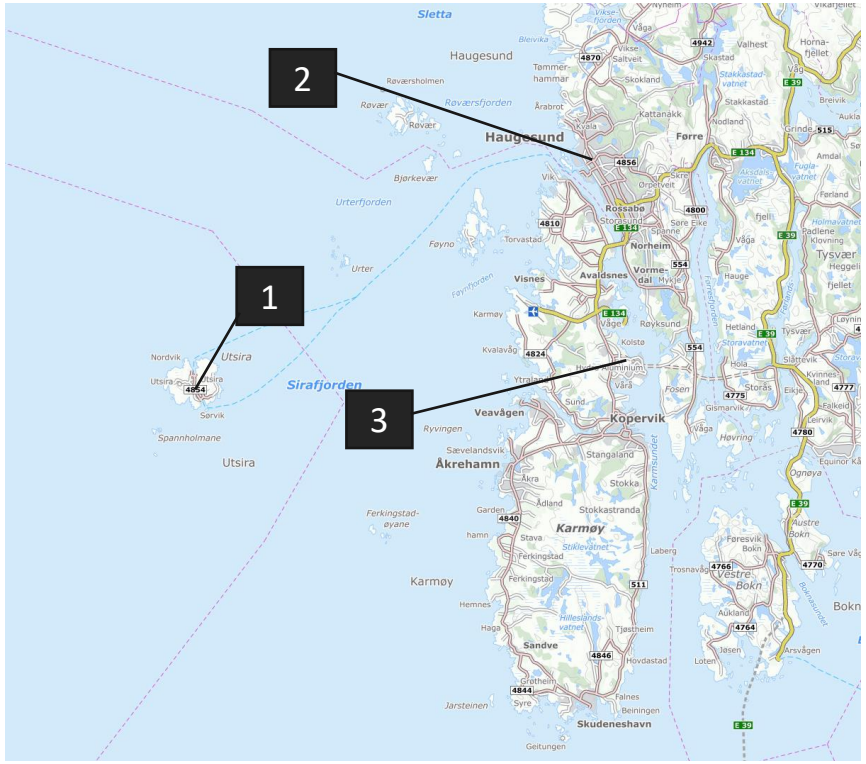
The consumption increases to 60 kW as requested at 4 PM. The battery is being charged with 36 kW and heat pumps of 20 kW are activated.

The system goes back to normal operation at 5 PM as requested.

BASELINE ENERGY

	Utsira project – Siratun Test of information flow between the systems from Schneider – Baseline – Flextools, and delivery of flexibility to Fagne (DSO)
Date/ time:	2023-09-21 / 4 PM

Test locations flexibility



1. **Facilities on Utsira**
   - Siratun
   - 9 private house installations
2. **Facilities near Haugesund**
   - HK's head office at Rossabø
3. **Facilities on Husøy**
   - Seam

Media coverage

Utsira – et levende laboratorium

Haugaland Kraft bruker øykommunen Utsira som testsenter for nye og smartere energiløsninger.

Utsira, Smart energi | Utsira – et levende laboratorium (h-avis.no)

– Utsira er klar

Ordføreren skryter av samarbeidet med Haugaland Kraft og opplever at kommunen er i ferd med å bli et utstillingsvindu for fornybar energi. I tillegg til kommunens egen satsing har planene for de gigantiske vindmøllene på Utsira Nord, en mil lenger ut i havet, skapt nasjonal og internasjonal interesse.

Stiller hele øya til rådighet

UTSIRA: Det som skjer på Utsira og resultatene kraftselskapet høster ute i havet kan komme andre småsamfunn til gode og føre til reduserte nettutgifter for deg og meg.

En fordel med Utsira, slik Fagne ser det, er de tøffe klimatiske forholdene med sterk vind og saltinnhold i luften, «Det som overlever på Utsira, det overlever overalt».

Utsira er også en ypperlig testplattform for nye løsninger for smarte samfunn. Målet er å øke kraften og overføringskapasiteten, forbedre beredskap og energieffektivitet, og øke selvforsyningen av elektrisitet i øysamfunnet gjennom pilotprosjekter som blant annet omfatter smart energistyring, mikronett og energifleksibilitet.

– Naturlig at vi lever opp til visjonen

Prosjektene gjør samtidig kommunen mindre sårbar i forhold til energiforsyning. I dag er alle på øya avhengig av den ene strømkabelen som går på bunnen av Sirafjorden inn mot fastlandet. I tillegg har to bolighus og turisthytta på Utsira fått solceller på taket i løpet av den siste tiden. Blant dem som har investert i solceller på egen eiendom er økonomisjef, Solevåg.

– Man blir mer fokusert på strømbruken når man får et slikt solcelleanlegg. Det kommer informasjon om kurver og data hele tiden, og man blir opptatt av både sparing og andre ting. Jeg tror det vekker bevissthet når en først begynner med dette, sier han.

Utsira, Solceller | – Naturlig at vi lever opp til visjonen (h-avis.no)

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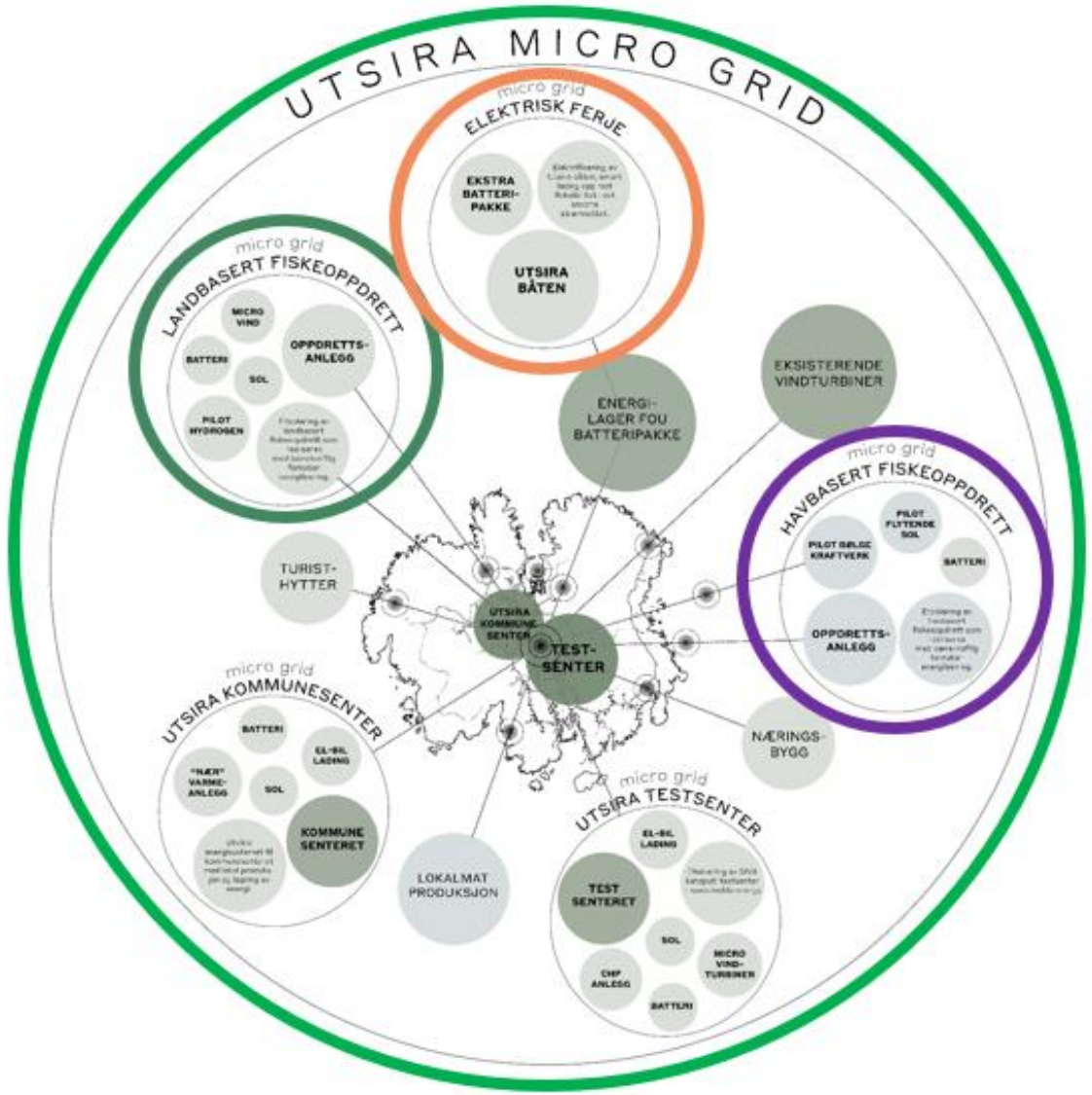
Utsira Living Lab Phase 3



- Technological innovation: A platform that supports the creation of local microgrids and the delivery of flexibility.
- The solutions are being developed to be scalable, and will eventually be usable by an unlimited number of energy customers, buildings and micro grids.

Utsira Micro Grid (finish)

Offshore fish farm

Onshore fish farm

Ferry electrification

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Utsira Living Lab as an umbrella for other R&D projects in the HK-group

• Business plan Utsira Living Lab Test Center	Ongoing	Haugaland Kraft, Sustainable Energy
• Battery/power electronics as voltage and frequency support	Ongoing	Fagne, Pixie
• Image recognition using AI	Ongoing	Fagne, Smart Systems
• Sensor monitoring of high voltage lines	Ongoing	Fagne, Heimdall Power
• Line inspection using X-ray	Ongoing	Fagne, Techair
• Inspection of poles	Ongoing	Fagne, Birdsview, Elvia ++
• Next Grid	Ongoing	Fagne, Heimdall, SINTEF, Kongsberg Digital
• Euroflex 2	Ongoing	Å Energy, Fagne, HKE ++
• ProgLast	Ongoing	Fagne, Sintef Energi
• ElBits	Ongoing	Statnett, Fagne, BKK, Elvia ++
• Pilot-e, FFR marked (Statnett)	Ongoing	Eviny, Fagne, Wartsila

Possibilities

Future collabortive projects

• Electrificatin of the ferry	Fagne, Havnekraft ++
• Fishfarmin on land and sea	Fagne ++
• Testpilot drone base for inspection, Utsira Nord	HK-Fiber/DWO, TAC (Tau autonome Center)
• Charging stations service vessels/coastal traffic	Fagne, HKE, Havnekraft, ++
• Pilot for monitoring cables	Fagne++
• Realization of hydrogen production on Utsira	HYDS, DWO, Fagne ++
• Wave power	Fagne, HK-energi, SKL ++
• Solarpanels on water	Endra, HKE, Fagne

Din egen kraft 💪