

Energy Efficiency in the industry- Norwegian perspective.

POLISH NORWEGIAN COOPERATION
FOR ENVIRONMENTAL FRIENDLY
AND INNOVATIVE SOLUTIONS
IN SMES - POLNORECO

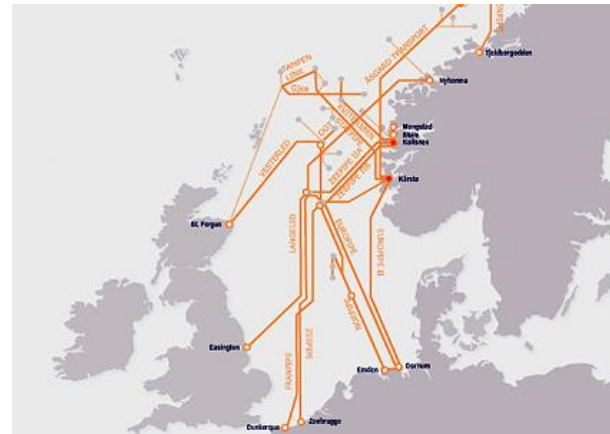
28 November 2017
Anders Stølan, CEO



Presentation Outline

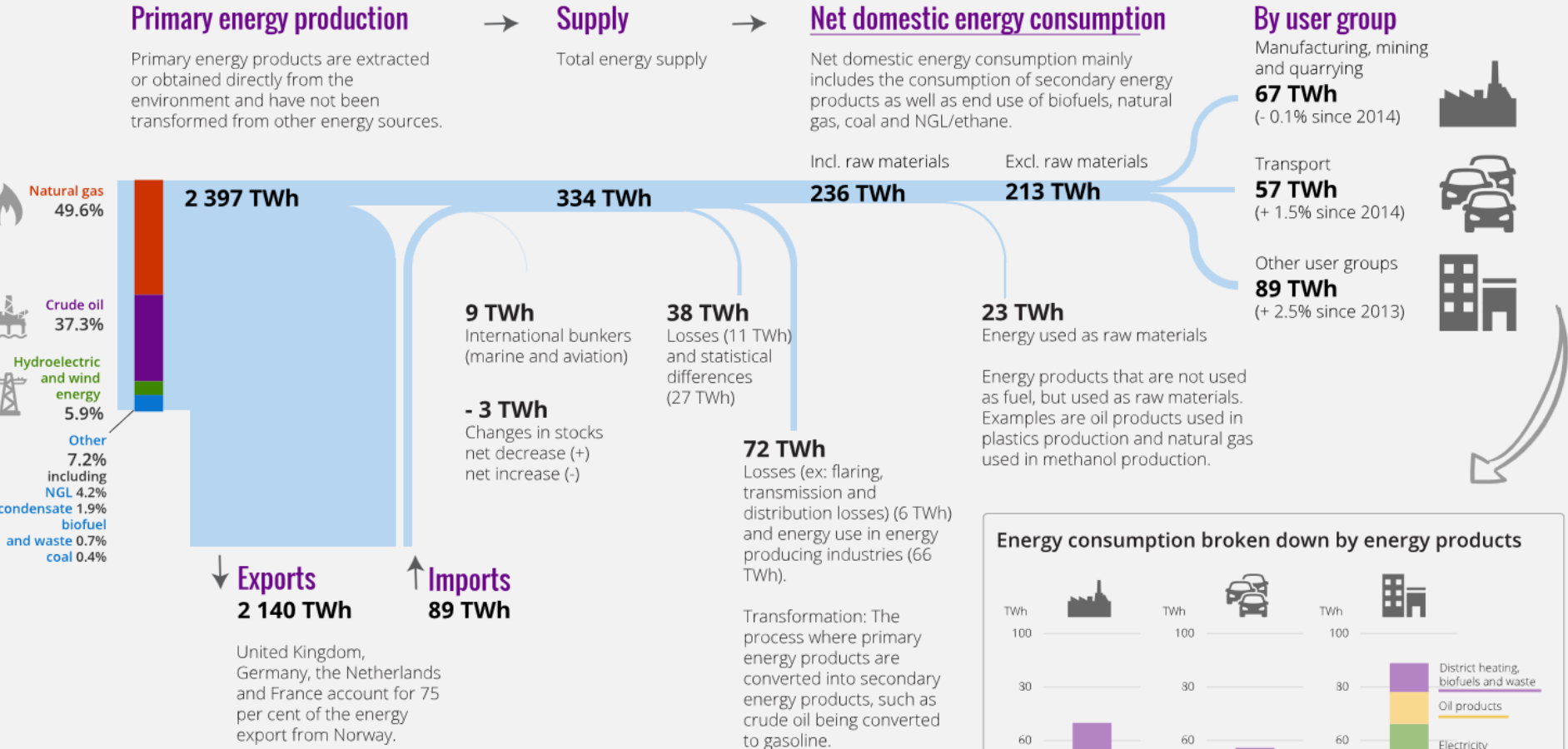
- Energy in Norway
- Energy Efficiency as part of Lean Philosophy
- Norwegian Cases
- Intra company cooperation
- Applied R&D

Energy Basis in Norway

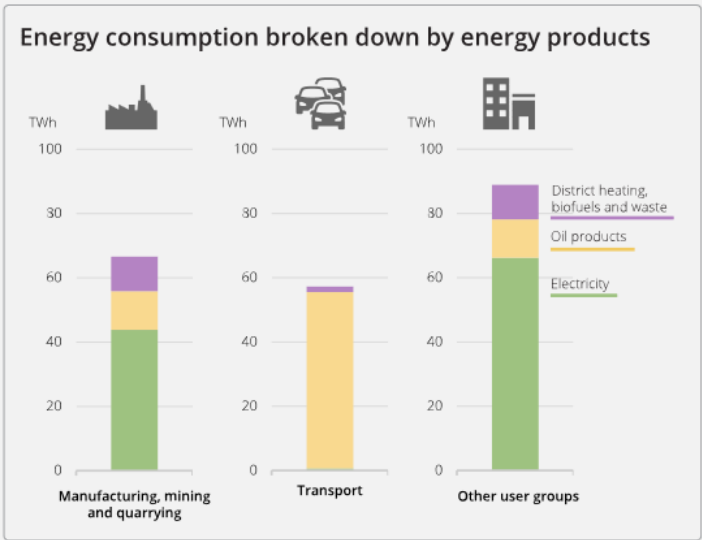


Energy balance, 2015, *preliminary figures

The energy balance shows the energy flows that appear within the national territory

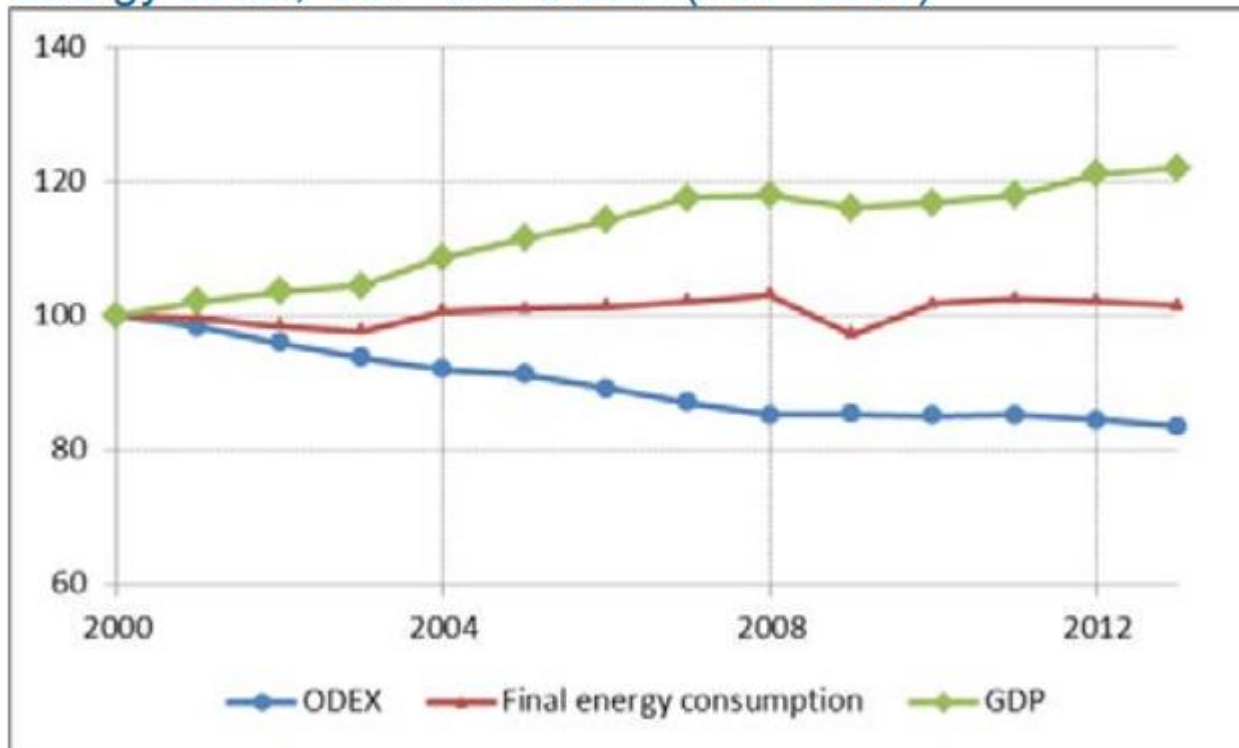


How much is actually 1 TWh?
1 terawatt hour (TWh) is one billion kilowatt hours (kWh). An average Norwegian household uses around 20 000 kWh per year (2012).



Energy efficiency measures index - Norway

Energy cons., GDP and ODEX (100=2000)



INDUSTRY



Energy management in industry and facilities

Support for analysis and establishment of action lists in industry and facilities

50%



Pre-project for energy measures in industry and facilities

We can provide support for a pre-project to investigate a planned investment project. »

50%

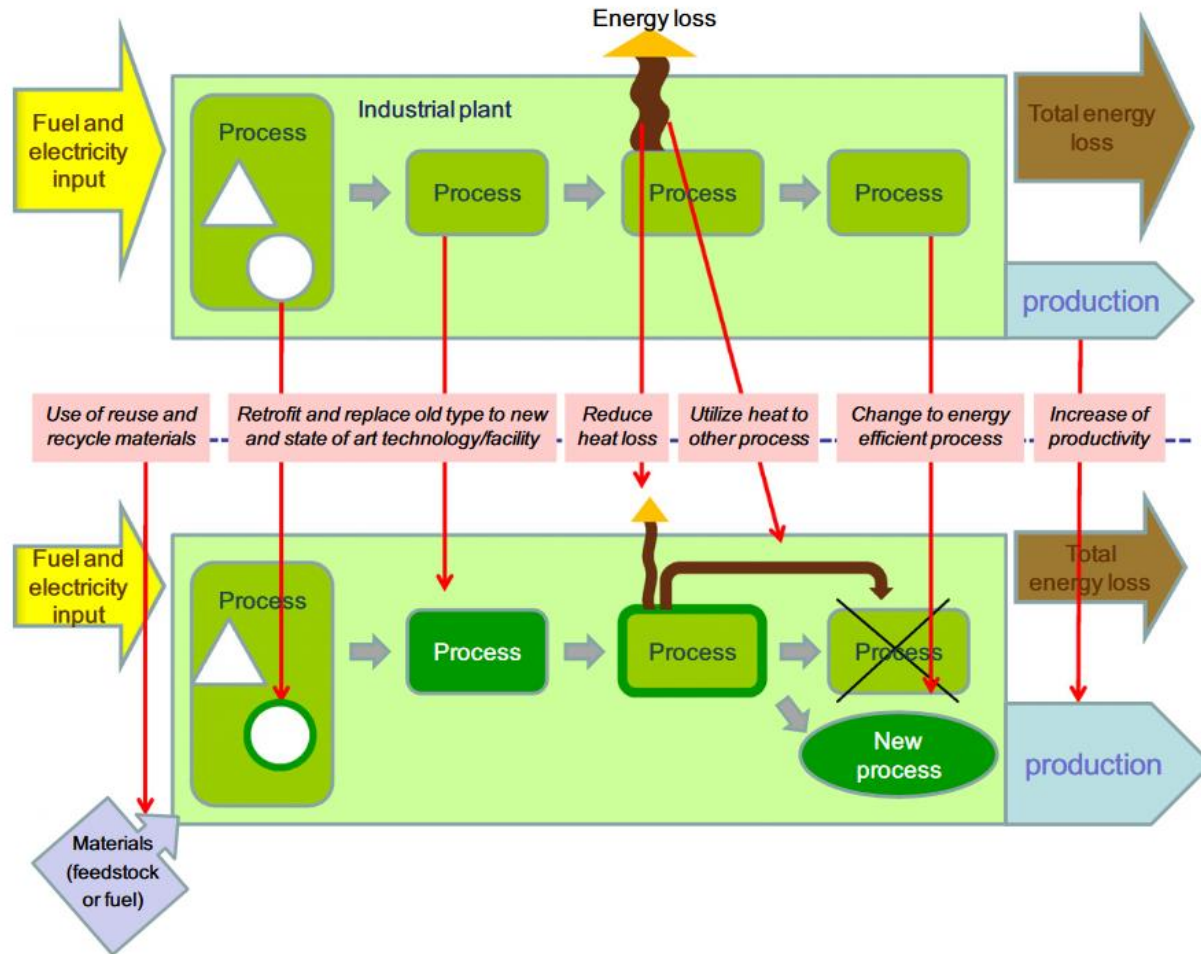


Energy and climate measures in industry and facilities

We can provide support for projects that involve concrete energy and climate measures in industry and facilities. »

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Increasing energy efficiency in industrial processes



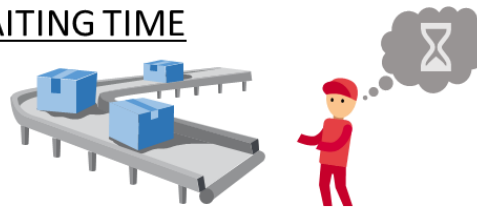
Source: K. Tanaka / Energy Policy 39 (2011)

THE LEAN PHILOSOPY – eliminating waste – 60 years history

OVERPRODUCTION



WAITING TIME



TRANSPORT



INEFFICIENT PROCESSES



7+1 TYPES OF WASTE

MOTION



MISTAKES / REWORK



STOCK

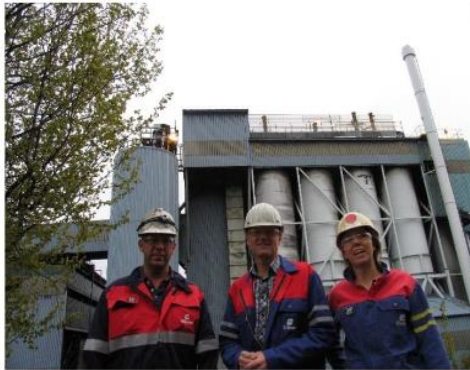


CREATIVITY



Re-design of processes – Energy management and monitoring

Example: Elkem Carbon Fiskaa



Production: 80.000 ton/year calcined anthracite and electrode mass

Energy use: 110 GWh/year (el)

First Elkem company with Energy Management in harmony with ISO 50001

Objective: 35% reduction of specific energy consumption within 2016

Installed 42 new energy meters and web-based monitoring system

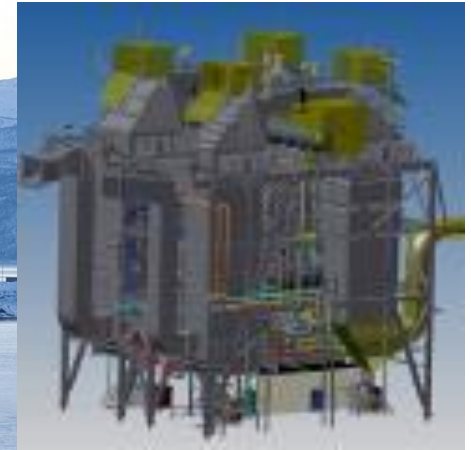
Identified 12 new energy measures with a saving potential of 40 GWh/year

Awarded The Energy and Environment Prize in 2014

<https://www.youtube.com/watch?v=uGHarDZL2sA>

Heat exchange and reuse – Finnfjord

The Norwegian ferro-alloy plant Finnfjord has invested in the world's largest heat recovery solution, the SteamGen 10 boiler from Aalborg Engineering. By generating steam through heat recovery from the large quantity of high temperature flue gas from the furnaces at the plant, it is possible to produce 340 GWh of electricity per year, which is equivalent to the electrical consumption of 85,000 Norwegian households. Finnfjord now has an energy consumption that is up to 40% lower than before, making the plant one of the world's most energy efficient ferro-alloy plants.



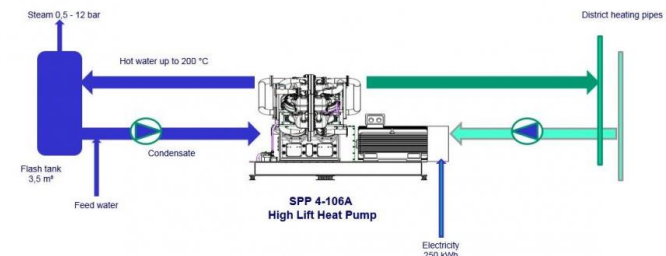
TINE utilizes district heating to make the chocolate pudding more climate-friendly.

- As the first industrial enterprise in the country, TINE's dessert facilities in Ålesund installed heat pumps using district heating. The solution replaces natural gas and reduces CO2 emissions from the plant down to a third.
- The dairy in Ålesund is TINE's special facility for ultra-pasteurized products - products that are treated at a particularly high temperature in production in order to extend their durability. Single-Phase Power heat pumps provide steam for this heat treatment. The steam holds as high a temperature as **180-190 degrees**.
- At TINE Ålesund, district heating is replaced by natural gas and electricity, **which reduces their CO2 emissions by 66 percent**.
- Enova has invested 5.8 million in Single-Phase Power, which delivers the technology in the project.



Single-Phase Power
ENERGY RECYCLING

Steam production from district heating

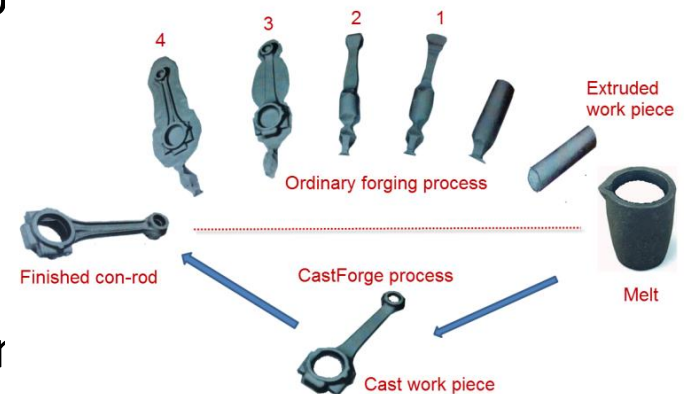


Data for heat pump plant:

Heating capacity:	3x 500 kW
COP:	2.19
Annual running time:	6,750 h/year
Produced heat:	10,1 GWh/year
Energy recycled/saved:	5,5 GWh/year

RENERGI – CastForge – Energy-efficient forging processes

- The project's main objective is to develop new energy-efficient processes for the production of high quality aluminum components for use in vehicles and aircrafts.
- The project is carried out in close cooperation between Farsund Aluminium Casting AS - A Benteler Automotive Company (foundry), Raufoss Technology AS (forging company), Scania (car manufacturer), SINTEF Raufoss Manufacturing AS and SINTEF Materials and Chemistry (research).



Innovative and green business concepts



Welcome to Powerhouse
Kjørbo

You are now standing inside the world's northernmost energy-plus building. During the course of its anticipated life expectancy of 60 years, Powerhouse Kjørbo will generate enough energy to cover the total amount of energy used to produce the building materials, construction, operation and disposal.



Introduction



Electricity



Solar Electric



Heating



Cooling



How it Works



Green Features

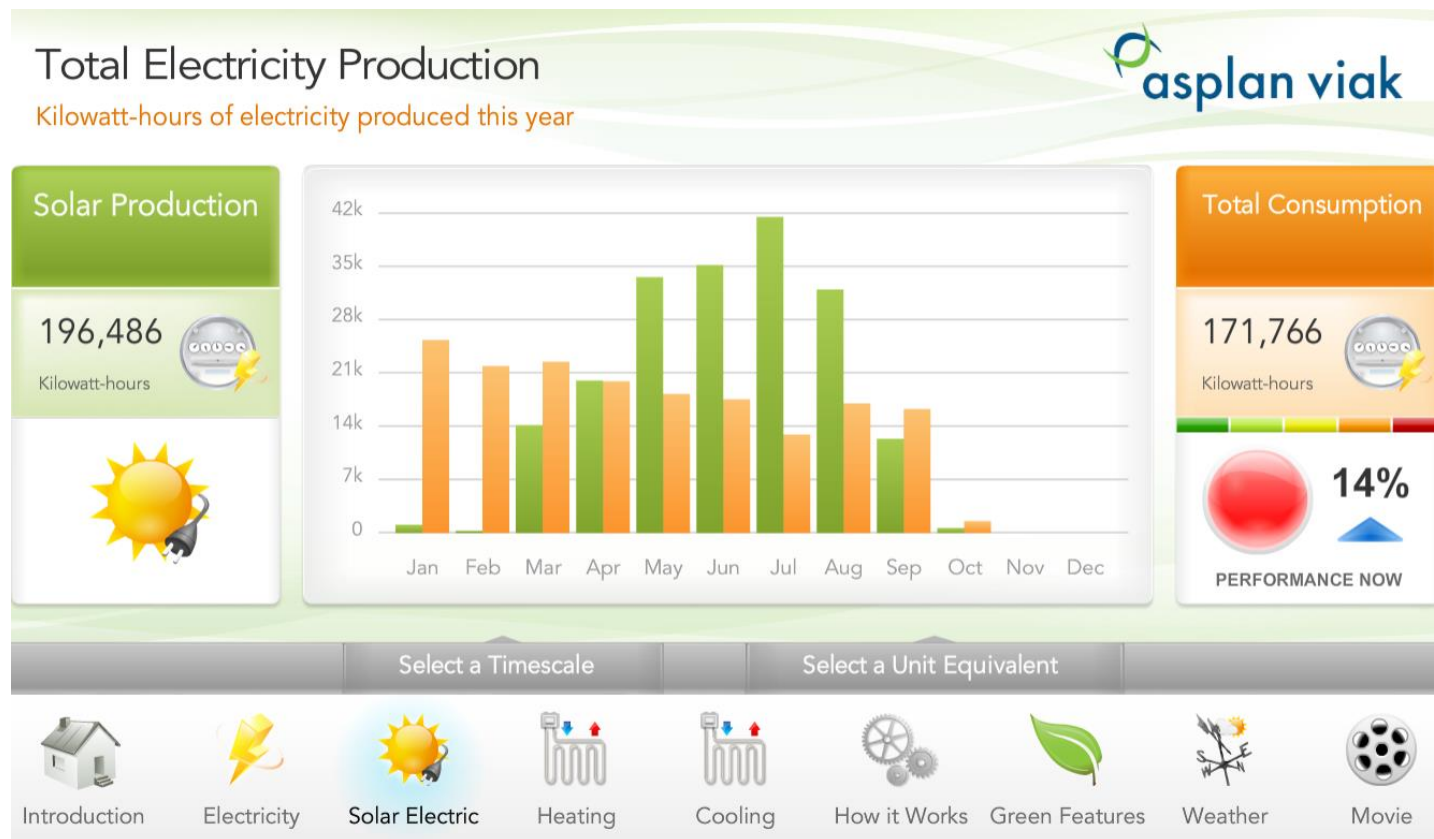


Weather



Movie

Powerhouse by Asplan viak



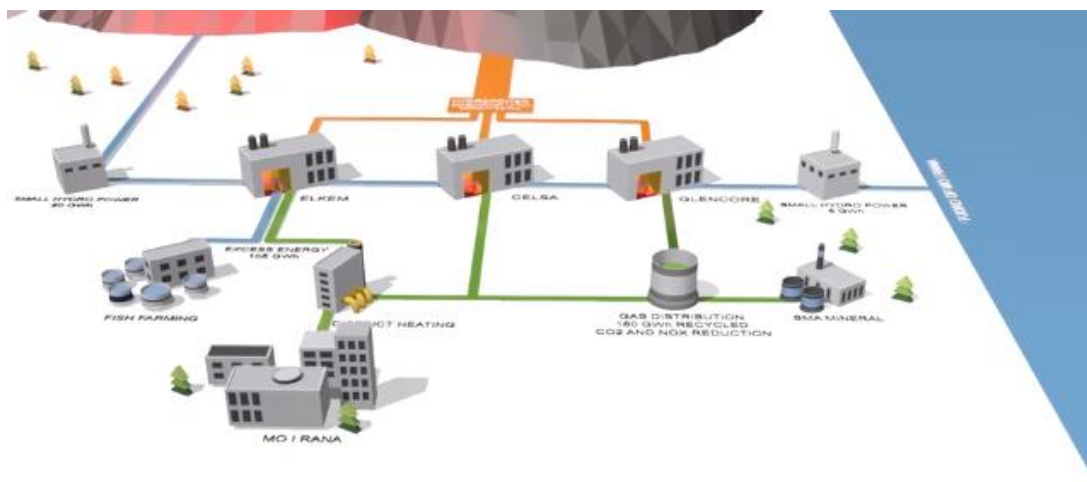


Energy

The first main focal area is energy, an area in which much progress has already been made at the Mo Industrial Park. Enova considers the Mo Industrial Park 'best in class' based on the numerous measures that have been implemented over several years and individual projects underway at several companies.

The potential for improved energy efficiency and recovery is significant and this will be one of the focuses of the new research centre for renewable energy, HighEFF, in which Sintef Energi is a main partner.

The film shows the current energy recovery rates and our recovery goals.



**TOTAL RECOVERY:
400 GWh**

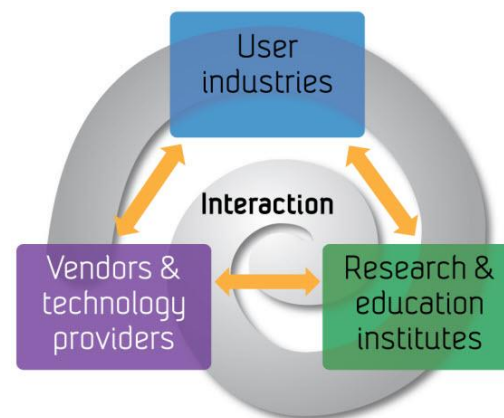
Further directions



HighEFF - Centre for an Energy Efficient and Competitive Industry for the Future hosted by SINTEF

HighEFF will focus on technologies and processes with potential for large reduction in specific energy use. The Centre have pinpointed areas, which are mostly of cross-industry-sectorial character to ensure competence transfer between industrial branches joining the Centre.

- **Corner Stones:**
- Energy Efficient Processing
- Surplus Heat Utilization
- Industrial Clusters
- Education and Training



Conclusions

- Start with Energy Management as part of Lean Philosophy (low investments)
- New Technology (payback time)
 - Production process
 - Buildings (isolation, ventilation, lightening)
- Extra impact by intra company cooperation (industrial symbiosis)
- Benefit from ongoing Applied R&D projects



THANK YOU

