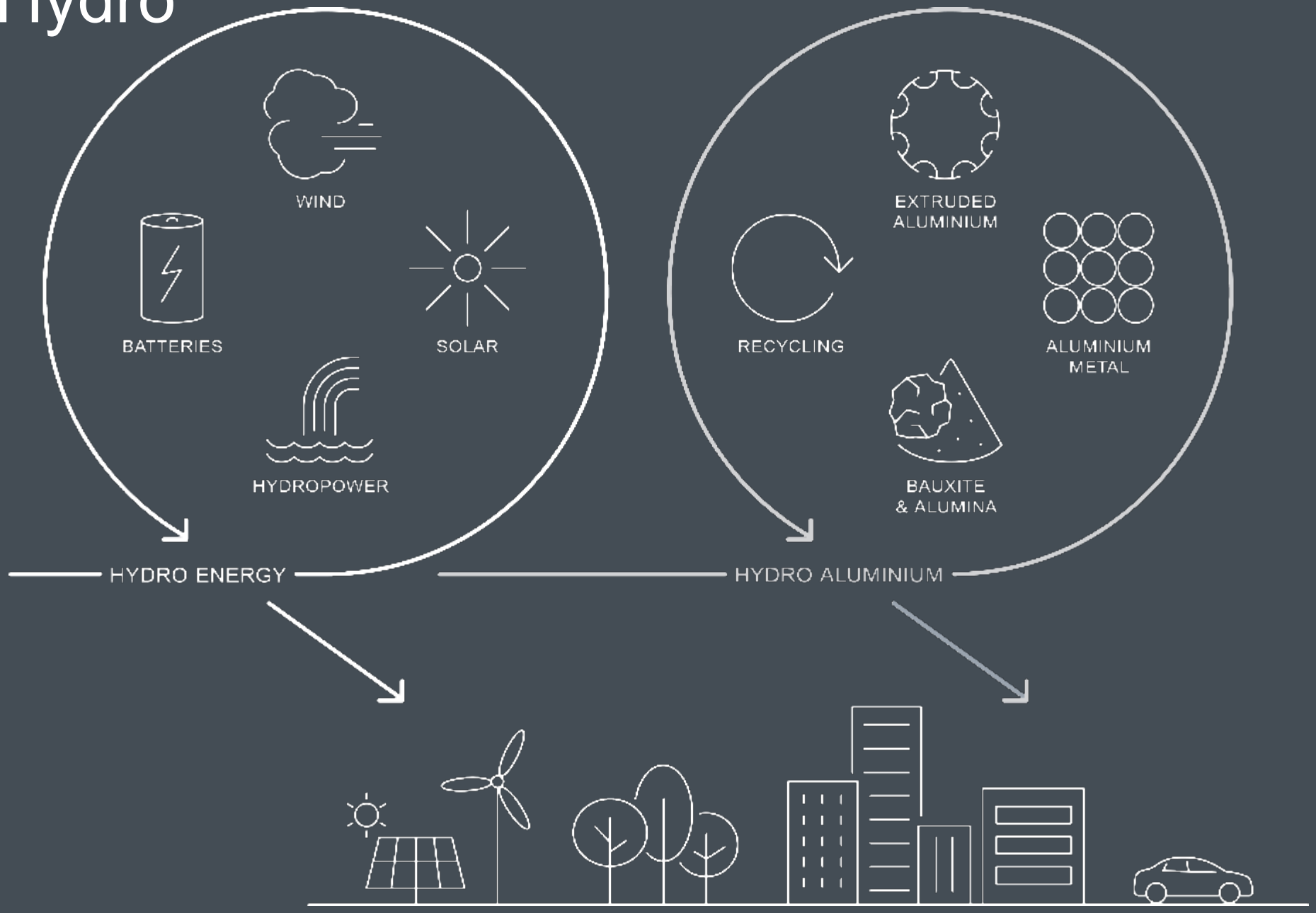
Muligheter og erfaringer med energiledelse

Hydro REIN - Energy Solutions
Thomas Haug – Energy Efficiency Manager

11.11.2022

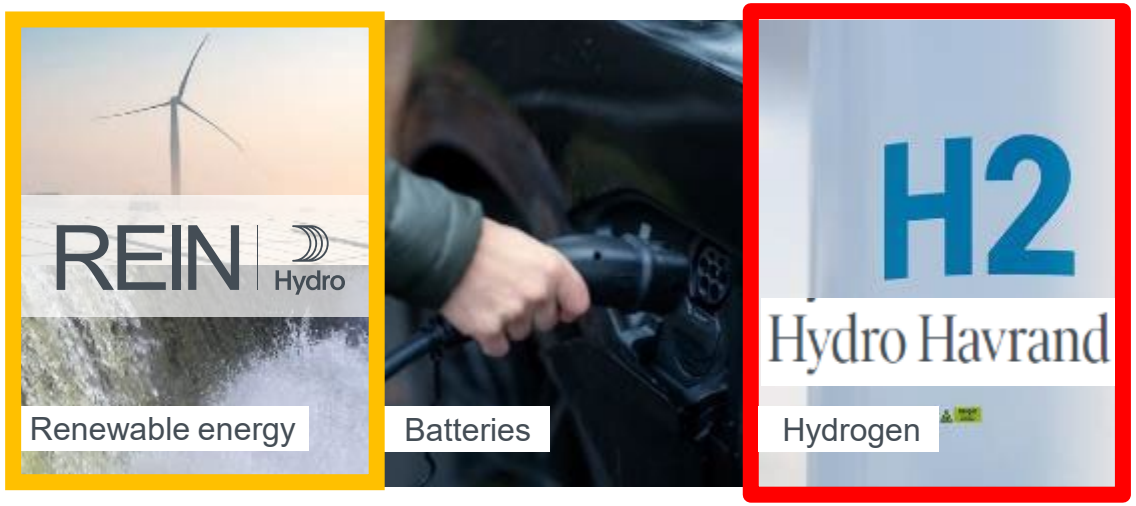
This is Hydro



Hydro's strategic direction is to lead the way in low-carbon aluminium and new energy

1 Strengthen position in low-carbon aluminium

2 Diversify and grow in new energy



Profitability & Sustainability

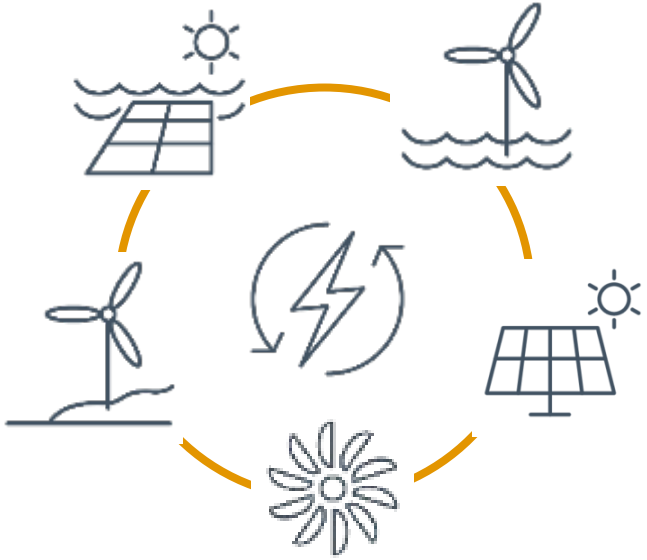
Hydro REIN: the one-stop-shop energy partner for industrials

Help the industry succeed in the energy transition

REIN Energy Solutions

Utilise Hydro's position and extensive experience in power systems

Hydro Classic



Source power from captive portfolio of renewable assets

REIN renewable invest

Energy efficiency: More important than ever

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Also at the core of Hydro's strategy

"We would like to be in the forefront of industries that matter for a more sustainable future."

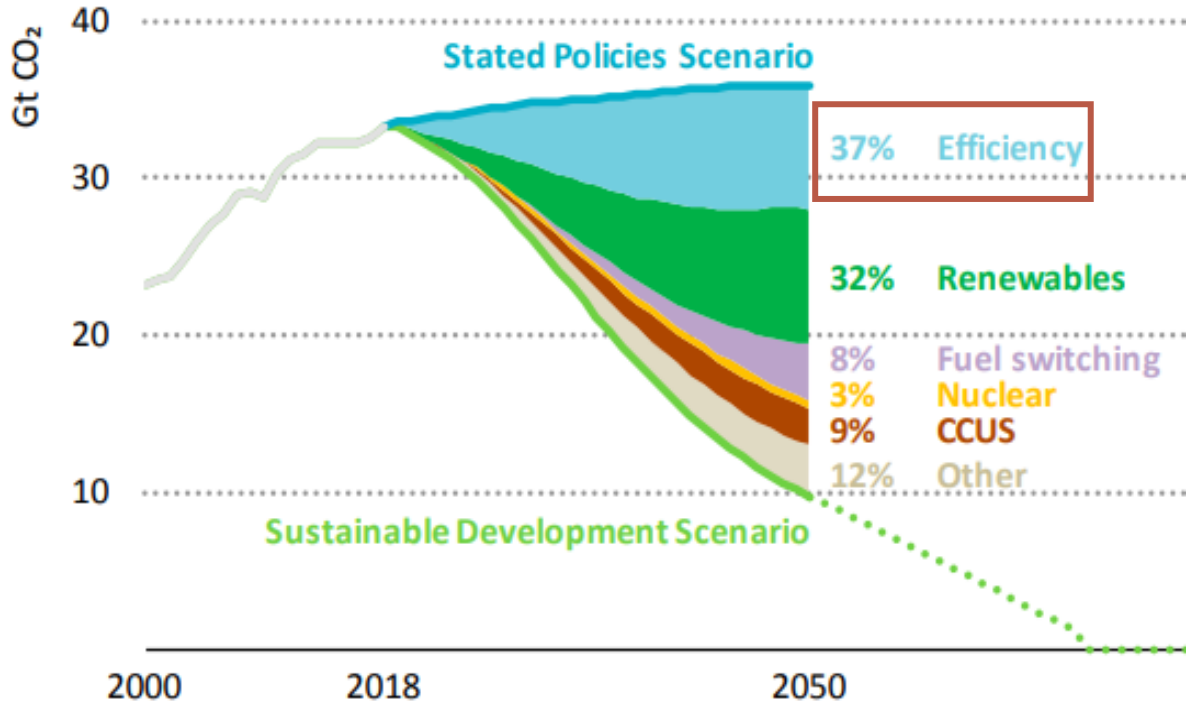
Hilde Merethe Aasheim, CEO

"Energy efficiency and cuts in energy consumption can be achieved using digital technologies.

- IPCC Working Group III Vice Chair Diana Ürge-Vorsatz"

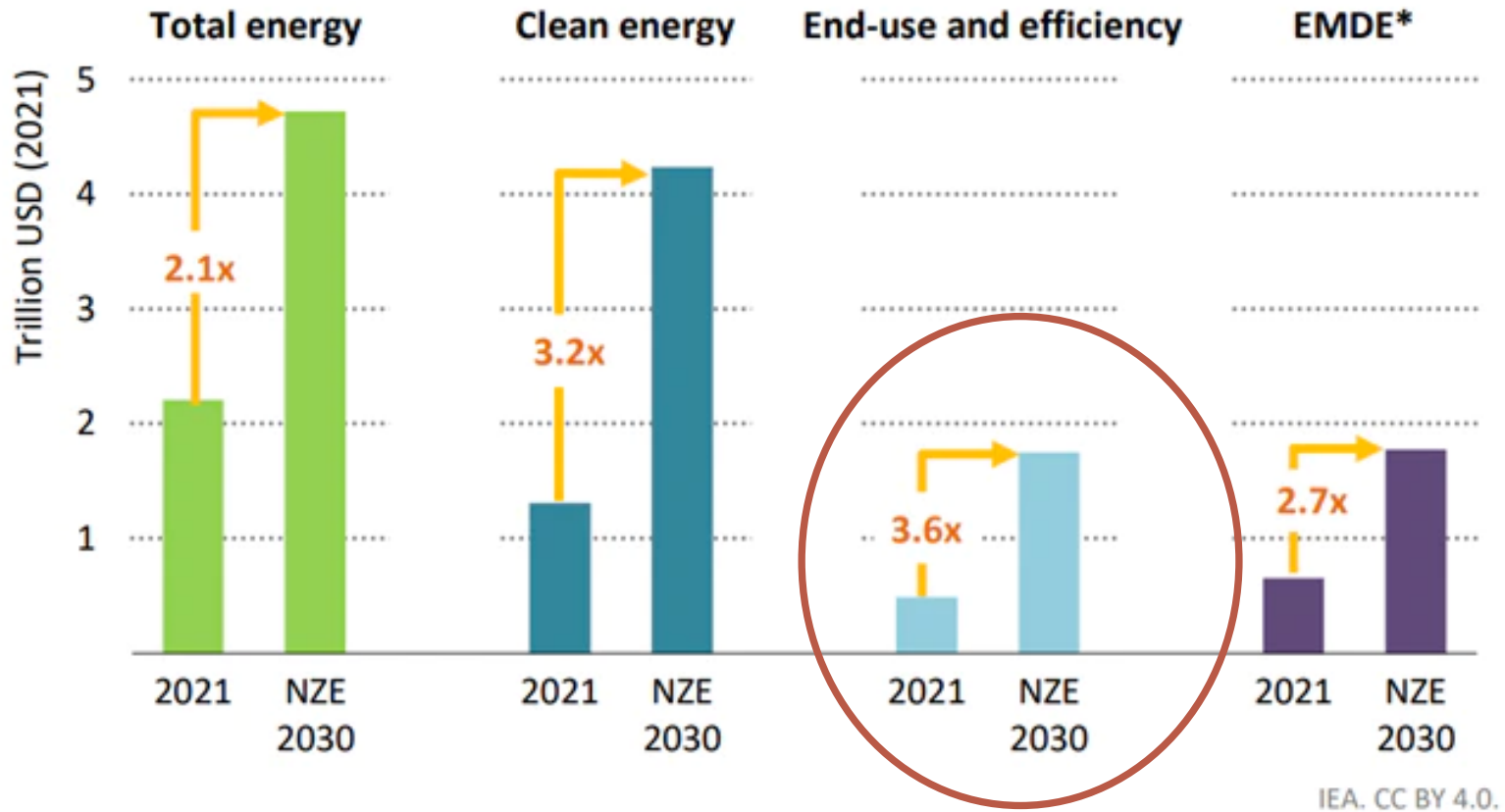
"We consider energy efficiency to be the 'first fuel' as it still represents the cleanest and, in most cases, the cheapest way to meet our energy needs."

Fatih Birol
IEA Executive Director



Investments in renewable energy and energy efficiency need to increase

Figure 1.18 ▷ Energy investment in the NZE Scenario, 2021 and 2030



There are multiple imbalances in current investment flows that need to be addressed in order to meet rising demand for energy services while reducing emissions

NZE = Net Zero Emissions

Four core business segments supported by our proprietary digital platform

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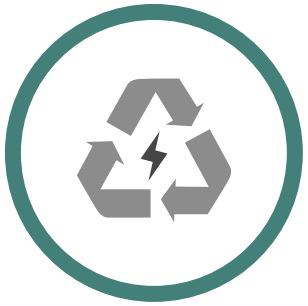
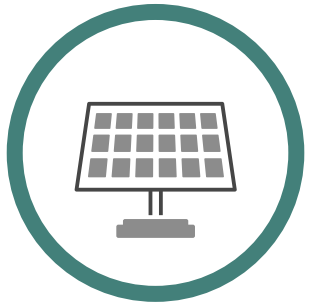


Energy efficiency

Implement measures to reduce energy demand and steer demand for energy



On-site generation

Renewable capacity located on-site, typically coupled with on-site battery installations

Storage systems

Battery or thermal storage installations, usually meant for peak-shaving or demand response

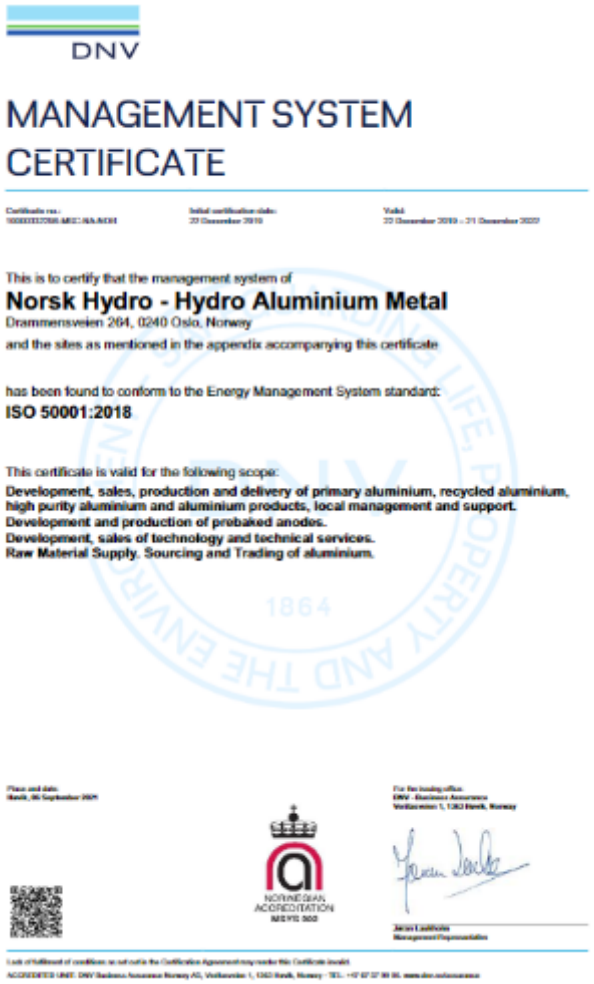
Green sourcing

Contracts with physical green traceability, often covering residual needs beyond on-site generation to show 100% renewable scope II emissions

REIN | Hub™
Energy intelligence for industry

Underpinned by our REIN-Hub™ digital platform, to unlock further energy efficiency & value

Pioneer as the first ISO 50001 certified plant in Norway



DNV

MANAGEMENT SYSTEM CERTIFICATE

This is to certify that the management system of

Norsk Hydro - Hydro Aluminium Metal

Drammensveien 264, 0240 Oslo, Norway

and the sites as mentioned in the appendix accompanying this certificate

has been found to conform to the Energy Management System standard:

ISO 50001:2018

This certificate is valid for the following scope:

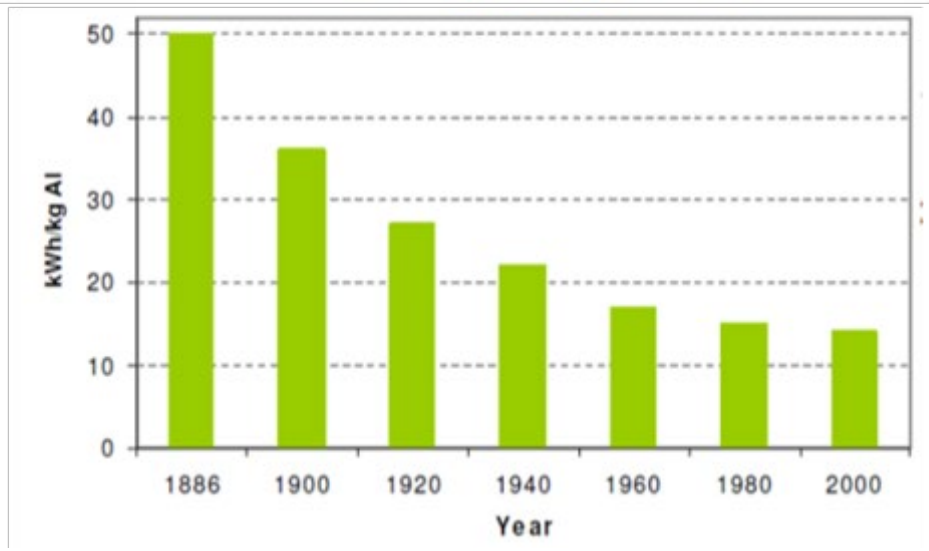
Development, sales, production and delivery of primary aluminium, recycled aluminium, high purity aluminium and aluminium products, local management and support.
Development and production of prebaked anodes.
Development, sales of technology and technical services.
Raw Material Supply, Sourcing and Trading of aluminium.

NORWEGIAN ACCREDITATION

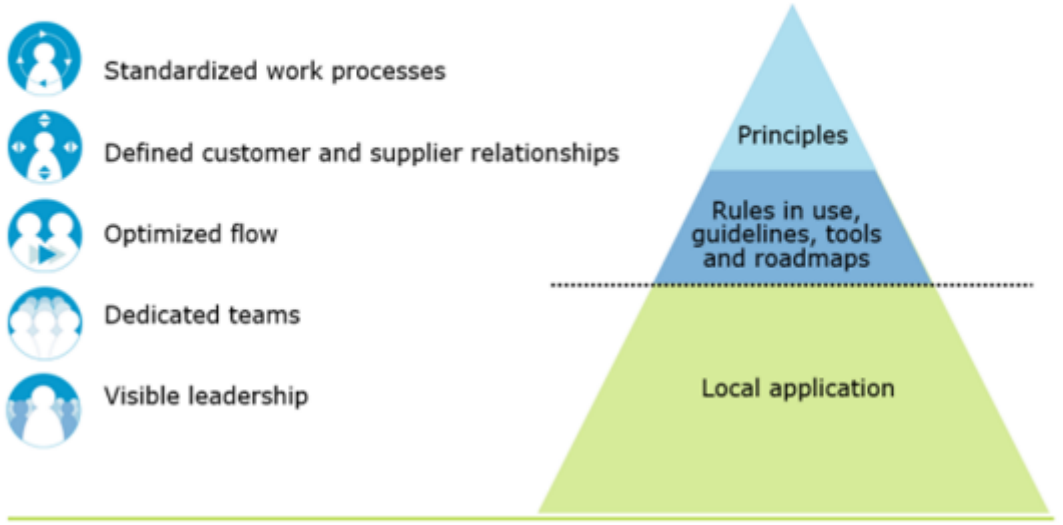
- Årdal Metal Plant - The very first ISO 50001 certificate issued in Norway in May 2012
- Today Hydro Aluminium Metal BA is certified in an Umbrella organized certificate
  - 5 smelters in Norway
  - 5 re-melters in Europe
  - 1 High purity Al plant
  - Head Office in Oslo

Energy Efficiency has been, and still is, a continuously improvement process

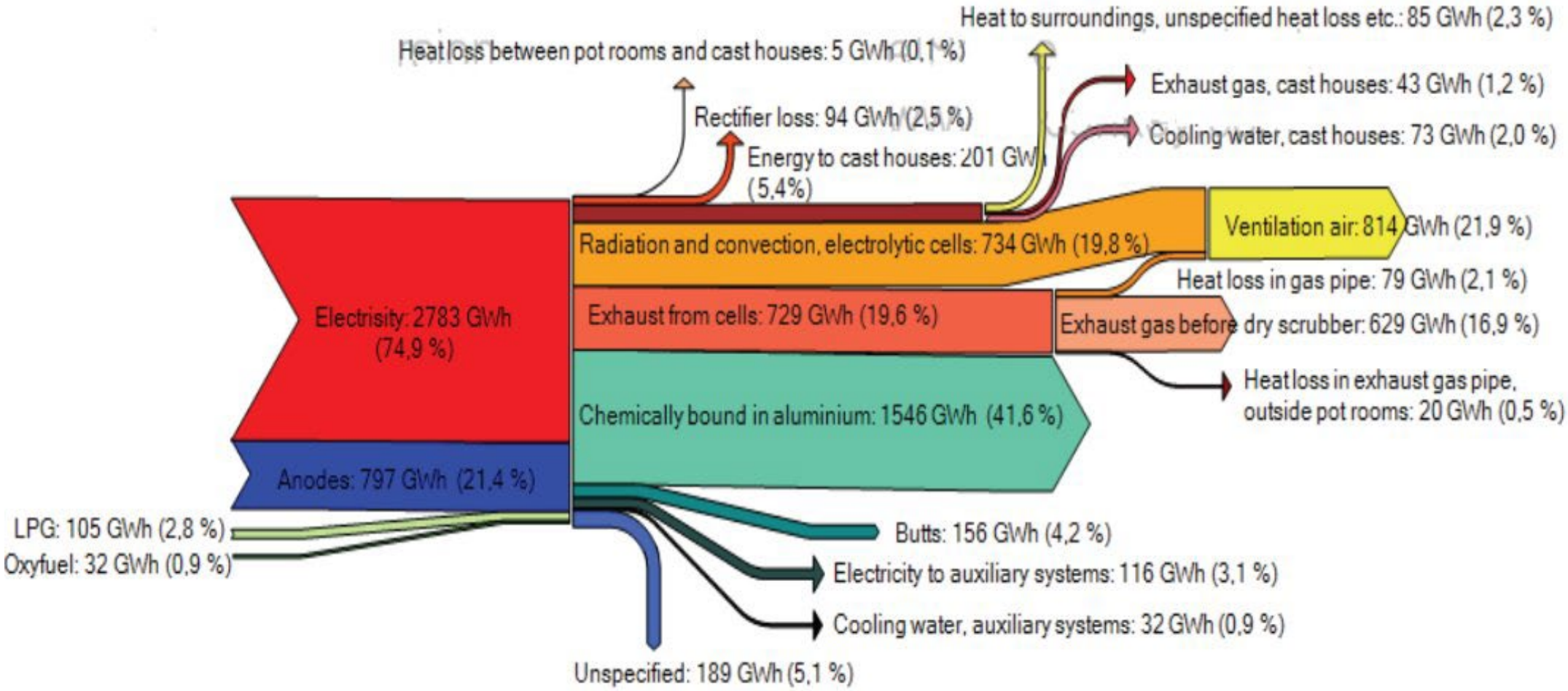
Our industry has shown this through decades with a strong focus on Management Business System



AMBS consists of 5 principles which are mandatory for everyone in Primary Metall.
AMBS consists of principles, rules in use, guidelines, tools and roadmaps.
Application of rules in use, guidelines, tools and roadmaps are a local issue and responsibility.



Typical energy flow in aluminium primary production



Core Team Energy Management in Primary Metal

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Need of more coordinated and revitalized effort on Energy Managemt

Energy Management – core team

Opportunity/Challenge

Including energy reduction projects in our Environmental strategy will help us fulfil our CO2-reduction goals.

Hydro Rein is looking for good cooperation projects with the plants with respect to energy savings.

Energy reduction projects have more benefits than just reducing energy consumption, but this is often not showcased in business cases today. We need a better way of calculating and presenting opportunities. (Ref. also Paris agreement.)

Today's situation

- The energy manager's role needs to be defined in Hydro. In terms of areas of responsibility, place in the organisation, reporting to the management level and time allocated for the work.
- There are no common projects between the plants, no one-smelter organisation.
- There is no forum for energy managers, no core team.
- Very few projects are granted funding both due to low energy prices in the calculations making the projects not profitable enough and also because business continuity projects always takes precedence over energy reduction projects.
- Compressed air leakages are significant, but are not properly measured and therefore not quantified.

Deliverables

- Reduced energy consumption for all sources according to updated Environmental strategy. (Ex. LED)
- Reduced pressurised air consumption also according to Environmental strategy.
- Plans for electrification of vehicles at the plants with recommendations for priority.
- A new way of calculating business case for energy reduction projects. Case in HighEFF.
- Scope 3-analysis for energy consumption.
- Develop SOPs and BAP for Energy management.

High level activities

- Identify ways of working for this core team and put together a longterm plan for activities.
- Give input to revision of Environmental strategy to include energy reduction.
- Present plans for Core team energy management for AMMT and ensure commitment from plant management level. Including list of projects connected to Hydro's Environmental strategy.
- Present BAP for energy management in Hydro to AMMT/plant managers for approval.

Targets

Quantify leakages and reduce compressed air leakages by 25 % by 2030.

Add KPIs for energy reduction on AM-level.

Include reduced energy consumption in our Environmental strategy with 2025 and 2030 goals.

Resources and Partners

- TOS Sustainability v/Gunn Iren (leader) and
- Thomas Haug, Hydro Rein
- Energy management core team with all Norwegian smelters included

Measurement

Pressurised air consumption

Energy consumption.

- The core team consist of energy managers from all plants in Norway
- Meet regularly to harmonize effort and share knowledge
  - best practice work-processes
  - Coordinate improvement activities
  - Give input to group strategy and target settings
  - Establish methodology and tools to build strong business cases including multiple benefits from energy efficiency projects
  - Participate in HighEff program
- Report on progress to management

Energy Management request interaction and building a strong culture for energy reduction and efficiency

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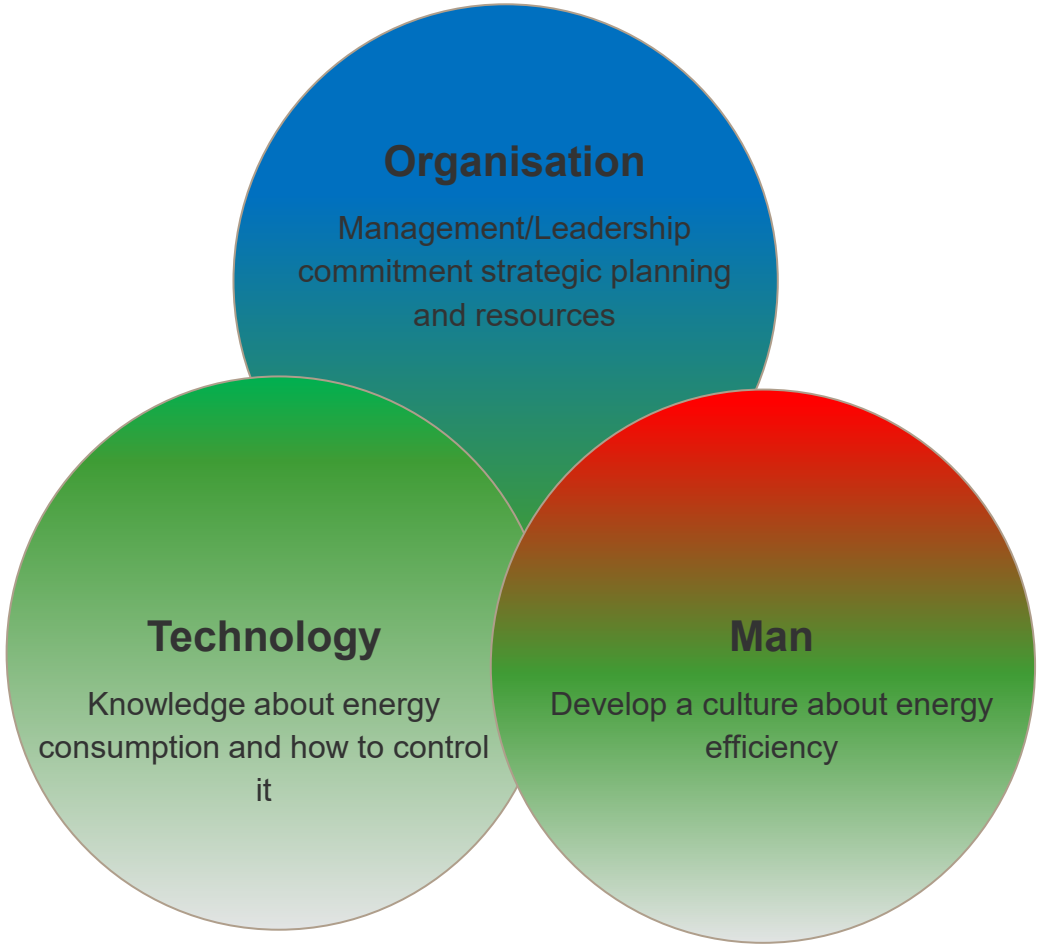
Energy Management request interaction between **man, technology and organisation**



Energy Culture is the **shared mind-set** that creates and sustains an environment that leads to continual improvement of the organization's energy performance. It comprises people, systems, structure, skills and strategy

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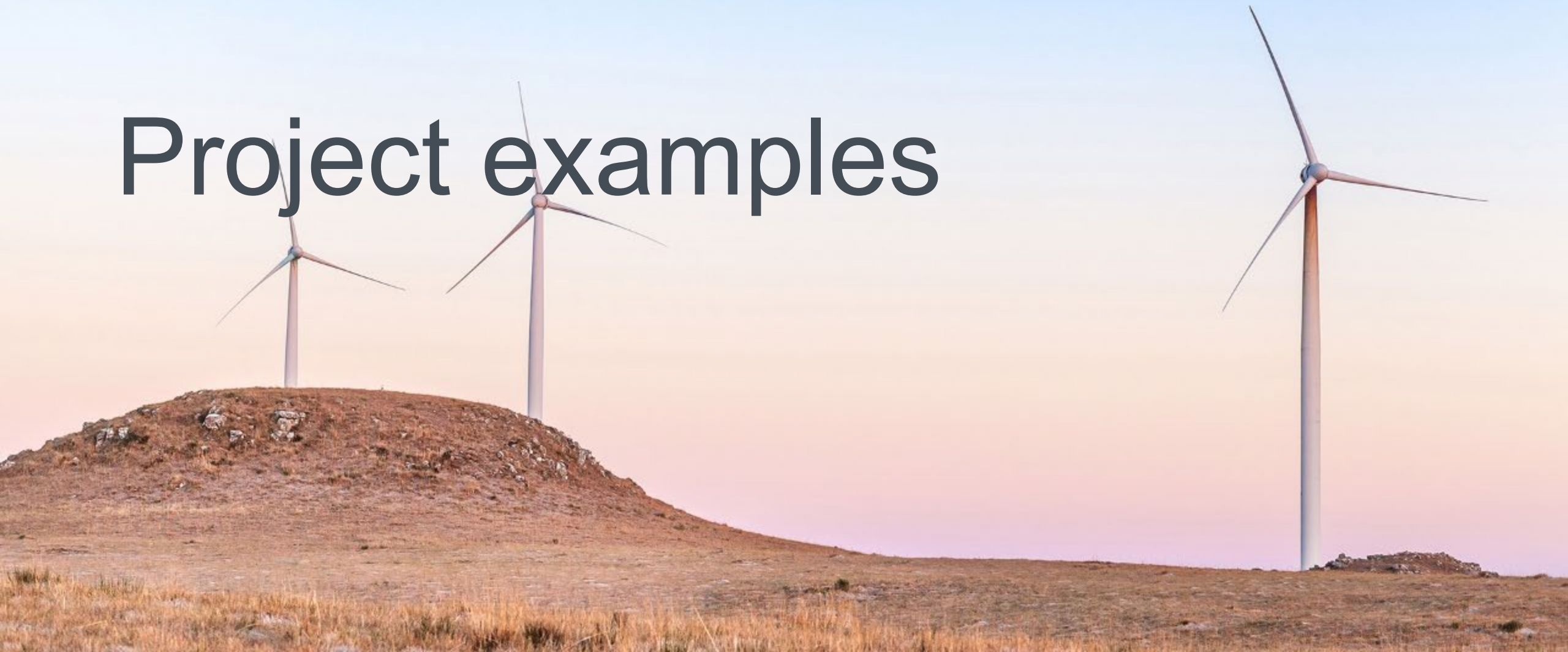
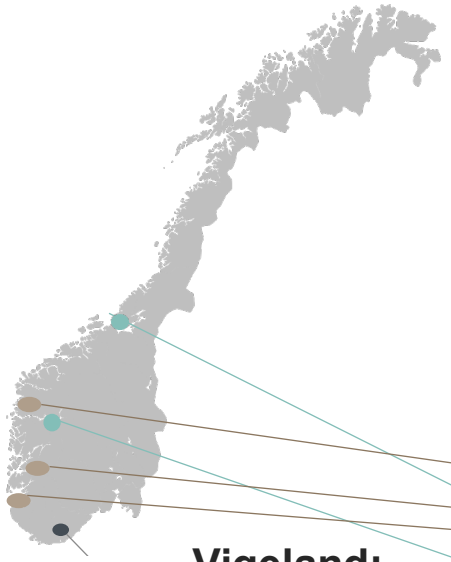
Project examples



Towards 100GWh in annual energy savings ?

Mapped potential – Work in progress



Vigeland:
Proof of Concept

Compressed air, S-LaaS, pre-heating, REIN Hub.

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Sunndal & Årdal:
Track-record & Scale-up

Economies of scale. Leveraged finance, reduced cost of capital. Operational center.

Karmøy, Husnes & Høyanger:
Complete Norwegian Roll-out

Operational excellence, further savings & success stories

2023
1.5-2 GWh

2023-2024
40-50 GWh

2023-2025
30-40 GWh

Through its partnership with REIN, Hydro Primary Metal have mapped and aims to save **100GWh/yr** energy efficiency savings in its home market of Norway on ″Low hanging fruit″ technologies

The **savings** are equivalent to the consumption of nearly **7,000 Norwegian** households, **or 8 typical extrusions sites**, and a 100MWp solar power plant in Norway.

Energy Solutions EaaS: a bundled offering

Business partnership to implement smart and cost-savings initiatives

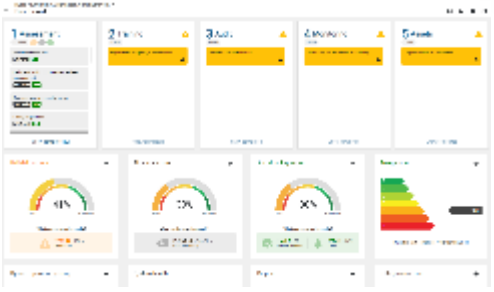
Light fittings with built-in sesnsors, CLM (controlling lightning module).

Smart LED

Efficient Pre-heating & usage of surplus heat

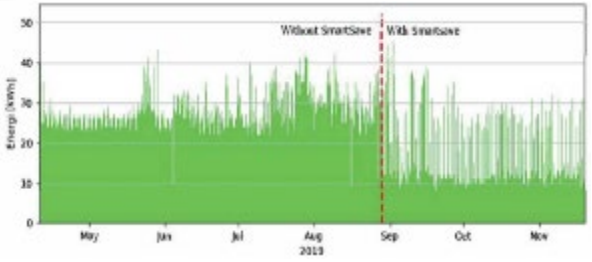
Compressed Air Management

Pump & Fan Optimization



REIN Hub

Dashboard – Control –
Reporting GHG and savings

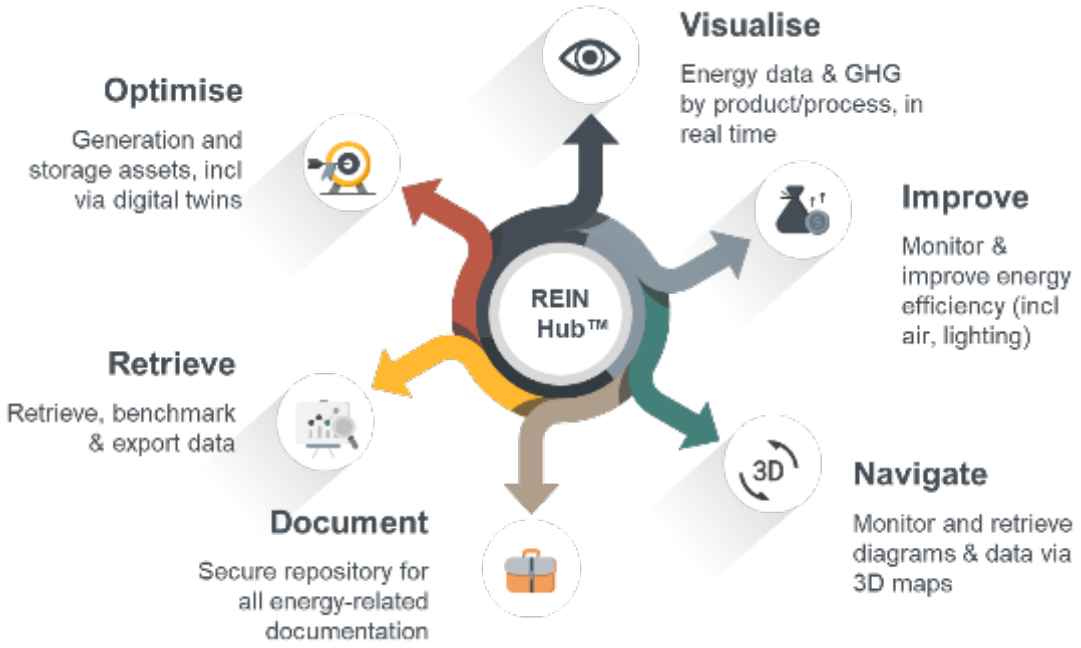


- Reduced energy consumption and costs
- Reduced carbon footprint
- Improved HSE
- Implementation and optimization by REIN

Digitalization

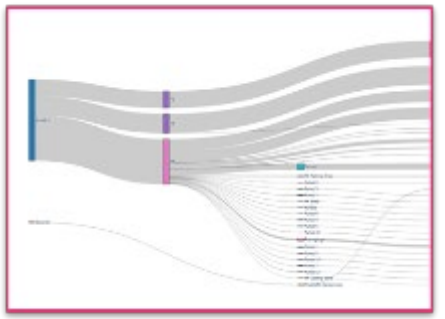
Increase insight and awareness

REIN Hub as the brain of EnSol's bundled offerings & energy partnership model



REIN Hub provide the real-time insight to energy systems, from production to consumption. This will;

- enable overview & insights;
- allow cost & emission reductions;
- enable new decentralized technologies, and;
- support the energy management system, e.g. ISO 50001



Energy Dashboard

Compressed Air Dashboard

GHG Emissions Dashboard

Greener Sweden Project

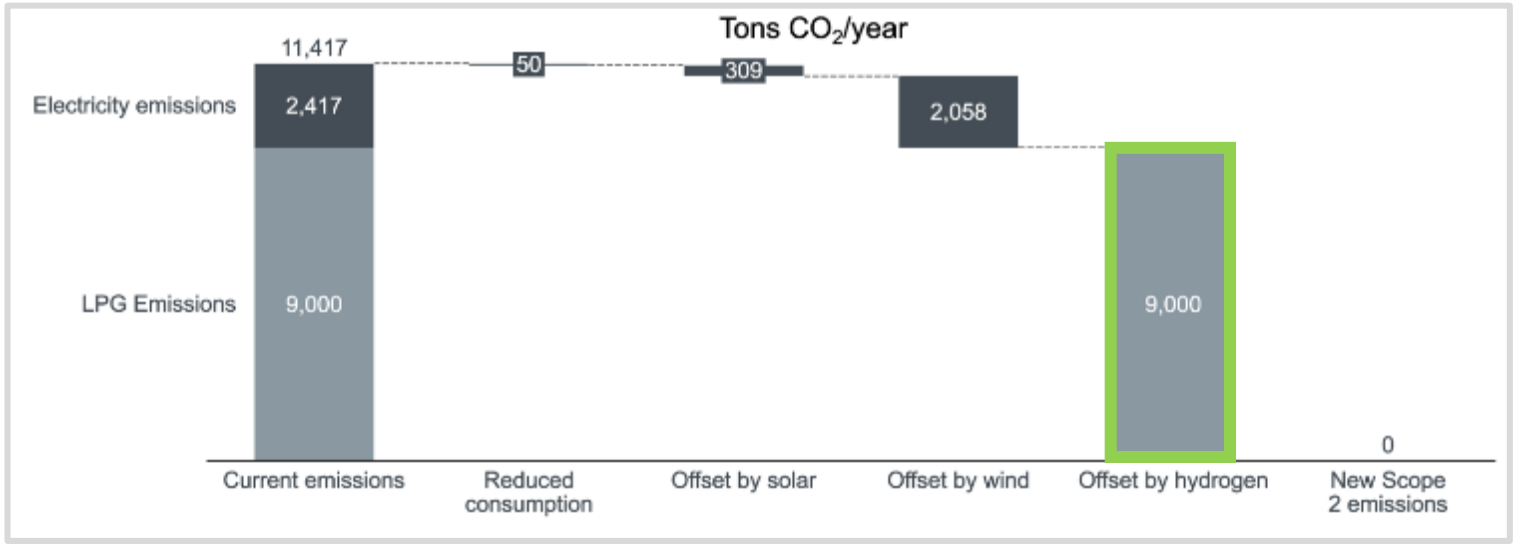
EXTRUDED+REIN + HAVRAND to produce a platform for zero carbon aluminium

Reduce Scope 1&2 emissions to 0

Phase 1: REIN to reduce energy consumption on site through energy efficiency and on-site generation

Phase 2: Fuel switch to hydrogen will eliminate 9000tons/year of direct LPG related emissions.

Phase 2: REIN to power hydrogen production and offset the remaining electricity related emissions through new wind power plant



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