BUSINESS
FINLAND

SMART ENERGY

Energy and Resource Efficiency

FINLAND

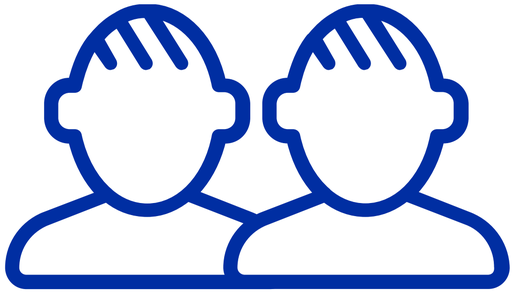
BACKGROUND

- In EU, net-zero greenhouse gas emissions by 2050
- Energy efficiency part of EU climate policy
- Energy efficiency is part of Finland´s national climate policy
  - Reduce the amount of energy required to produce services and products
  - Improved energy efficiency reduces CO2 emissions and energy consumption
  - Cost savings
- Resource and energy intensive industry play a crucial role
  - Key materials and chemicals – steel, plastics, ammonia and cement – emitting 500 Mt of CO2 per year, equivalent to 14% of the EU total
- Net zero emissions* can be reached by
  - Circular economy
  - Greater materials efficiency and extensive recycling
  - Innovative industrial processes
  - Digitalization

*Material Economics (2019). Industrial Transformation 2050 - Pathways to Net-Zero Emissions from EU Heavy Industry

BEST PRACTICES FROM FINLAND

Voluntary energy efficiency agreements



550 companies & 100 municipalities have the agreement, equivalent to 60% of Finland´s energy consumption

50 Mt

CO_2 emissions reduced with energy efficiency agreements since 1997

200M€

Energy efficiency savings during 2017-2018

FINLAND OFFERS SOLUTIONS TOWARDS NET-ZERO GHG EMISSIONS

Energy Authority and Motiva promote
energy & material efficient, sustainable industries

RESEARCH

- International R&D cooperation
- Pilot projects & test beds

ENERGY EFFICIENCY

- Reduce energy intensity
- Reduce emissions

RESOURCE EFFICIENCY

- Replace fossil fuels
- Enhance bio & circular economy

SERVICES

- Digitalization
- Consulting

NET-ZERO EMISSIONS

Finnish technology suppliers
and services providers

INDUSTRIAL ENERGY EFFICIENCY

Reducing consumption & emissions of industrial processes

- Industrial heat pumps
- Waste gas burner
- Flue gas cleaning & CO_2 capture
- ORC
- Microturbines
- Air compressor system
- Cleaning solutions for heat transfer surfaces
- Insulation solutions
- Solar thermal system
- Automation & electrification
- Valves

oilon
VEO
CALEFA
CALIGO CLEAN EFFICIENCY
kpa unicon
enviroburners
LOGSTOR
AURELIA
CarbonReUse
Outotec
SAALASTI
Tamturbo
Danfoss
NIRAFON
Clean Steel
ABB
Owens Corning PAROC
SARLIN
Savosolar
MERUS POWER
Altum TECHNOLOGIES
NELES
Heliostorage

INDUSTRIAL ENERGY EFFICIENCY

Efficient raw material handling and high-quality material recycling

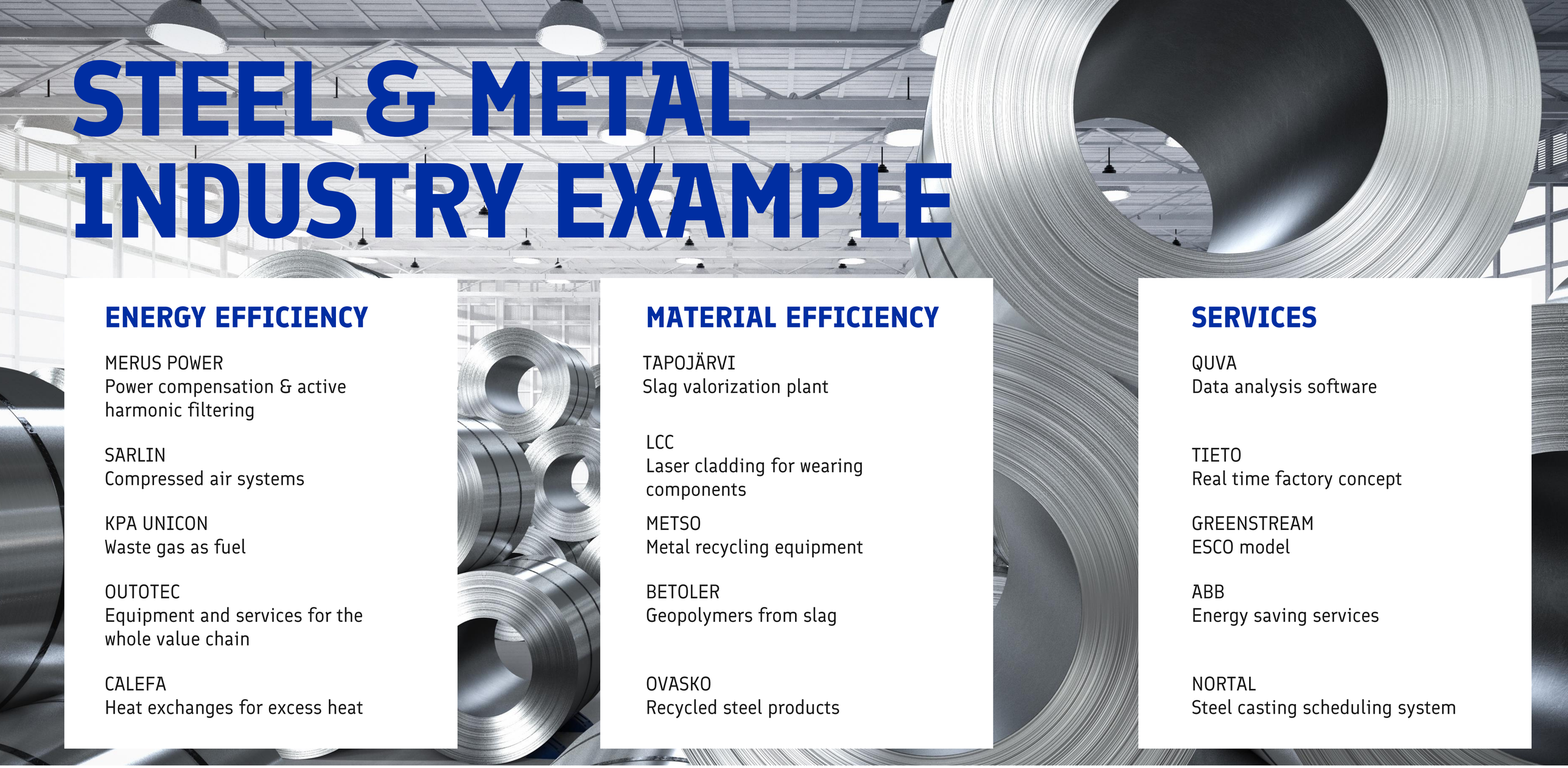
- Slag valorization plants
- Sustainable geopolymers
- Animal by-product rendering
- Tall oil refining
- Clinker additives
- Feedstock & fuel handling
- Bio ash granulators
- Biomethane & fertilizers
- Cement free construction materials
- Residue derived fuels
- Advanced liquid biofuels

SERVICES

Efficiency of industrial processes

- Data analysis software
- Process optimization
- Consulting
- Energy efficiency improvements
- Digital twin
- Sensors
- Predictive maintenance
- Smart maintenance using AR
- Feasibility studies
- ESCO model
- Robotics
- Turn-key plants
- R&D
- Automation & digitalization
- IoT platforms
- Real time factory concept
- Energy & material audits

STEEL & METAL INDUSTRY EXAMPLE



ENERGY EFFICIENCY

MERUS POWER
Power compensation & active harmonic filtering

SARLIN
Compressed air systems

KPA UNICON
Waste gas as fuel

OUTOTEC
Equipment and services for the whole value chain

CALEFA
Heat exchanges for excess heat

MATERIAL EFFICIENCY

TAPOJÄRVI
Slag valorization plant

LCC
Laser cladding for wearing components

METSO
Metal recycling equipment

BETOLER
Geopolymers from slag

OVASKO
Recycled steel products

SERVICES

QUVA
Data analysis software

TIETO
Real time factory concept

GREENSTREAM
ESCO model

ABB
Energy saving services

NORTAL
Steel casting scheduling system

PULP & PAPER INDUSTRY EXAMPLES

ENERGY EFFICIENCY

ENVIROBURNERS
Waste gas as fuel

ALTUM TECHNOLOGIES
Fouling control

NIRAFON
Acoustic cleaning

VALMET
Turn-key plants and services for the whole value chain

CLEAN STEEL
Smart blasting for cleaning boilers

MATERIAL EFFICIENCY

PROMETEC
Pulp chip sampling

FORCHEM
Tall oil refining

ECOPROTECH
Pulp mill sludge digestion

TECWILL GRANULATORS
Bio ash granulators

UPM & ST1
Advanced liquied biofuels from P&P residues

SERVICES

PINJA
Energy efficiency improvements

EFORA
Smart maintenance using AR

INDMEAS
Fibre efficiency services

TRIMBLE
Process data analytics

TEKNOSAVO
Optimization services

FOOD & BEVERAGE INDUSTRY EXAMPLES

ENERGY EFFICIENCY

OILON
Industrial heat pumps

SAVOSOLAR
Solar thermal systems

LOGSTOR
Insulation systems

AURELIA TURBINES
Micro turbines

KONTRAM
Process monitoring instruments

MATERIAL EFFICIENCY

RECOMILL
Animal by-product rendering

WATREC
Brewery waste to biomethane & fertilizers

DORANOVA
Abattoir & greenhouse waste to biomethane & fertilizers

DUCTOR
Poultry waste to biomethane & fertilizers

METENER
Food industry waste to biomethane & fertilizers

SERVICES

INSTA
Automation and digitization

ADVEN
Energy as a service from industrial by products

PROCESS GENIUS
Digital twin IoT service

ELOMATIC
Energy & material audits

CAVERION
O&M and process development

REFERENCE CASES

CASE COFFEE ROASTERY, PAULIG

- 1000 apartment heated by excess heat recovery
- Recovered heat to Helsinki district heating system
- Biogas in roasting processes since 2015 with 90% GHG reduction (2700 t/a)
- More heat pumps planned to make heat recovery even more efficient. This supports carbon neutral district heating system target.

CASE DATA CENTER AND LOCAL DISTRICT HEATING COMPANY

- As a result, carbon neutral district heating network
- Europe´s fastest supercomputer will heat up homes in the city of Kajaani
- 20% of the district heat can be covered by the waste heat recovered from the data center
- Main fuel of the district heating is sawmill residue, the recovered heat will decrease the use of peat

REFERENCE CASES

CASE CEMENT FACTORY, FINNSEMENTTI

- Target to have industrial scale pilot plant to produce carbon neutral synthetic fuels for transportation sector
- CO2 capture from the cement factory combined with H2 side stream from a near-by chemical factory
- R&D&I project going on to investigate the feasibility of P2X technologies
- Participants include Lappeenranta University of Technology, Finnsementti, Kemira, Wärtsilä, St1, Neste, Finnair, Shell

CASE LIMESTONE INDUSTRY, NORDKALK

- All rotary kilns equipped with heat recovery set-ups
- 72 000 MWh of district heating delivered to local communities in 2019 (equivalent to 7,2 million litres of heating oil)
- At Vampula grinding plant, 72% of heating oil was replaced by locally produced biogas in 2019
- Up and coming: Energy storage with lime, Nano Coated Salt (NCS) to store energy thermo-chemically. The capacity of full scale will be 10,000 t of NCS which is equivalent to 4,000 MWh of thermal energy storage

REFERENCE CASES

CASE BIOREFINERY, METSÄ FIBRE

- 20 % of the income from other products than pulp (chemicals, bioenergy)
- Electricity self sufficiency 240 %
- 1,3 Mt capacity, 6,5 Mm3 fiber usage
- No fossil fuel consumption
- Up and coming: Innovative bioproducts scale-up (textiles, biocomposites, lignine products)

CASE FOSSIL-FREE STEEL FACTORY, SSAB

- As a result, 7% of Finland´s CO2 emissions could be eliminated
- Target is fossil-free steel production by 2026
- 90% of CO2 emissions is caused by iron production process
- Coke to be replaced with hydrogen in iron ore production process
- SSAB Raahe mill is used as a pilot plant; VTT and Oulu University are part of the investigation