

**BUSINESS  
FINLAND**

# **SMART ENERGY**

**Energy and Resource Efficiency**

**FINLAND**





# BACKGROUND

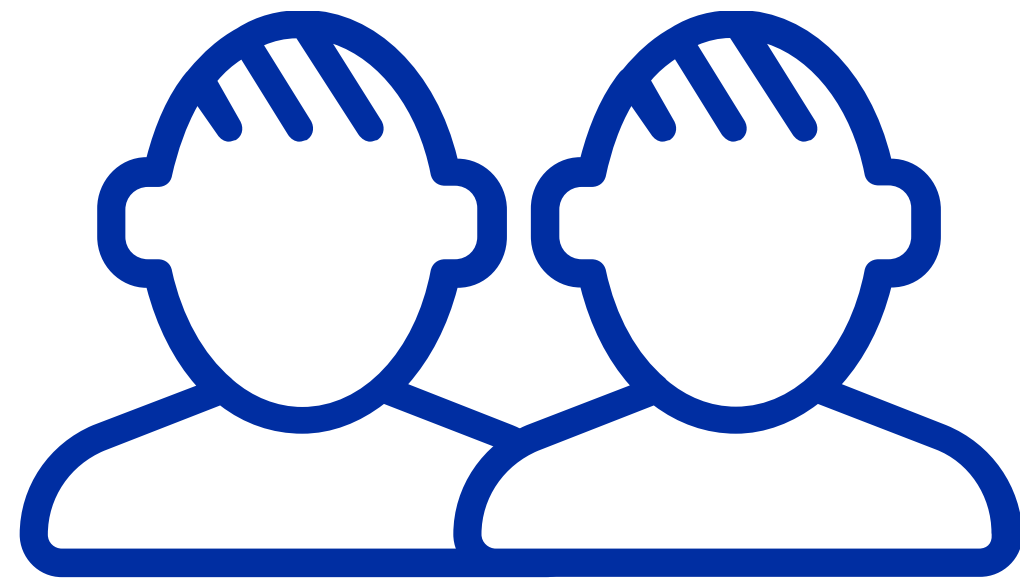
- In EU, net-zero greenhouse gas emissions by 2050
- Energy efficiency part of EU climate policy
- Energy efficiency is part of Finland's national climate policy
  - Reduce the amount of energy required to produce services and products
  - Improved energy efficiency reduces CO2 emissions and energy consumption
  - 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

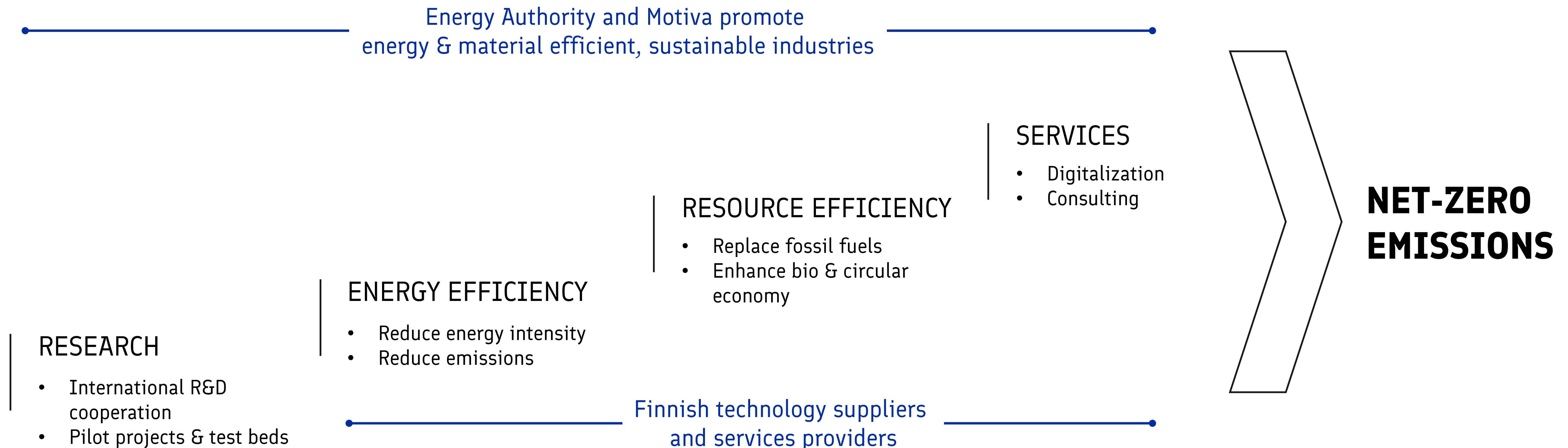
50 Mt

CO<sub>2</sub> emissions reduced with energy efficiency agreements since 1997

200M€

Energy efficiency savings during 2017-2018

# FINLAND OFFERS SOLUTIONS TOWARDS NET-ZERO GHG EMISSIONS



# INDUSTRIAL ENERGY EFFICIENCY

Reducing energy intensity & emissions of industrial processes

Industrial heat pumps

Waste gas burner

Flue gas cleaning & CO<sub>2</sub> capture

ORC

Microturbines

Air compressor system

Cleaning solutions for heat transfer surfaces

Insulation solutions

Solar thermal system

Automation & electrification

Valves

**oilon**

**VED**

**CALEFA**

**CALIGO**  
CLEAN EFFICIENCY

**kpa unicon**

**enviroburners**

**LOGSTOR**

**AURELIA**

**CarbonReUse**

**Outotec**

**SAALASTI**

**Tamturbo**

**NIRAFON**

**Clean Steel**

**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

 **Raumaster**

TRACEGROW  
grow with us

 **Savosolar**

**forchem**  
RESPOL GROUP

**CROSS WRAP®**  
WRAPPING THE WORLD

 **APILA**  
G R O U P

**TANA**  
From Waste to Value®

**NESTE**

**TAPOJÄRVİ**

 **Prometec**

 **DORANOVA**

**SARLIN**

 **LCC**

**TAMTRON**

**INRAY**

**EcoPROTECH**

 **UPM**

 **metso**

**OVAKO**

 **Nordkalk**

 **Tecwill**  
Granulators

***Watrec***

**ST1**

**BETOLAR**

 **fortum**

**Outotec**

**kemira**

**SOIL  
FOOD**

 **DUCTOR®**



# 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

### 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

## SERVICES

### MERUS POWER

Power compensation & active harmonic filtering

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Heat exchanges for excess heat



# 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

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## 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.

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## 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

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## 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

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## 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