HighEFF

# Centre for an Energy Efficient and Competitive Industry for the Future

## Knowledge - Friendship - Teamwork

FME FORSKNINGS-SENTER FOR MILJØVENNLIG ENERGI
Norges forskningsråd

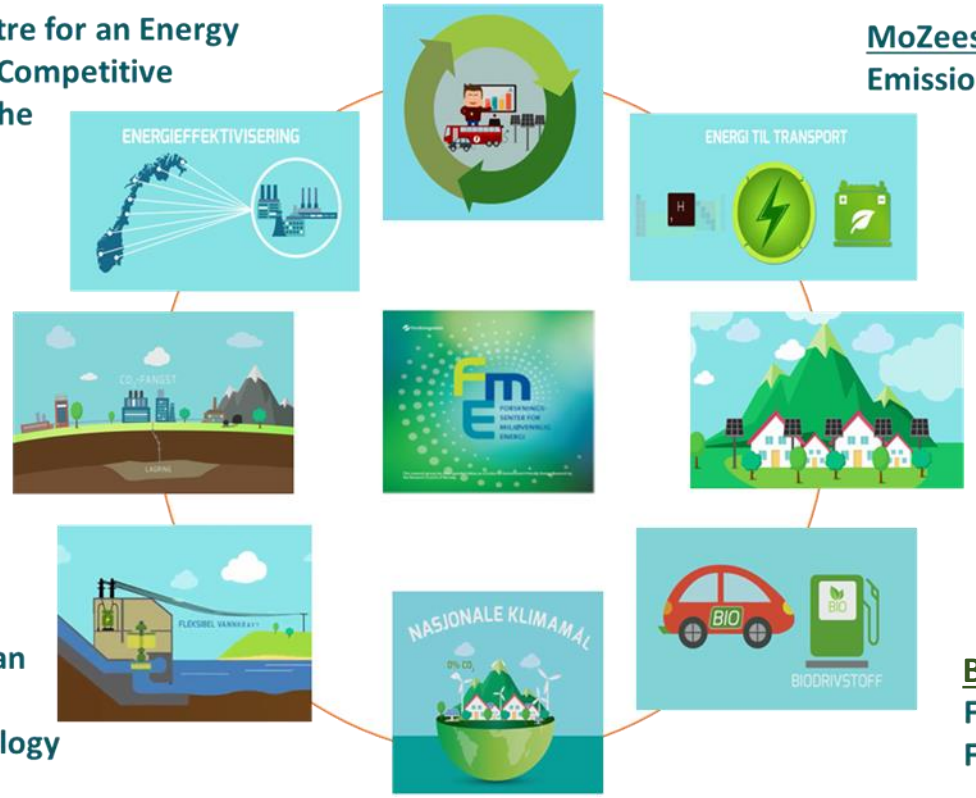
Symposium on SDG 7 Energy, Oslo October 19, 2017
Nina Dahl, Research Director, SINTEF

# Centres for Environmental-friendly Energy Research

**CINELDI**: Centre for Intelligent Electricity Distribution

**HighEFF**: Centre for an Energy Efficient and Competitive Industry for the Future

**MoZees**: Mobility Zero Emission Energy Systems




**NCCS**: Norwegian CCS Research Centre

Research Centre for Sustainable Solar Cell Technology

**HydroCen:** Norwegian Research Centre for Hydropower Technology

**Bio4Fuel:** Norwegian Centre For Sustainable Bio-based Fuels and Energy

**ZEN**: The Research Centre on Zero Energy Neighbourhoods in Smart Cities

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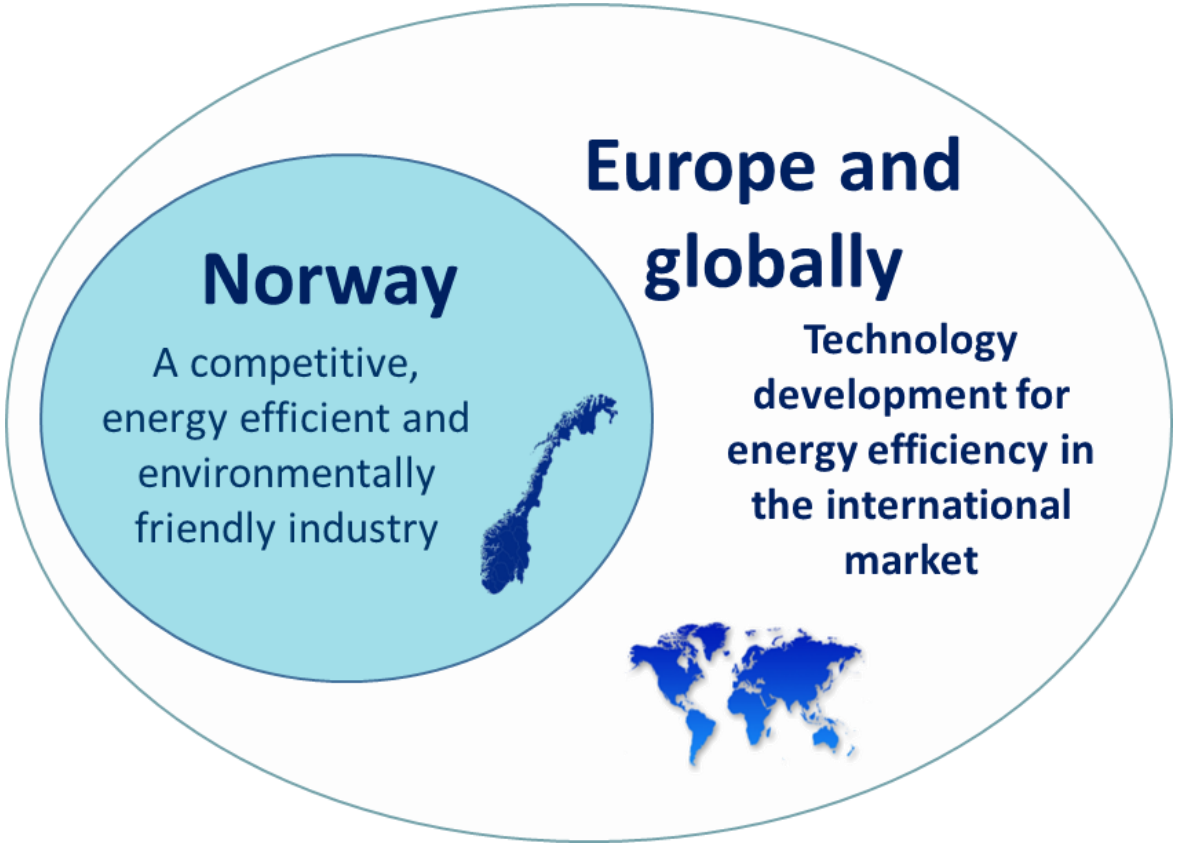
# HighEFF Vision

Joint effort for creating a competitive, energy efficient and environmental friendly industry for the future

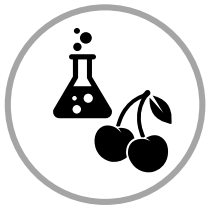


# HighEFF want to be a valuable contributor

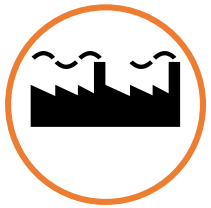
# HighEFF Objective

## By increasing energy efficiency, HighEFF will help ensure that Norway has the worlds greenest industries

- **20%-30% reduction in energy consumption**
- **10% reduction in greenhouse gas emissions**
- **Increased value creation in Norway**
- **Energy efficient processes and components**
- **A competitive Norwegian industry**



Food and chemical



Industryclusters

Metal and material

Oil gas and energy

CENTRE FOR ENVIRONMENT-FRIENDLY ENERGY RESEARCH

The Research Council of Norway

# HighEFF – some metrics

**Largest effort in supporting research, development and innovation**

**To structure the research**

- 44 partners
  - 27 industry partners
  - 17 academic partners
- 2016-2024
- 22 PhD / Post docs
- ~420 MNOK total budget
- SINTEF is the Center Host

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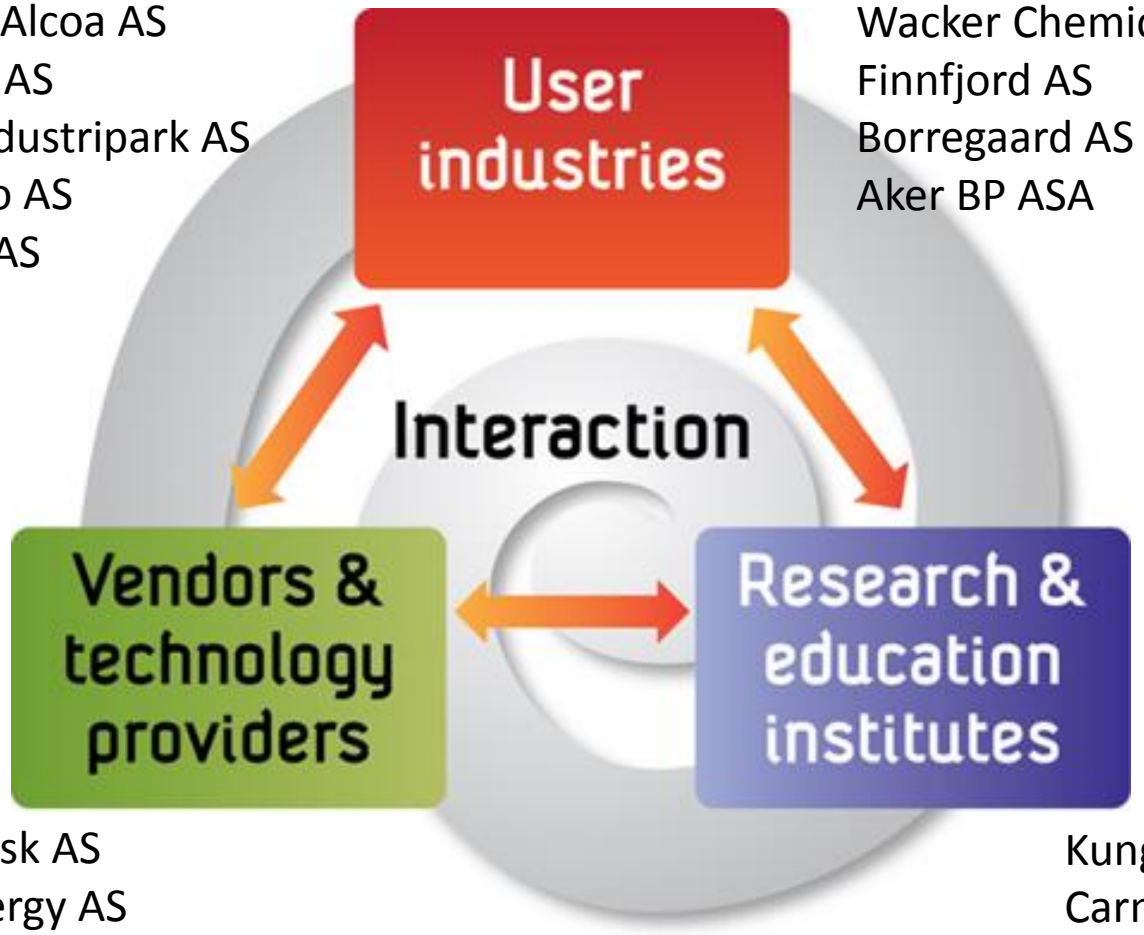
Norges forskningsråd

HighEFF

Statoil Petroleum AS
Hydro Aluminium AS
Rema 1000 i Norge AS
Eramet Norway AS
Norsk Alcoa AS
Elkem AS
Mo Industripark AS
Gassco AS
Orkla AS

Marine Harvest ASA
Glencore Nikkelverk ASA
Alfa Laval Corp AB
TINE SA

Bulk Infrastructure AS
Glencore Manganese Norway AS
GE Power Norway AS
Vedde AS
Wacker Chemicals Norway AS
Finnfjord AS
Borregaard AS
Aker BP ASA




Danfoss AS
EPCON AS
Officine Mario Dorin
Parat Halvorsen AS
Mayekawa MFG Co., Ltd

SINTEF Energi
Norges teknisk-naturvitenskapelige universitet, NTNU
SINTEF Materials and Chemistry
Stiftelsen TEL-TEK
NTNU Samfunnsforskning
Nord Universitet
SINTEF Ocean

Kuldeteknisk AS
Hybrid Energy AS
Cadio AS
Cronus Technology AS
OTECHOS AS

Kungliga Tekniska Högskolan, KTH
Carnegie Mellon University
The University of Manchester
Shanghai Jiao Tong University
AIT Austrian Institute of Technology
Doshisha University

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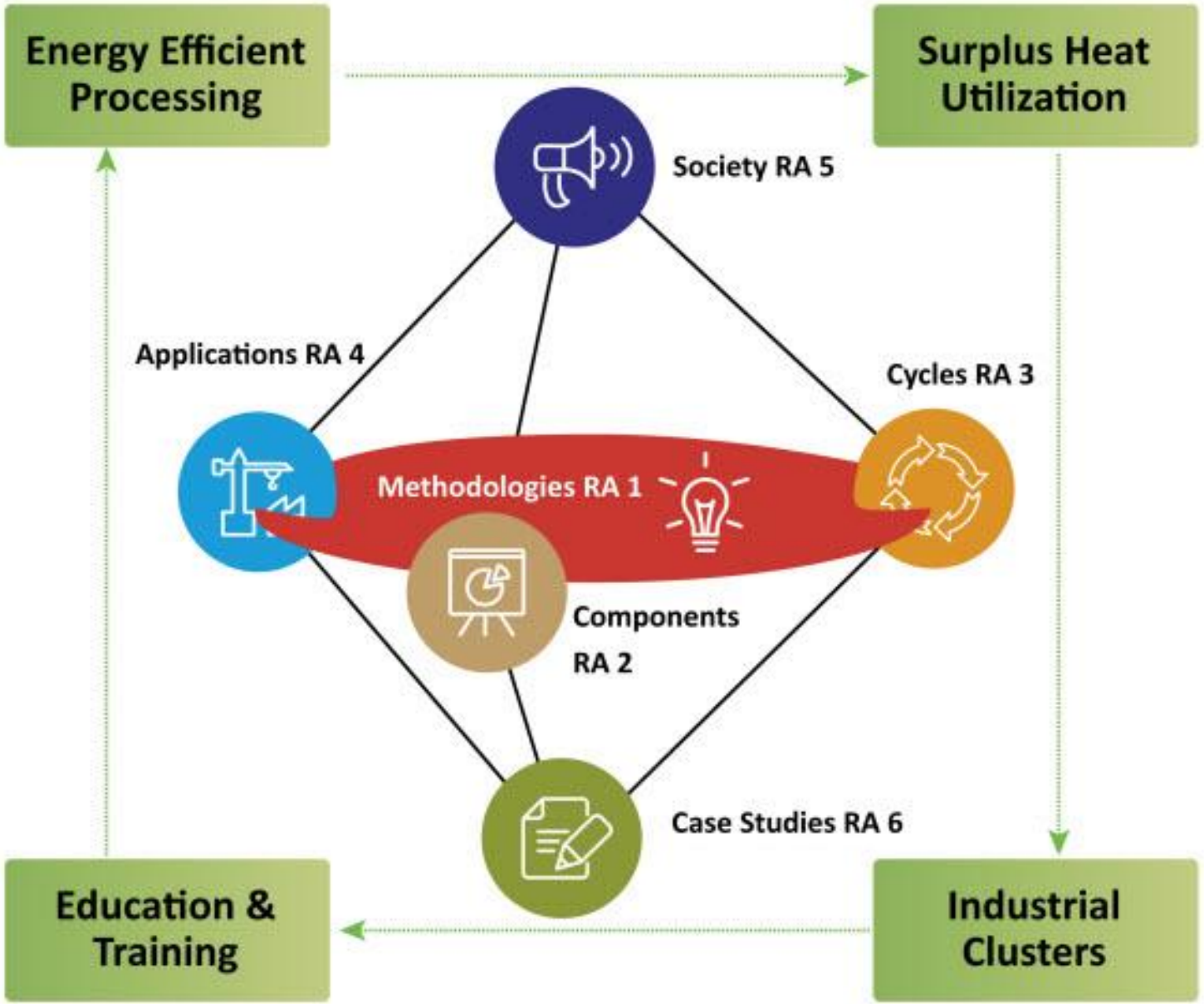
The Research Council of Norway

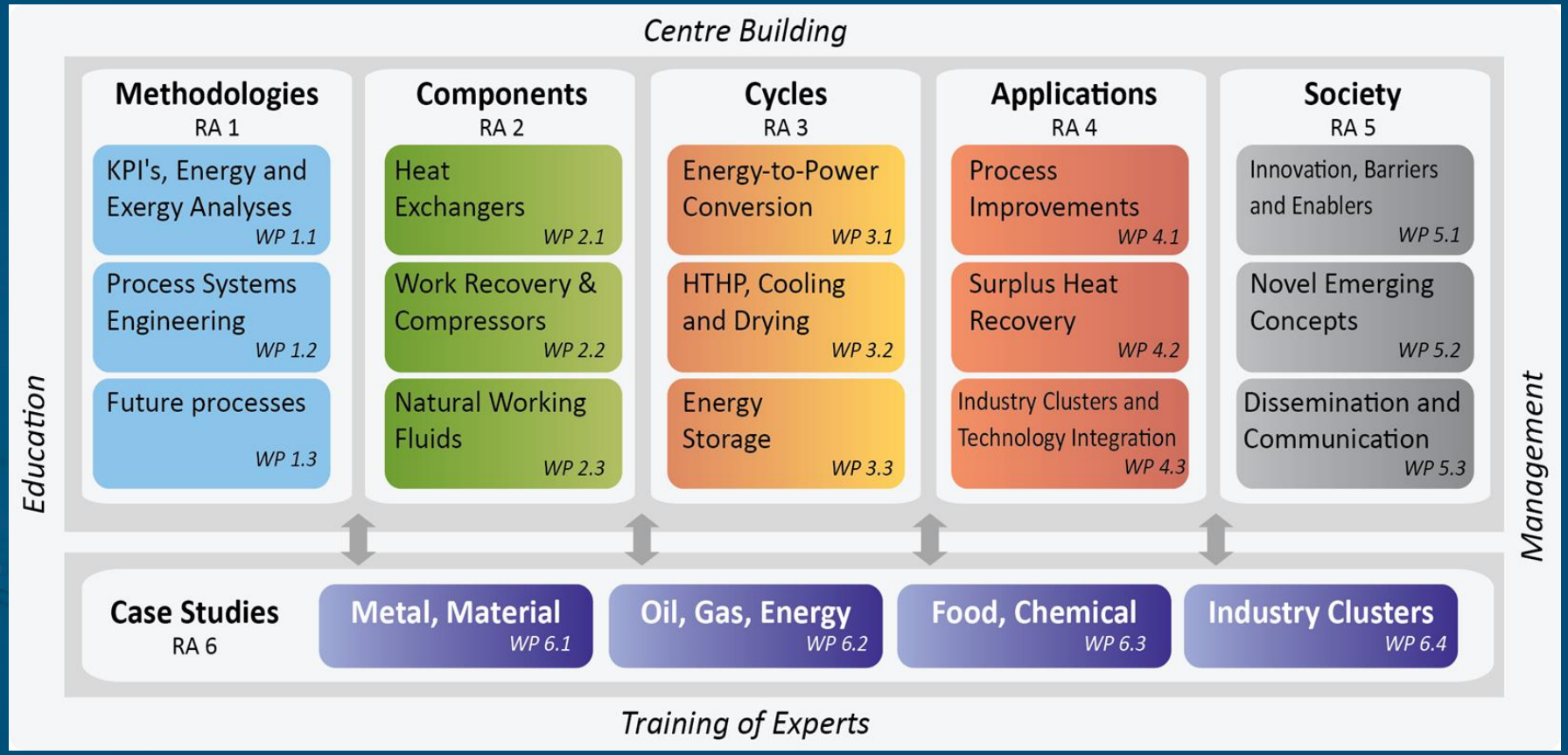
**Enablers**
ENOVA
Innovasjon Norge

# "The HighEFF approach"



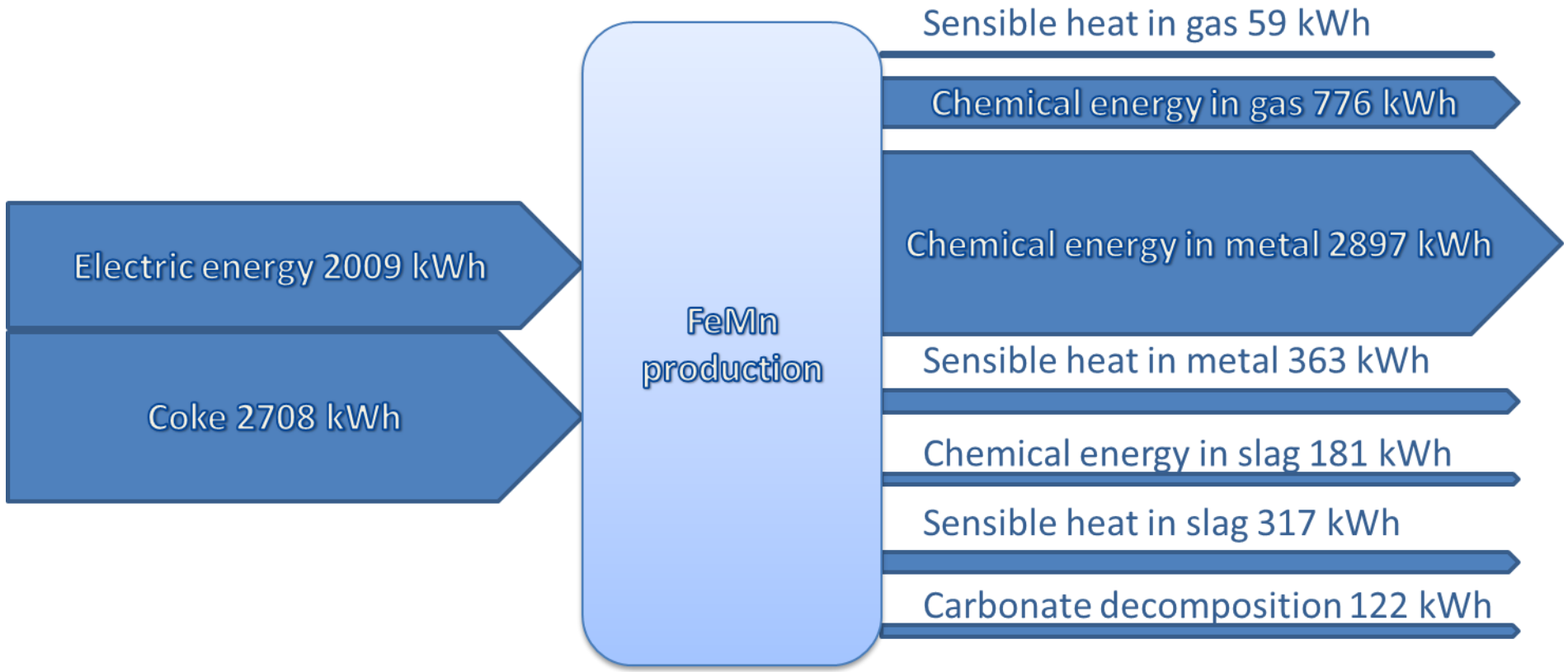

RA = Research Area

# WBS – cross sectoral and interdisciplinary




WP = Work Package

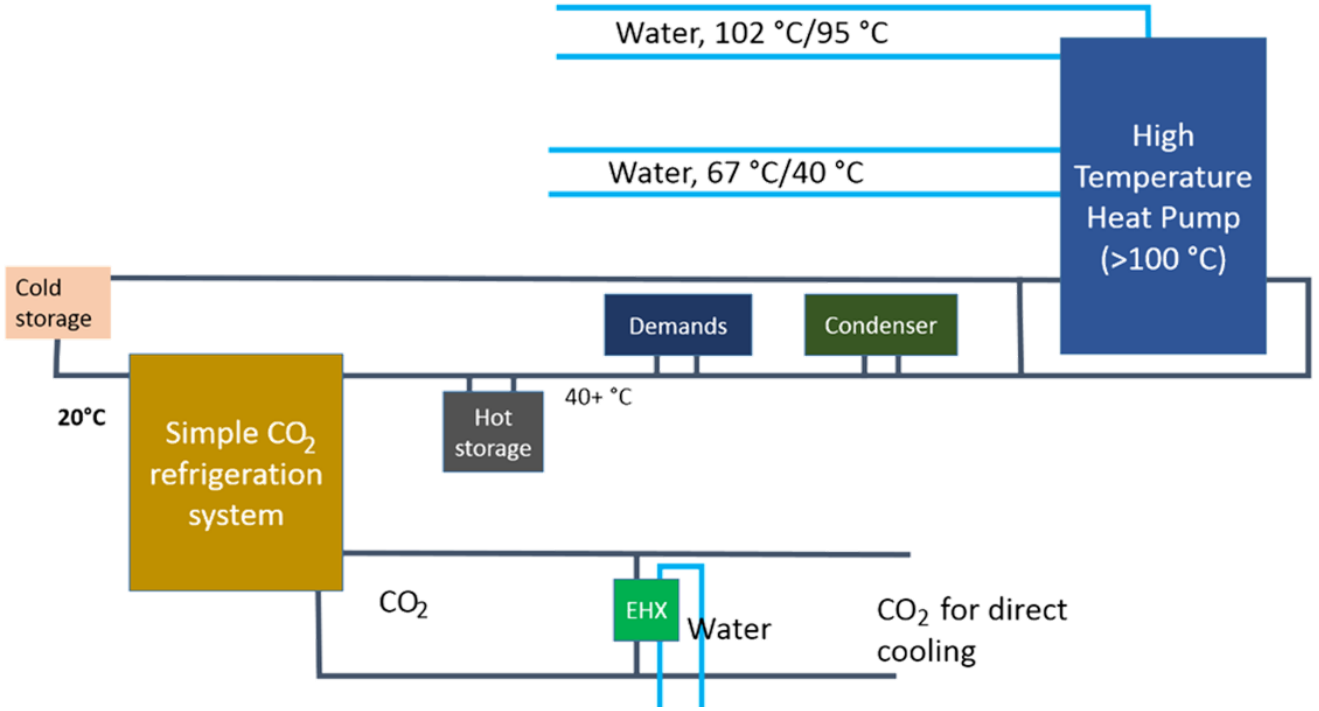
# Example Energy flow in Mn-alloy production




- Energy consumption vary with raw material properties and temperature and furnace operation
- Losses of metal will increase specific energy consumption

Source: M. Tangstad, Metal Production in Norway

# Example Novel Dairy Energy System with HTHP




Eight different energy solutions for a new dairy are compared. The dairy will have heat and cold demands at three and two temperature levels respectively for building, storage and processes. The findings are based on hourly demand for an entire year.

Source: www.higheff.no

# Example Novel Dairy Energy System with HTHP

**35%**

less need for district heating

**48%**

lower electricity demand

**47%**

less $CO_2$-equivalents

The solutions included direct and indirect cooling and heating with $CO_2$ and the use of a high temperature heat pump (HTHP), either a propane/butane cascade or a hybrid heat pump.

Today's standard solution, cooling with $CO_2$ without using the surplus heat, and heating with electricity and district heating formed the foundation for comparison and potential for improvement.

Source: www.higheff.no

# Centre Management Team

**Centre Manager**
SINTEF

**Petter E. Røkke**
Research Director

**Scientific Leader**
NTNU

**Truls Gundersen**
Professor

**Scientific Coordinator**
SINTEF / NTNU

**Petter Nekså**
Chief Research Scientist/Professor

**Centre Coordinator**
SINTEF

**Line Rydså**
Research Manager

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# Thank you all for listening!


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