



# **ENERGY FROM UNTAPPED RESOURCES**

WASTE-TO-ENERGY / BIOENERGY / ENERGY EFFICIENCY

Michael Becidan, PhD

Senior Research Scientist, SINTEF Energy Research

# SINTEF: Scandinavia's largest independent research organization

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NOK 3,2 billion  
Revenues

NOK 500 MILL  
International sales

# Applied research, technology and innovation

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Renewable energy



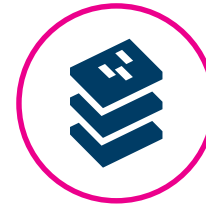
Ocean space



Industry



Buildings and  
infrastructure



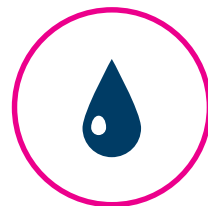
Materials



Micro-, nano- and  
biotechnology



Climate and environment



Oil and gas



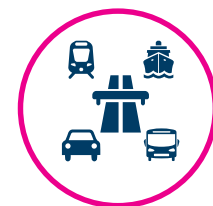
Health and welfare



Society



ICT

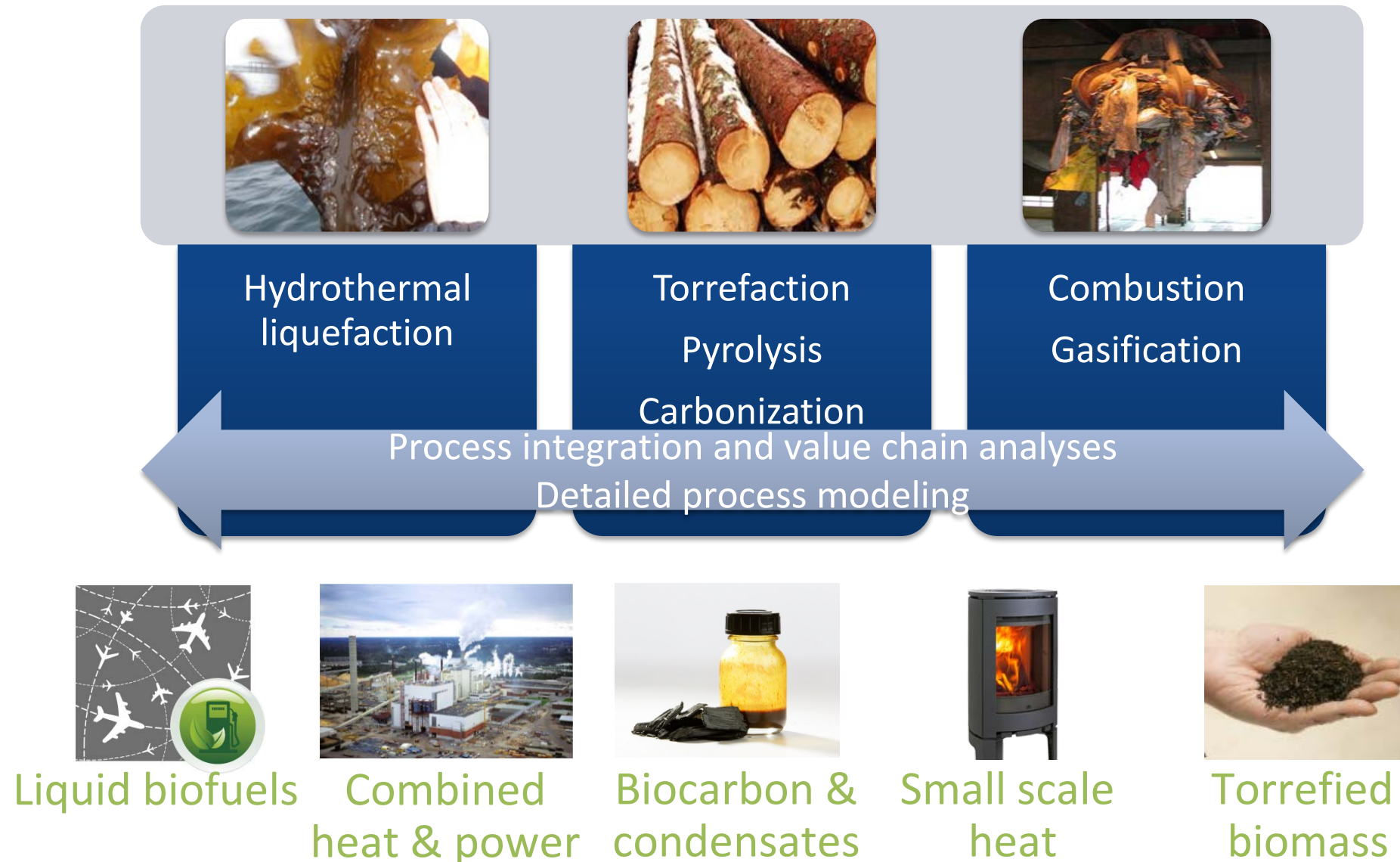


Transport



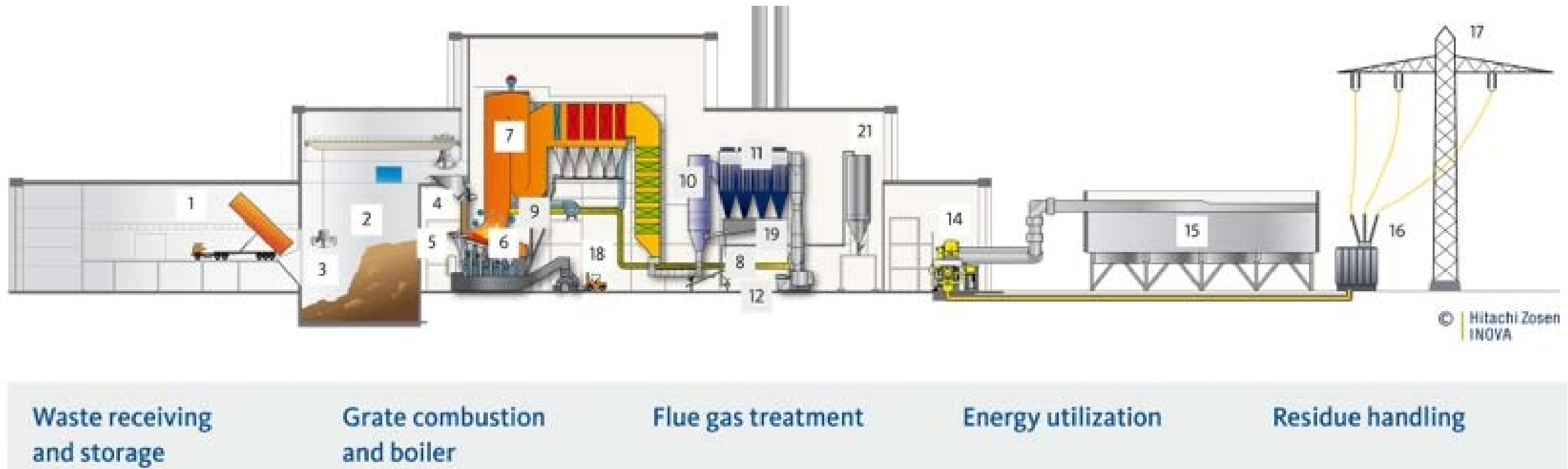
# SINTEF Energy Research - We shape energy solutions for the future

About our biomass and waste to energy expertise



# Waste-to-Energy (WtE)

- Modern WtE: waste combustion with energy production and gas cleaning



# Waste management in Norway

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- 5.2 million inhabitants thinly spread (14 hbts/km<sup>2</sup>), difficult topology
- **High levels of material and energy recovery (35 & 40%)**
- 1.7 Mtons municipal waste processed in 17 plants (+36% since 2010)
- Main product: district heat
- Norwegian actors at the forefront, e.g. EGE Oslo (the capital city) with
  - (1) optical sorting of waste
  - (2) biogas (for transport) from food waste
  - (3) WtE (district heat mainly)
  - (4) Carbon Capture Storage (CCS) development

# WtE - advantages

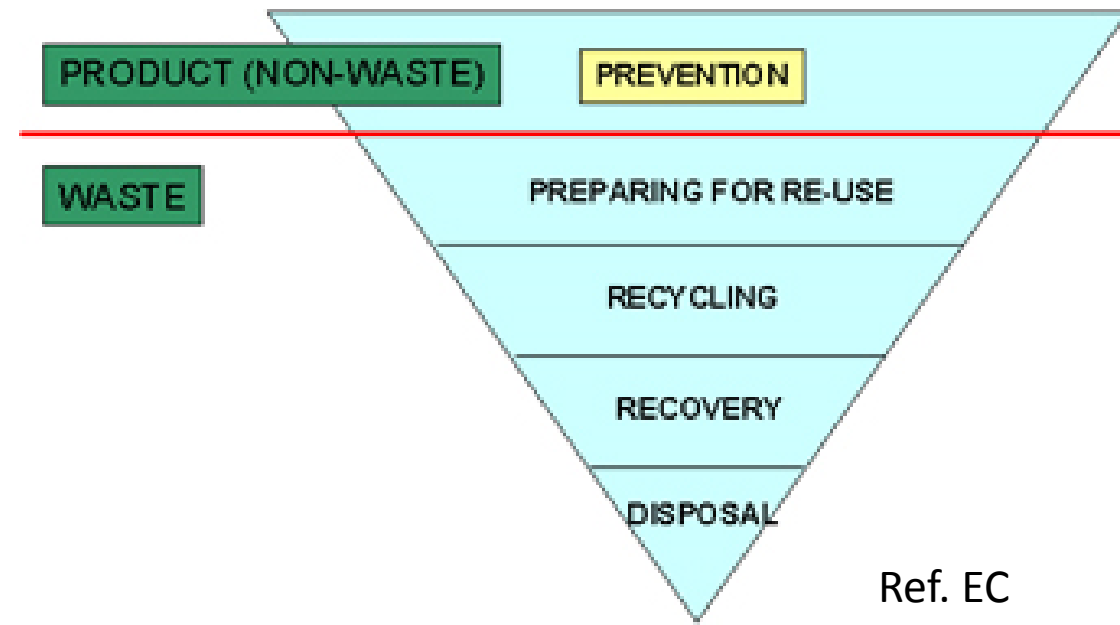
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- Known, robust technology
- Feedstock is available
- Local, renewable energy = security of supply + less dependence on fossil fuels
- Climate change mitigation (reduced CO<sub>2</sub> emissions)
- Complementary to material recycling
- Valuable metals and minerals
- Energy production but also destruction of unhygienic material
- 400-700 kWh electricity per ton municipal waste (EU) - current consumption in Indonesia ca. 680 kWh/inhbt



# WtE - Challenges

- What is "waste"?
- Logistics (collection, etc.)
- Gaseous emissions and ash residues to be properly managed
- Education & public perception
- Requires proper legislation – WtE should not replace material recycling
- Operational challenges
- Energy efficiency
- R&D: see nest slides...





# Current SINTEF R&D projects

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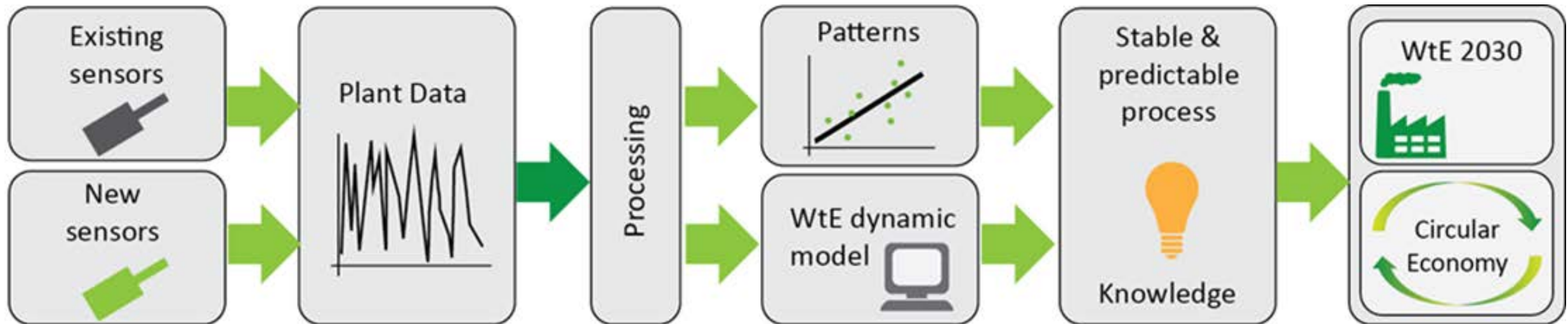
WtE can be improved in terms of energy, environment and economy!



1. SINTEF is now starting a modelling R&D project ("GrateCFD") co-financed by the Research Council of Norway and industry partners  
→ The goal is **to enable optimum plant operation**
2. We are also working with technology providers to develop **innovative small-scale solutions for WtE** – especially adapted to island communities and decentralized energy production

# Other R&D initiatives

- "WtE 2030" project proposal - Extract more energy from less waste by optimisation of energy efficiency and by **harnessing existing WtE capacities:**



# Bioenergy

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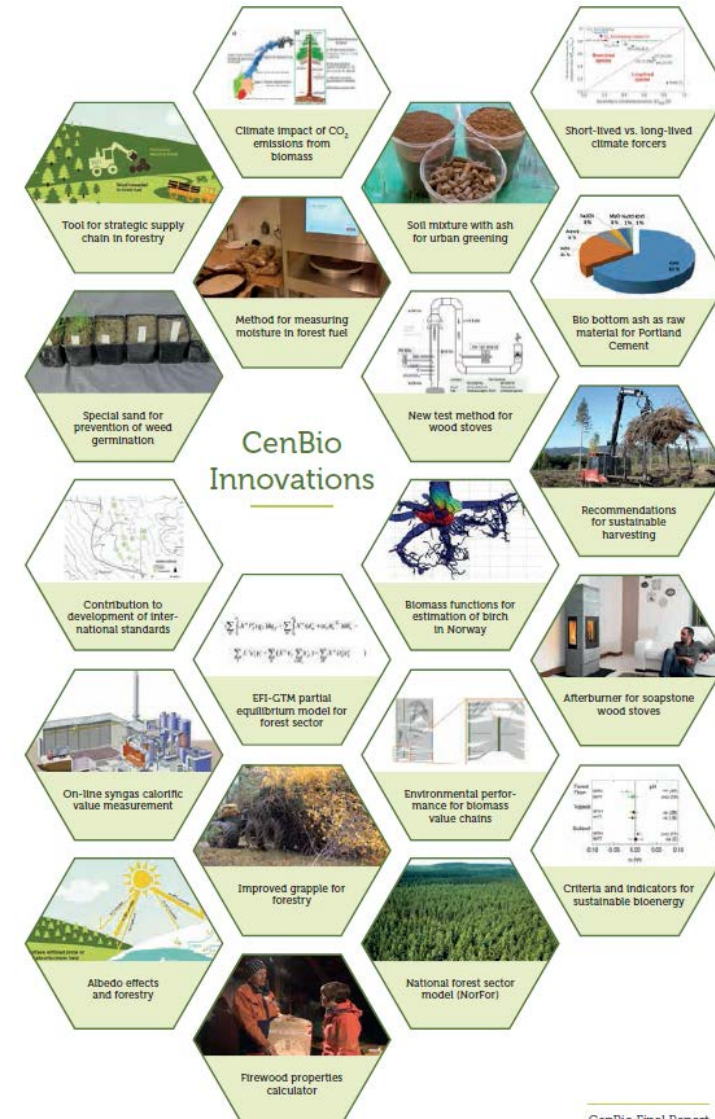
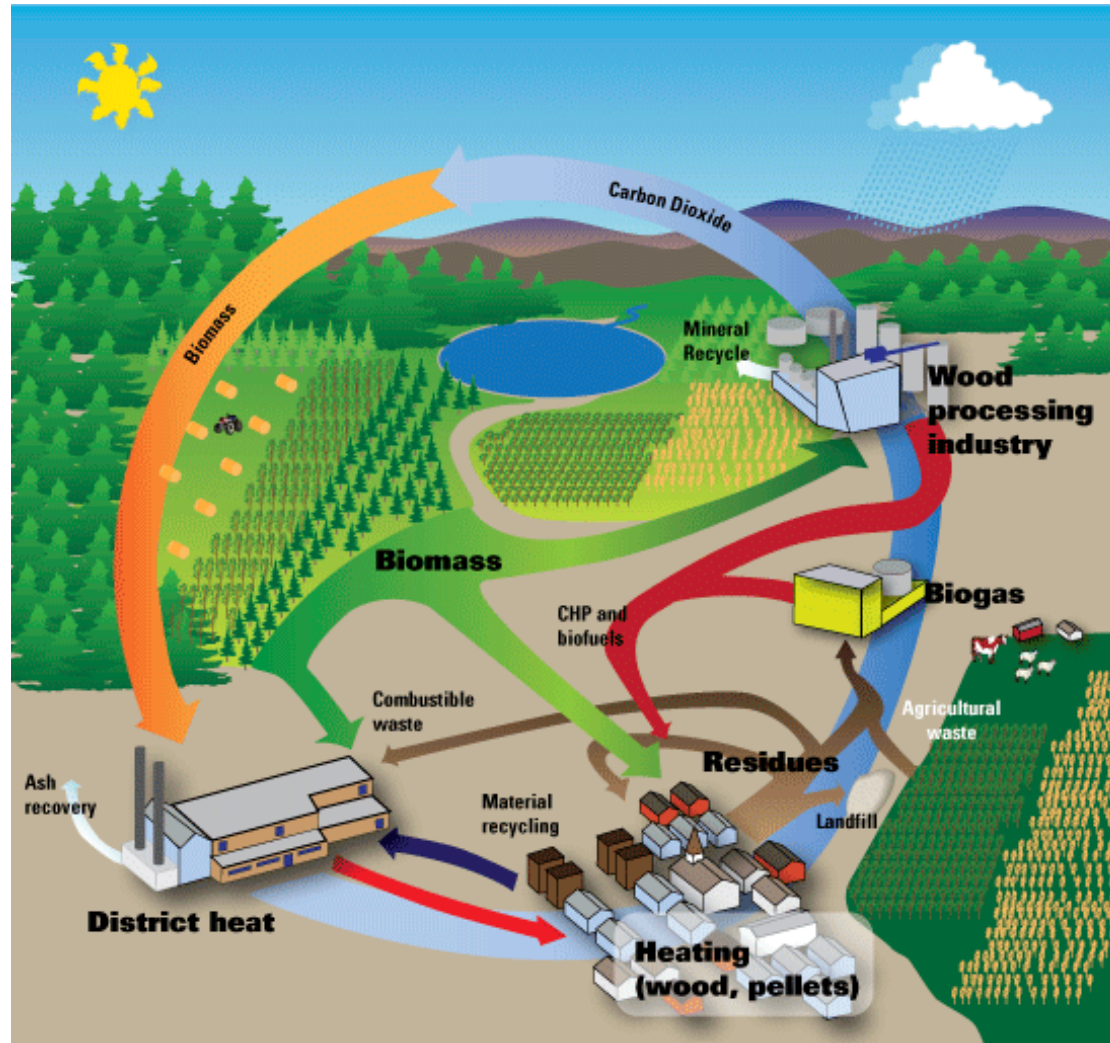
1. **Stationary bioenergy** - combustion of biomass to produce heat/cooling and/or power
  2. **Biofuel** (for transport) production
- **Bioenergy is the largest renewable energy source** in the EU (and the rest of the world) – and is likely to remain so in the near future
  - BUT it must be done in a **sustainable manner**
  - How? A promising possibility – not the least for Indonesia - is to use **biomass residues** (agriculture, forest, sludge) and new feedstocks (e.g. aquatic biomass)



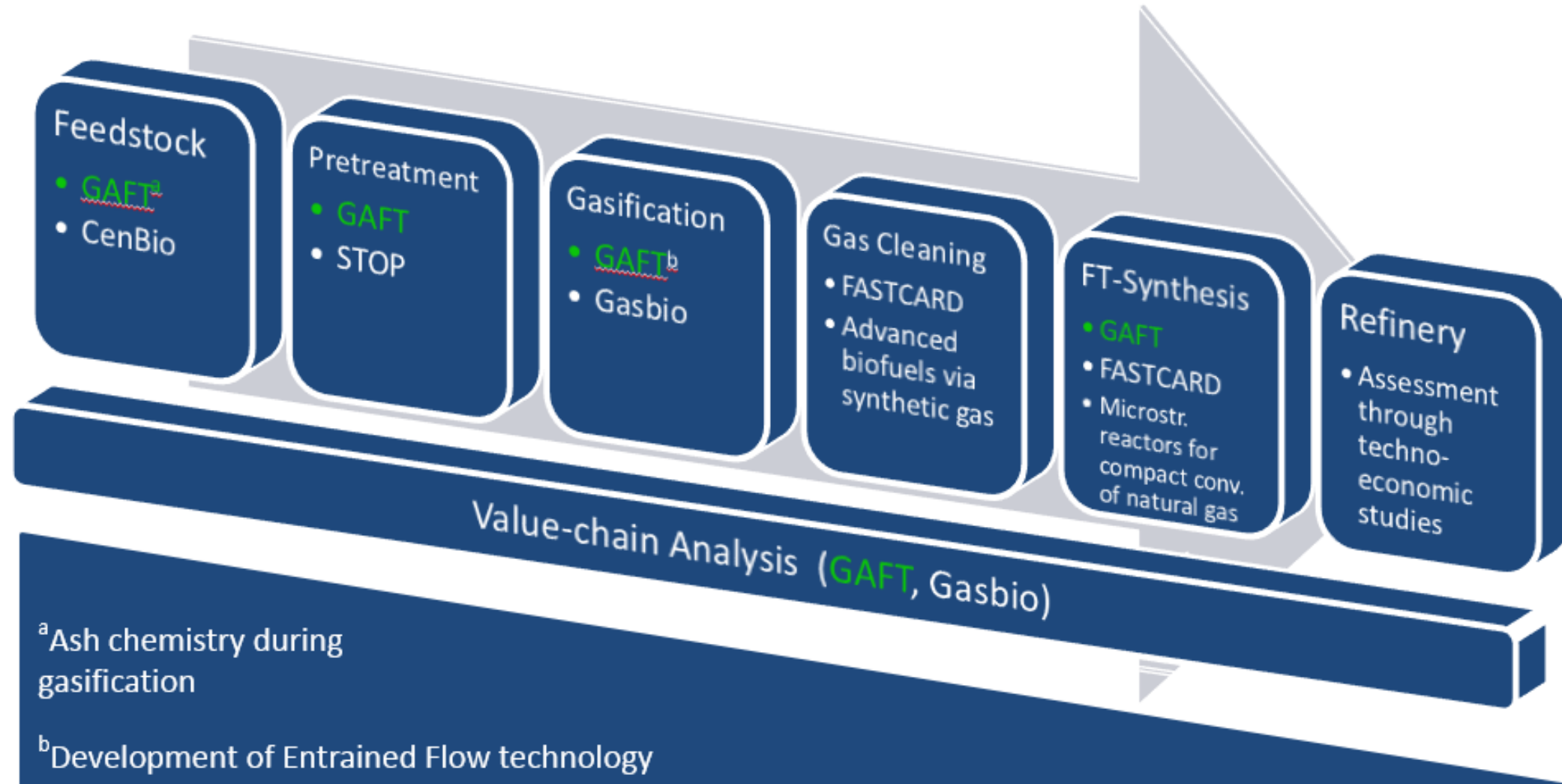


# Current R&D projects: CenBio

- To enable sustainable & cost-efficient bioenergy industry in Norway
- 7 R&D partners & 17 industry partners



# Current R&D projects: GAFT





# Energy Efficiency

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- Focusing on **industry**, the main aspects will be:
  - Energy efficient processing
  - Surplus heat utilisation
- Energy, climate/environment and competitiveness are tightly intertwined
- Large potential in existing industries => low hanging fruits



Ref. SINTEF

# Current SINTEF R&D project

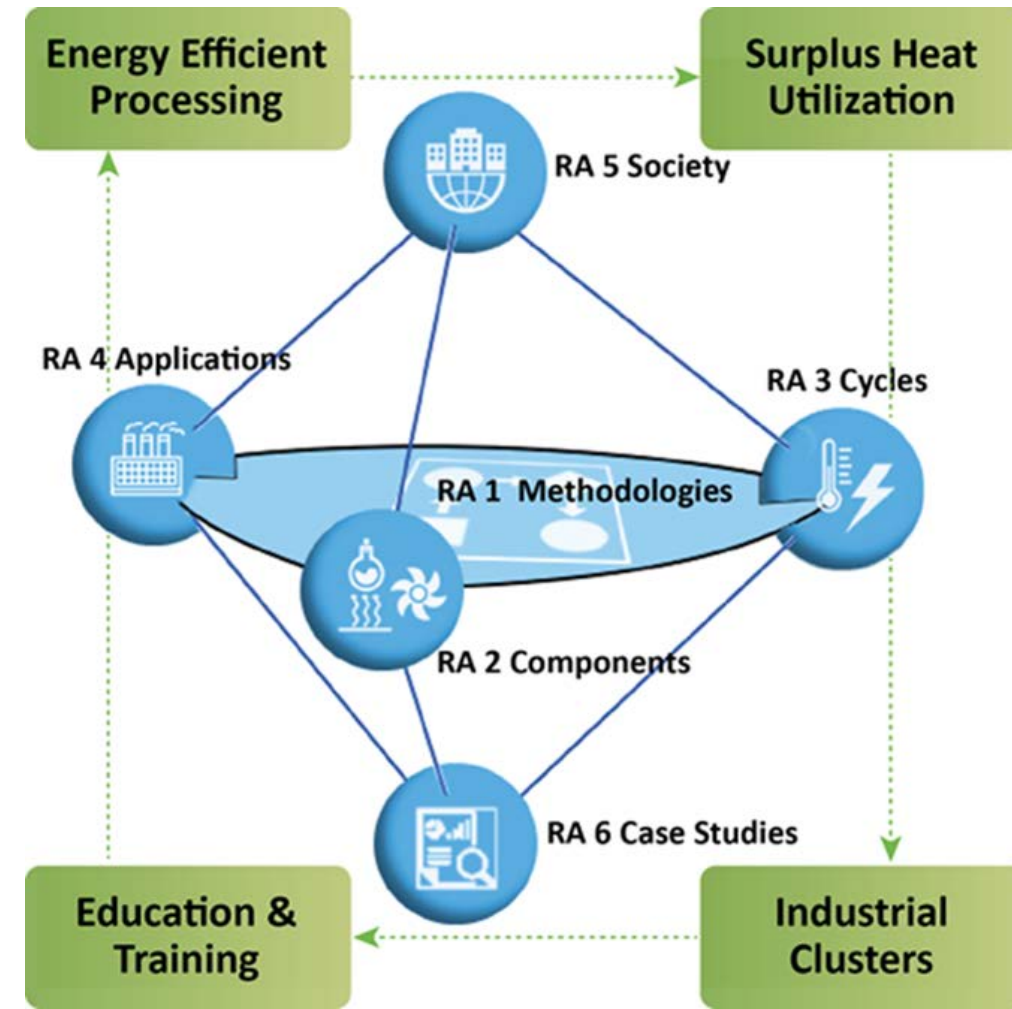
- HighEff - Centre for an Energy Efficient and Competitive Industry for the Future

- Goals:

- **20-30 % reduction in specific energy use**
- **10 % reduction in greenhouse gas emissions**

- Key data:

- Coordinated by SINTEF
- 50 partners, e.g. GE Power, Statoil, Alcoa, Hydro
- 2016-2024, 50 M US\$



# Last thoughts...

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- **Large potential for renewable energy** in municipal waste, biomass residues as well as energy efficiency improvements in the industry
- Important to **define what the goal(s) and priority(ies)**: more energy, reduced costs, new revenues, climate change mitigation, industrial development, new industrial value chains, "zero-waste", etc.
- **Learn from other's** experience (read *mistakes*)
- **SINTEF is open to new R&D projects & new partners!**

Thank you for your attention!  
Any questions?

[michael.becidan@sintef.no](mailto:michael.becidan@sintef.no)

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Technology for a better society