# Bioenergy experiences from Finland

# Finland in short

- Sovereign and democratic state since 1917 (previously part of Russia and Sweden)
- Whole country above 60 degree latitude
- Nordic country, EU member state, NATO member country, Arctic country
- Happiest country in the world 2017-2025
- GDP at purchasing power parity per capita: 66 500 USD (2025)
- 20,3 Mha of forests (75 % of land area), 40 % owned by the government and other public instutions.
- Annual increment ca 100 Mm3, removals and drain ca. 85-90 Mm3/a.

Climate data for Finland [hide]

| Month | Jan | Feb | Mar | Apr | May | Jun | Jul | Aug | Sep | Oct | Nov | Dec | Year |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Record high °C (°F) | 10.9 (51.6) | 11.8 (53.2) | 17.5 (63.5) | 25.5 (77.9) | 31.0 (87.8) | 33.8 (92.8) | 37.2 (99.0) | 33.8 (92.8) | 28.8 (83.8) | 21.1 (70.0) | 16.6 (61.9) | 11.3 (52.3) | 37.2 (99.0) |
| Record low °C (°F) | −51.5 (−60.7) | −49.0 (−56.2) | −44.3 (−47.7) | −36.0 (−32.8) | −24.6 (−12.3) | −7.7 (18.1) | −5.0 (23.0) | −10.8 (12.6) | −18.7 (−1.7) | −31.8 (−25.2) | −42.0 (−43.6) | −47.0 (−52.6) | −51.5 (−60.7) |

# Bioenergy Association of Finland

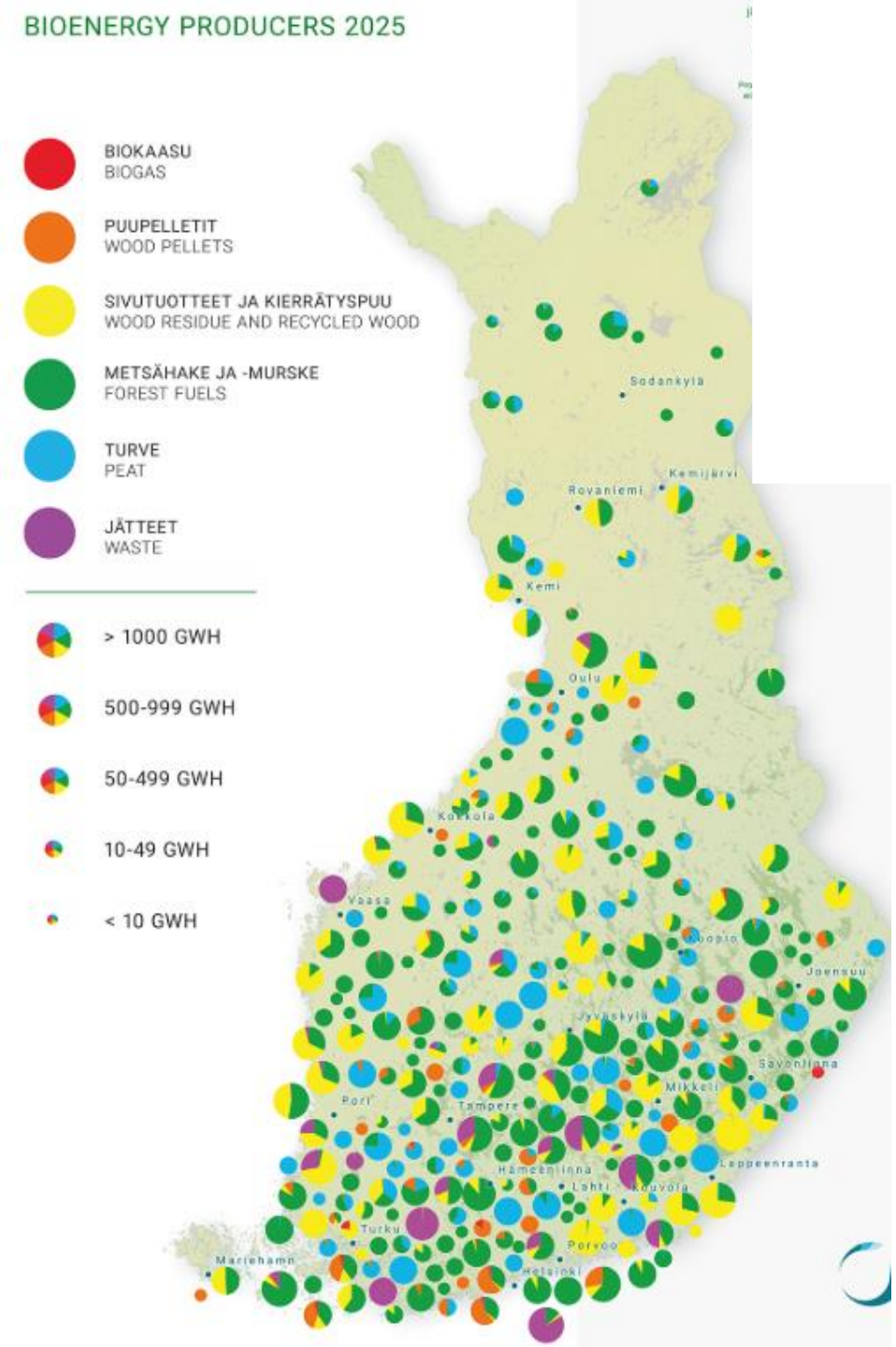
# We provide advocacy, communication and event services for the whole bioenergy sector In Finland.

## 246

Organisation members



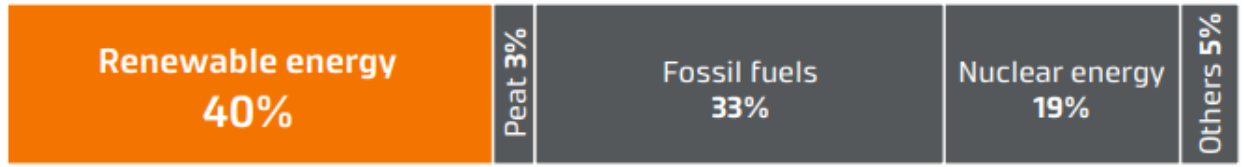

# Bioenergy in Finland is ...



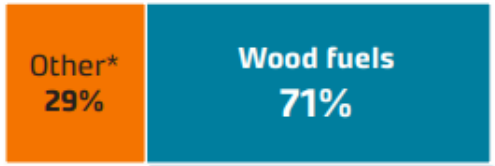

# Many forms of bioenergy energize Finland

- Ca 150 bioenergy plants equal or > 20 MWth (Heat only or CHP)
- Ca 5000 bioenergy plants 100 kW < 20 MWht
- Ca 200 000 bioboilers < 100 kW
- Ca 2 million wood stoves
- Production of biofuels and biogas 6 TWh + ca 5 TWh announced
- Wood pellet production 400 000 tn/a
- Biochar/biocarbon production ca. 70 000 tn/a

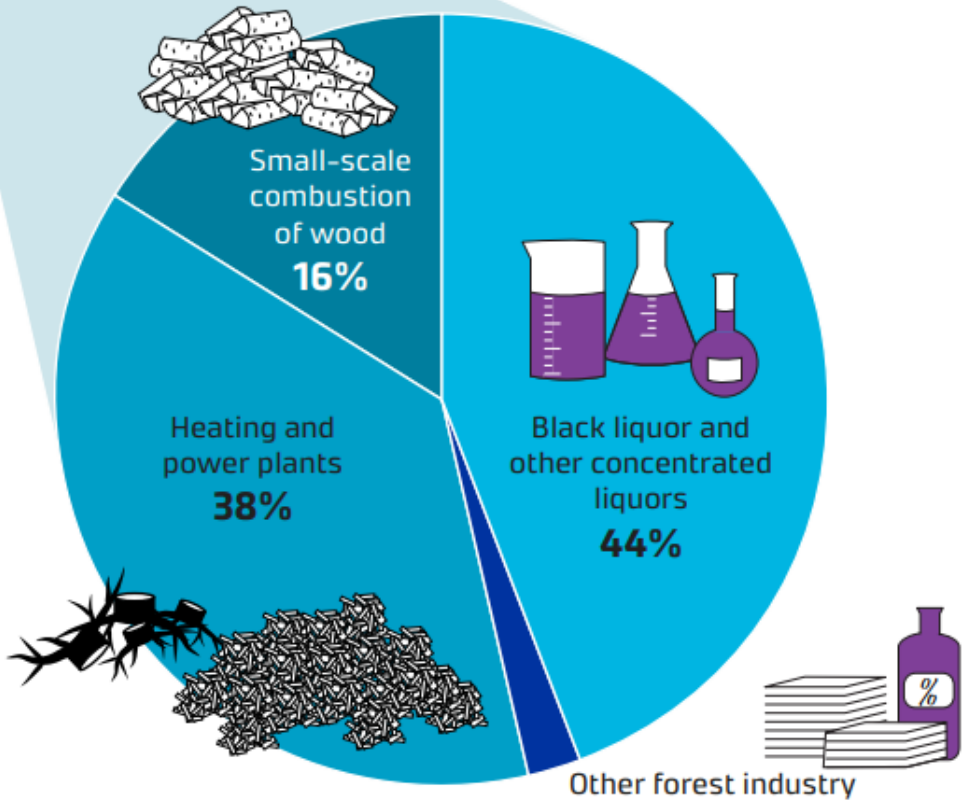
**Total energy consumption**
**355 TWh**




**Renewable energy**
**140 TWh**




**Wood fuels**
**99 TWh**




*Other renewable energy includes wind and hydro power, heat pumps, solar energy and other biofuels.

TWh= terawatt-hour
The data for 2020 are preliminary
Sources: Statistics Finland, Natural Resources Institute Finland

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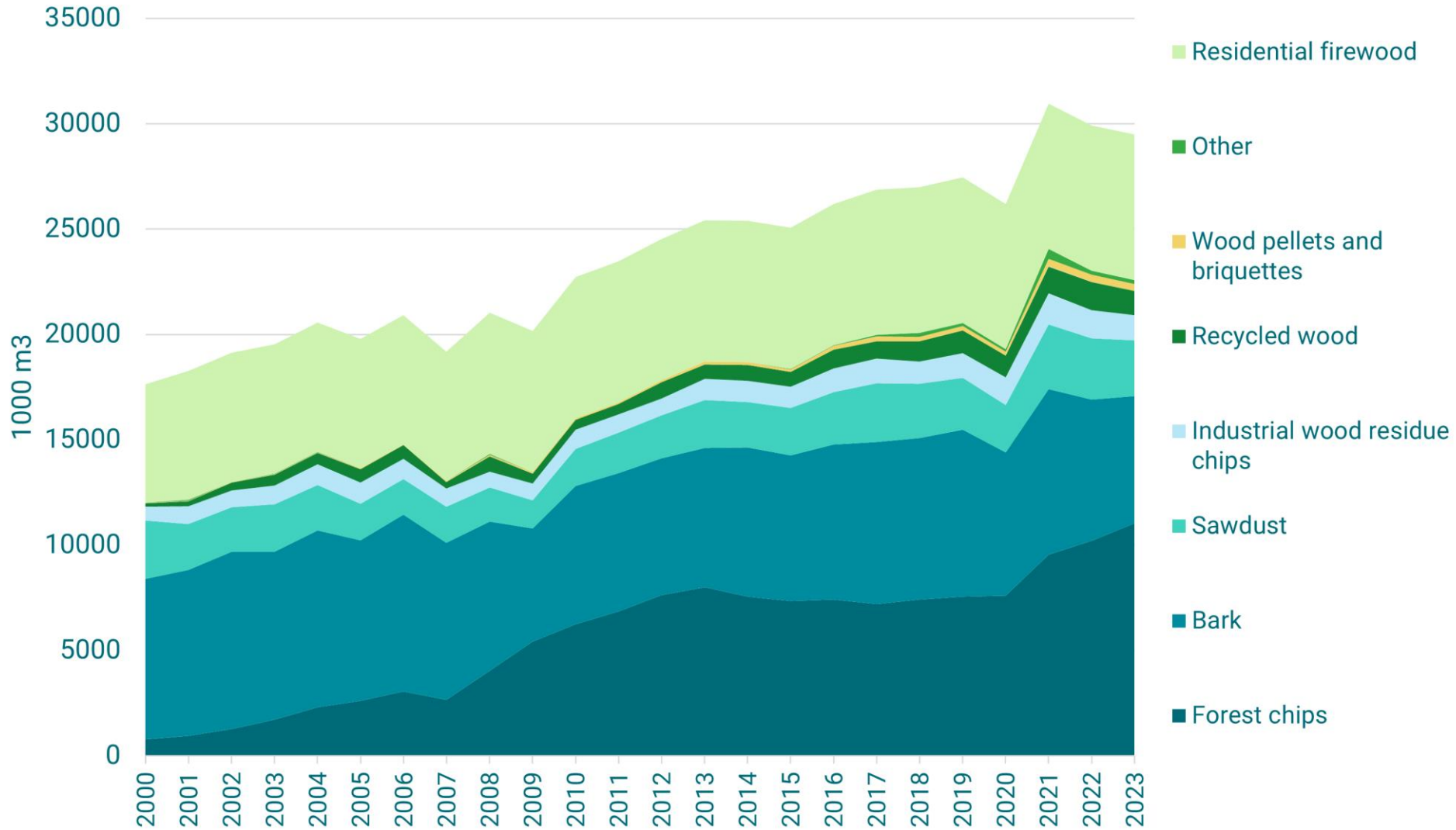
NATURAL RESOURCES INSTITUTE FINLAND

# Solid Wood Fuels per Type 2000–2023



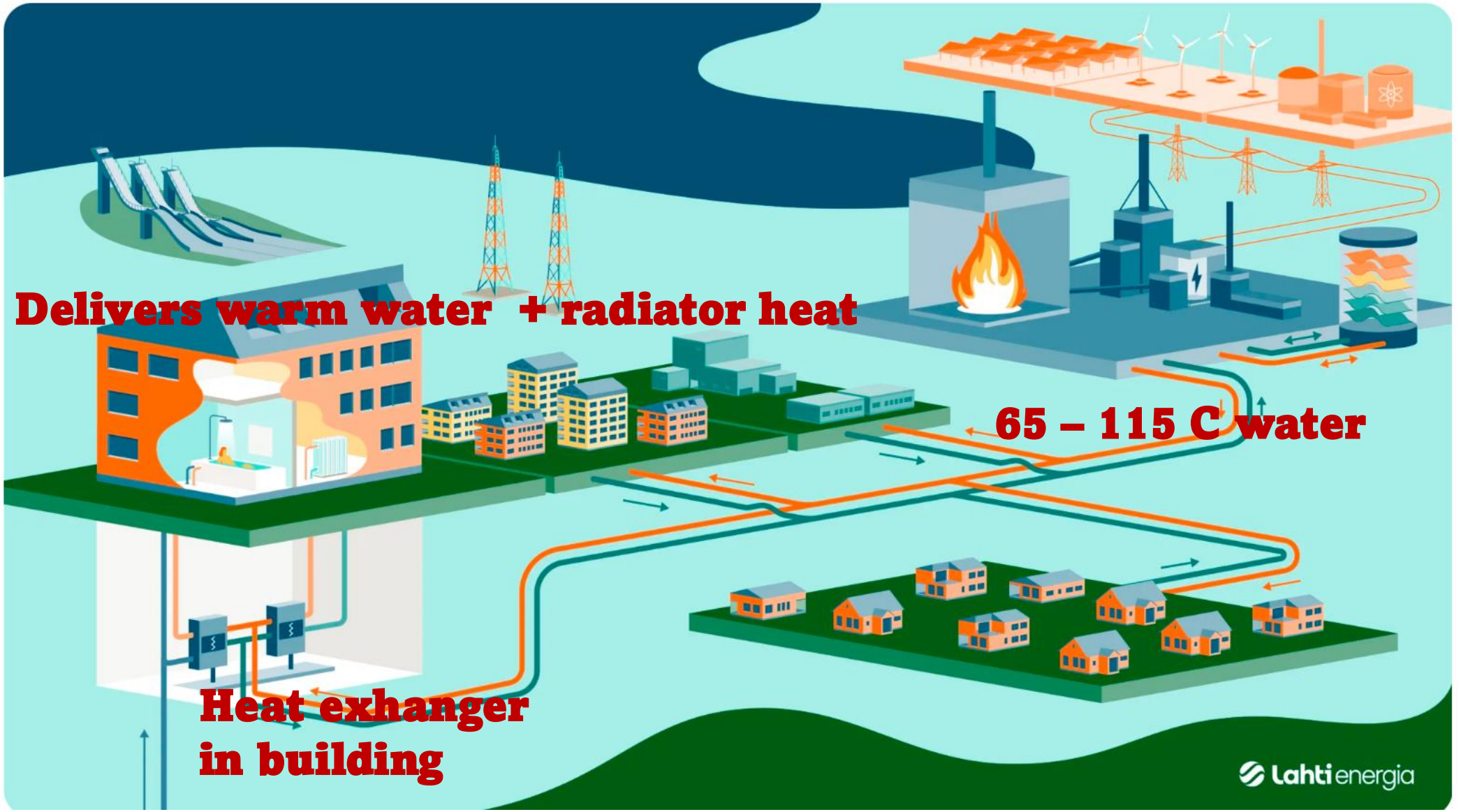

Source: Natural Resources Institute Finland, 2024

# Why bioenergy matters in Finland ?

# BioHeat entrepreneurs build local economy

- Started in the early 1990's
- Plants operated by BHE's in 2020:
  - Ca 650 in total
  - Heats up ca. 200 schools, day cares, elderly care houses
- Ca 350 operated by limited companies (Oy), ca 90 Co-ops, nearly 200 by entrepreneur or group of entrepreneurs with shared responsibility
- Thermal capacity ca 400 MW in total
- Scale 300 kW-6000kW
  - 30 % operate **on heat networks**, 70 % heat individual buildings
  - 150 > 1 MW and 380 on 300 kW – 1 MW

# What (district) heating network ?



# Why (district) heating network ?

- **Cost efficient**, individual buildings need only heat exhanger + radiators or utilise existing air heat system
- 50+ years technical lifespan
- Customer has no maintenance costs
- Reliable energy system, provided with duplicated boiler system and heat network works as buffer
- District heating is technology neutral for energy source → hybrid production and sector integration with ie electricity  and waste heat is possible

METSÄENERGIA LÄHIENERGIA KANGASLÄMPÖ

# Case Metsästä lämmöksi

- Heat entrepreneur company founded in 2003, joined by wood fuel company founded in 1980.
- Service model Metsästä Lämmöksi (from forest to heat) in Savonlinna region, East Finland
- Selling 13 500 MWh/a heat (= 23 000 loose-m3 forest fuel) to several customers through 7 heating plants (0,3 – 1 MW) in Savonlinna region + wood chips to other customers
- The plants are located within 30 km radius. The raw material is obtained from a radius of 50 km and its average storage time is 1½ years.
- Employs ca 20 people from forest to heat transfer
- Combined revenue of three companies ca 5 M€ (2024)

# Case Eno Energy Cooperative

- Founded in 1999 as cooperative by 12 individuals, nowadays 51 members
- Business concept of Eno Energy Cooperative is to produce district heating energy by using locally sourced woodchips
- Four plants operated: 2 MW, 1 MW, 1 MW, 0,8 MW
- Revenue 1,5 M€ (2024)
- Local energy source brings safety and independence in times of possible energy crisis
- The combustion of wood does not result in a net increase in carbon dioxide emissions
- The ashes and its nutrients can be returned back to the forest

# Case Eno: benefits

Enonenergia.fi

- Cheaper heat for consumers compared to light fuel oil
- Conserves approximately 2 million liters of oil annually
- About € 2 000 000 saved within the local economy
- Carbon dioxide emissions reduced by about 5 million kilos annually
- Additional annual employment equivalent to 7-10 man year/a

# Active forest management is an insurance

- Ca 1000 forest fires annually in FI, **average total 1100 hectares/a**
- Fire risk are mitigated by monitoring flights, by forest road network and local fire fighting competence
- Foremost: active forest management decreases fire risk and decreases loss of resources, decreases carbon emissions, improves quality timber availability

Wikipedia/By John McColgan

# Solutions exist – grab the best available tech

# Efficient forest machines are key for sustainable forest management

HARVESTERS

FORWARDERS

HARVESTER HEADS

SIMULATORS

TAILORED SOLUTIONS

PONSSE


INFORMATION SYSTEMS

# Energy heads for tractors and excavators



KESLA

# Chippers for mid or large scale



# Bundling machine for efficient small scale wood harvest

# Small scale bio-chp on-grid & off-grid


**Kluskus Combined Heat and Power System**

**Walter 110kW of heat and 40kW of power**

# Wood chip & pellet boilers / boiler houses for heat and steam production


ARITERM ENERGY

ALA • TALKKARI

# Synthetic gas, heat and biochar from biomass by pyrolysis

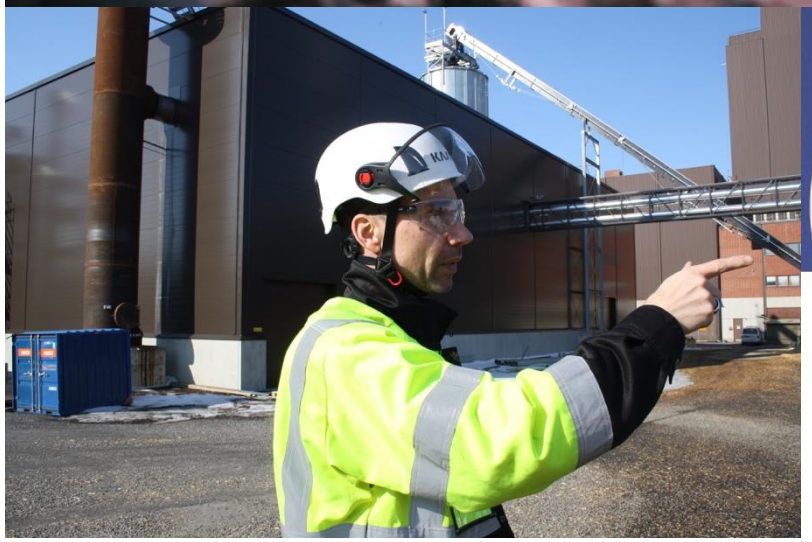
CARBOFEX


# Biocoal can replace fossil coal use

TAALERI

## Biocoal – the drop-in alternative to fossil coal

Taaleri Bioindustry and Joensuu Biocoal are leading the change with Europe's largest industrial-scale biocoal production plant.



**Juha Hyvärinen**
Managing Director: Taaleri Biocoal Canada Development Ltd

# Helen in Finnish capital bids farewell to coal

## Case: Helen Salmisaari A power plant, Helsinki, Finland

### Driver

- The conversion promotes the company's goal of phasing out coal by 2030
- The conversion strengthens the construction of a sustainable energy system
- The versatile production structure ensures the reliability of heat supply even in freezing weather

Helen Salmisaari A power plant

### Delivery scope

- Coal-fired district heat boiler conversion to bubbling fluidized bed (BFB) combustion enabling **wood pellet firing with a fuel capacity of 150 MW**
- Valmet flue gas cleaning system and heat recovery
- Valmet DNA Automation System modification

### Benefits

- This is the first time Valmet uses Bubbling Fluidized Bed (BFB) technology for 100% wood pellet firing
- **From coal to wood pellets**
- Upgraded plant with very high efficiency in heat production and very low emissions
- Additional 26 MW heat recovery to district heating network

> In April 2025, we completely phased out coal following the closure of the Salmisaari coal power plant, and our estimated emission reduction this year (2025) is already over 80 percent compared to the 1990 level.
>
> ***Timo Aaltonen***
> *Senior Vice President, Heating and Cooling at Helen*

# Technology and know-how transfer


- Finnish experiences have been transferred to Canada (QC, ON, BC and YT) for years.

- The holistic value chain design includes identification of heating clusters, grid and boiler sizing, wood availability analysis and supply design. The model is emulating Finnish heat entrepreneurship, and it is mainly used to decarbonize heating in small communities and towns without connection to natural gas pipelines.

BIOENERGIA

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