Country Report Finland

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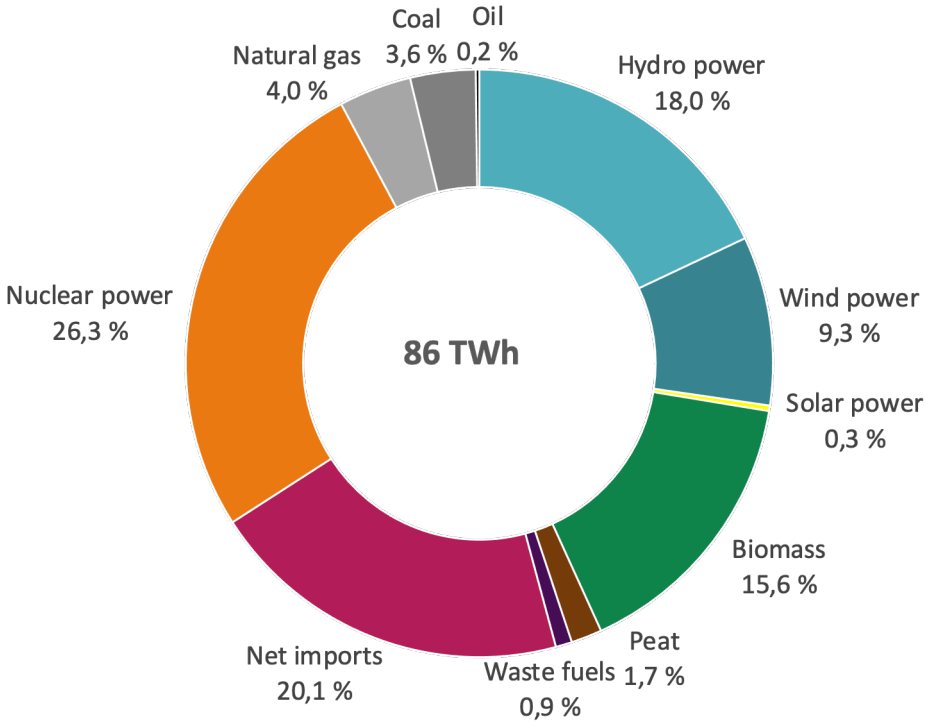
Finland

Facts about **the Happiest Country in the World**

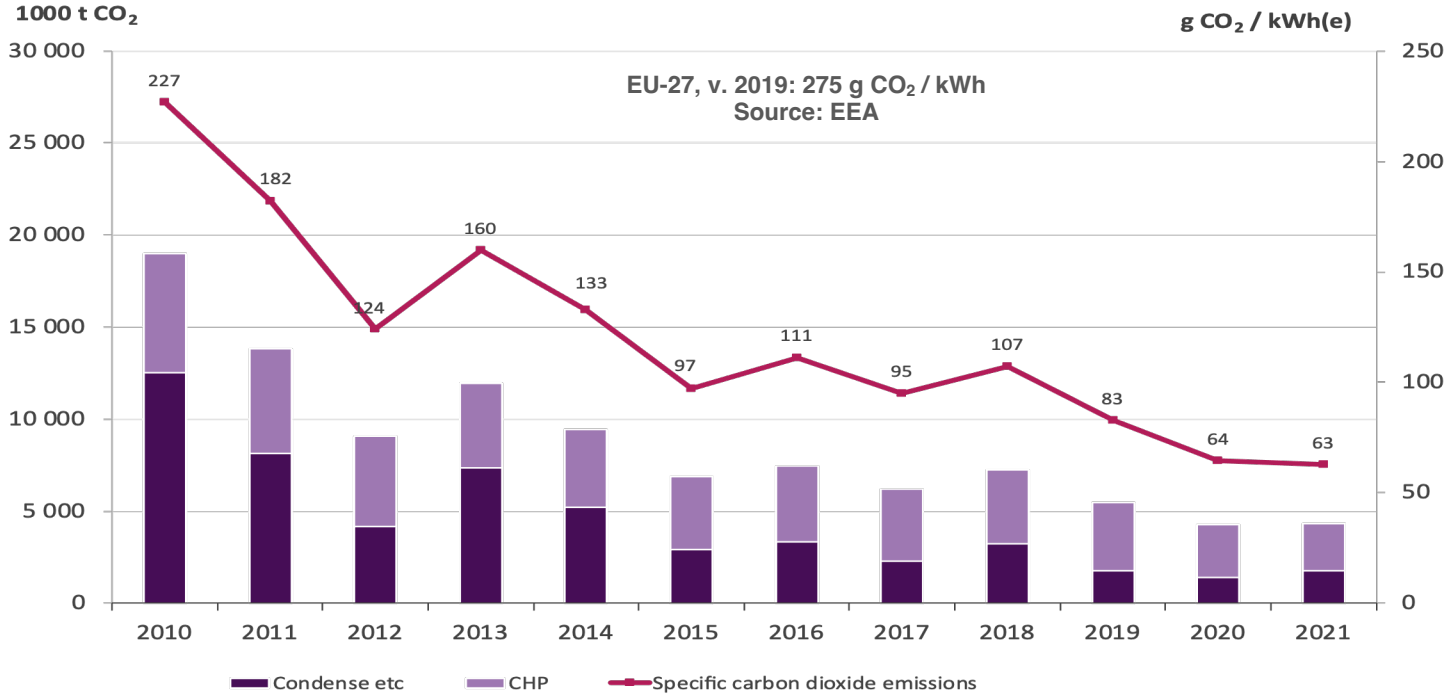
- The Most Amount of **Heavy Metal Band** Per Capita in The World
- There Are More Than 3 Million **Saunas** in Finland
- **Heavy Drinkers** of **Coffee**... as well as **Milk**
- The **Wife-Carrying Race** and **Swamp Football** Originated in Finland
- The Inventor of **Text Message** Is Finnish
- The Longest Palindromic Word Comes From the Finnish Language… **SaippuakivikauppiaS**
- The Finns Invented the **Molotov cocktail**

5,5 million population, 1,2 million single family houses, 0,5 million free time houses, 190 000 lakes, 338.440 km2, GDP 45 372€, no gas network

ELECTRICITY BY ENERGY SOURCE AND NET IMPORTS 2021

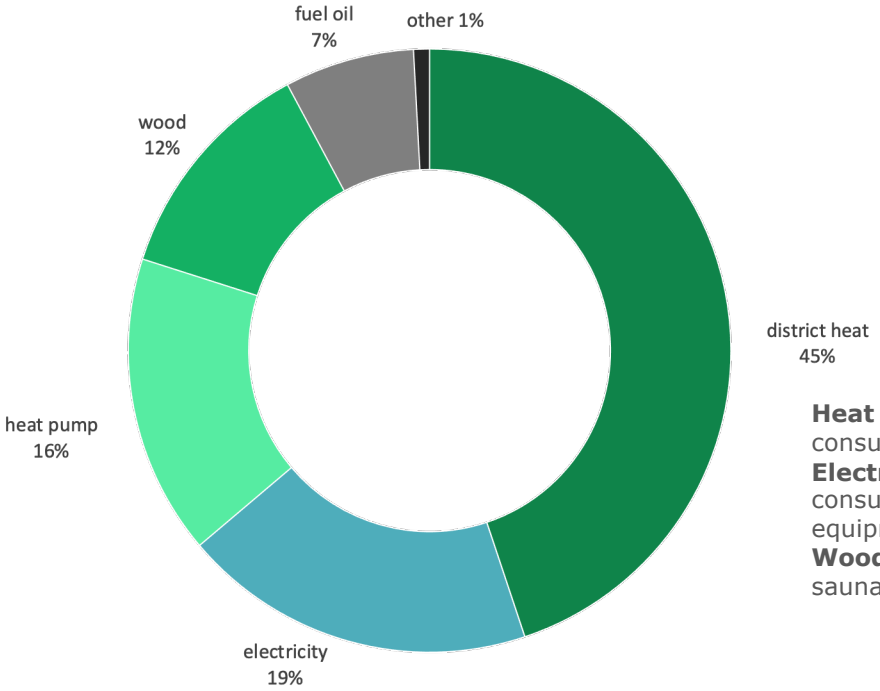


CO_2-EMISSIONS OF POWER GENERATION



MARKET SHARE OF SPACE HEATING 2020

RESIDENTIAL, COMMERCIAL AND PUBLIC BUILDINGS



Source: Statistics Finland

Heat pump: includes the electricity consumption of heat pumps
Electricity: includes the electricity consumption of heat distribution equipment and electric sauna stoves
Wood: includes the wood used by sauna stoves

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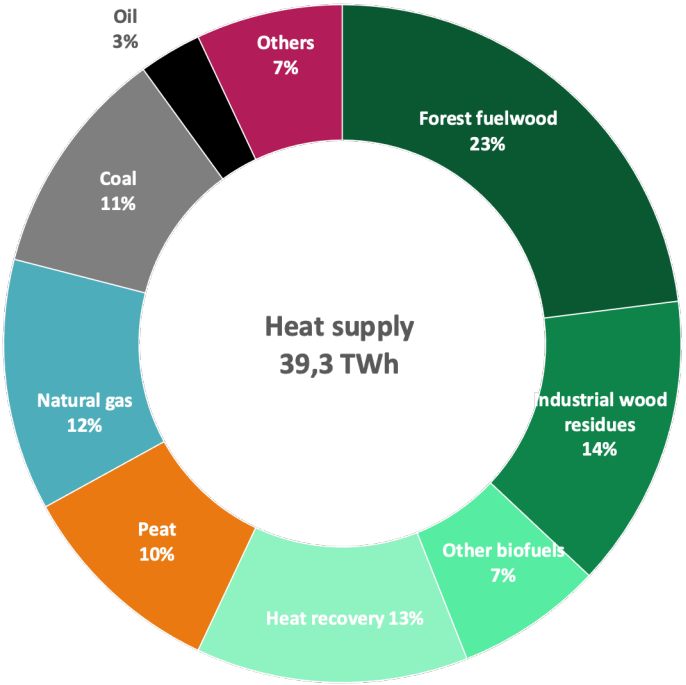
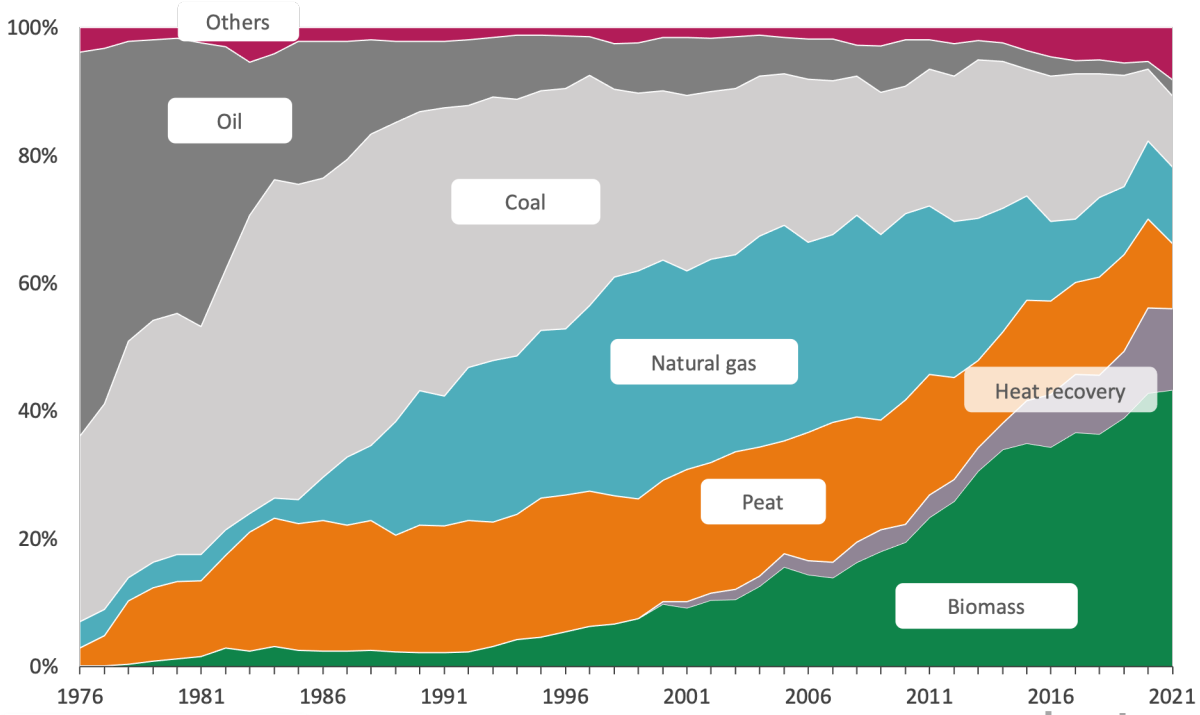
ENERGY SOURCES OF DISTRICT HEATING (2021)



- Recovered (recycled) heat: energy that would otherwise go to waste
- Other biofuels: includes also the bio share of municipal waste
- Other: non-bio share of municipal waste, plastic or hazardous waste, electricity.

Share of renewables and recovered heat well more than a half in district heat supply



- Fossil fuels have increasingly been replaced by biomass and recovered heat.
- Use of biomass has more than doubled during last decade.
- Amount of recovered heat has more than tripled since 2010. Recovered heat consists mainly of waste heat. Fuel consumption is avoided by making use of surplus heat.

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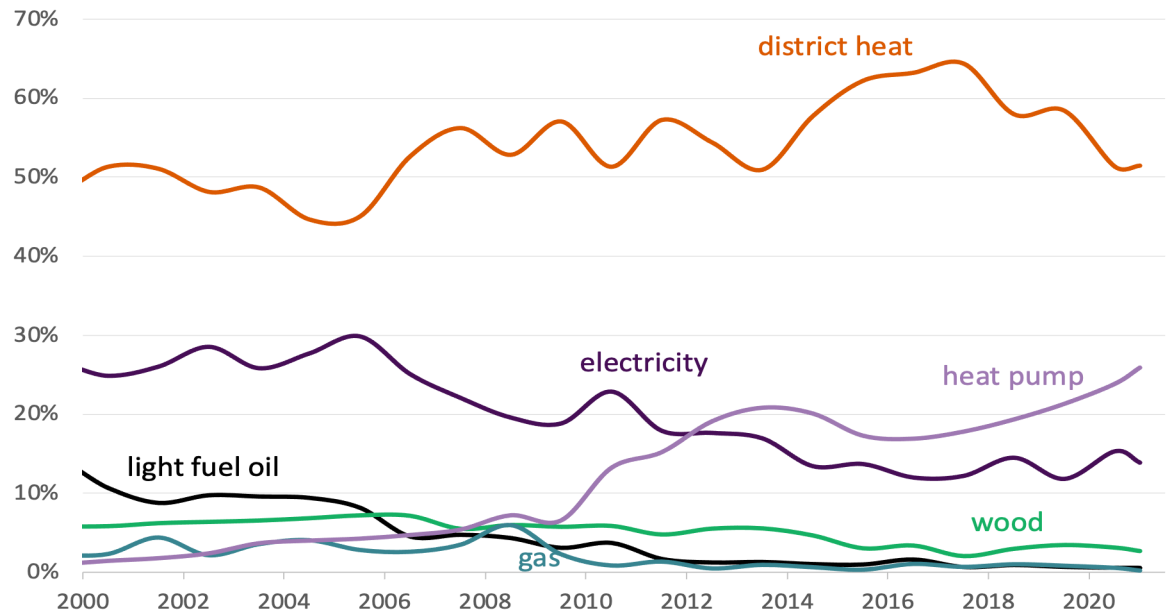
www.heatpumpingtechnologies.org

HEATING CHOICES IN NEW BUILDINGS



Source: Statistics Finland, Granted building permits (heated cubic volume)

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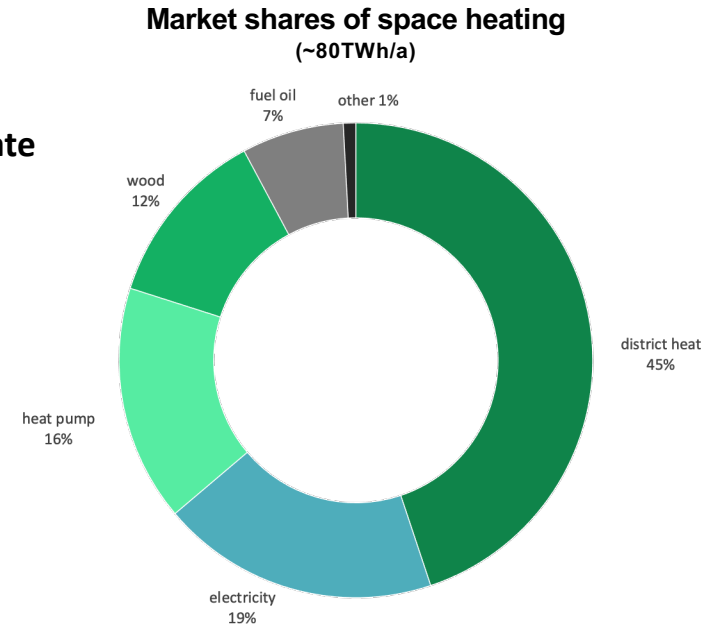
www.heatpumpingtechnologies.org

Heat Pumps – a glorious story in Finland

- **Heat Pump sector is big, 13 TWh/a, 16 % of the heating of Finland (80 TWh/a) (+DH production with HPs)**
- **Investments in 1.2 million heat pumps already 7 billion euros**
- **Investment level now about 1 billion/a in 150.000 HPs/a increase about 1 TWh/a HP heat production**
- **Market–based business, investments made mainly by private consumers**

Unique bridge technology between heat and electricity=> demand response, storage technology

Suits as well to individual as centralized heating and cooling systems



Source: Finnish Energy, 2021

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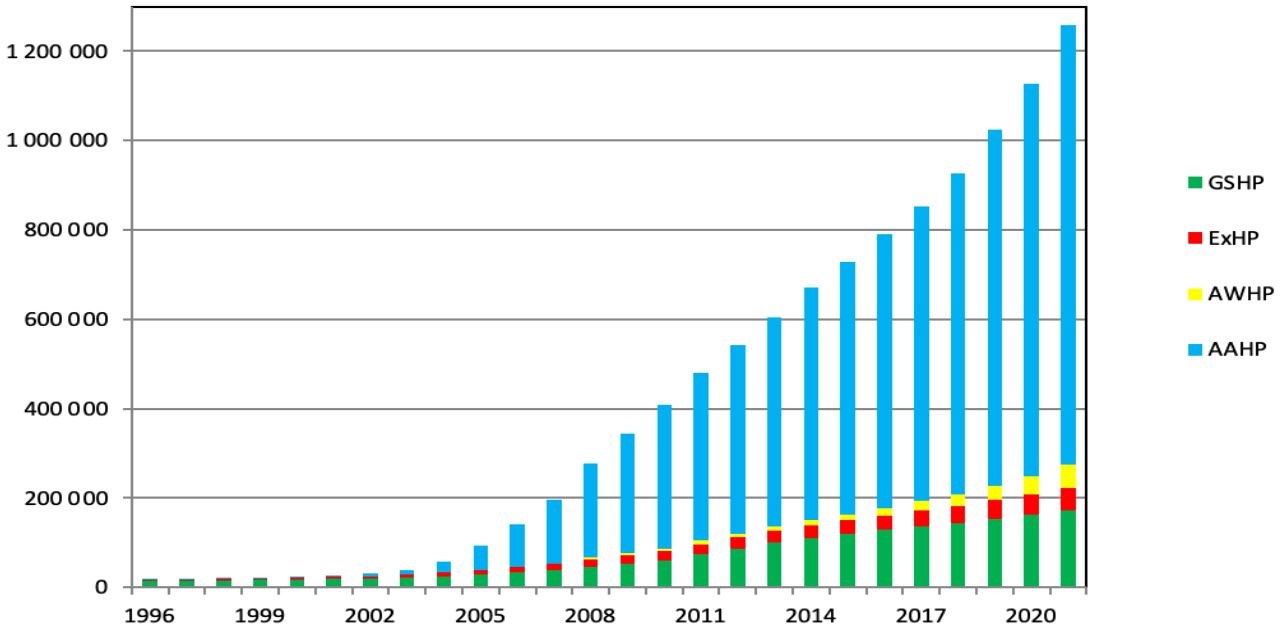
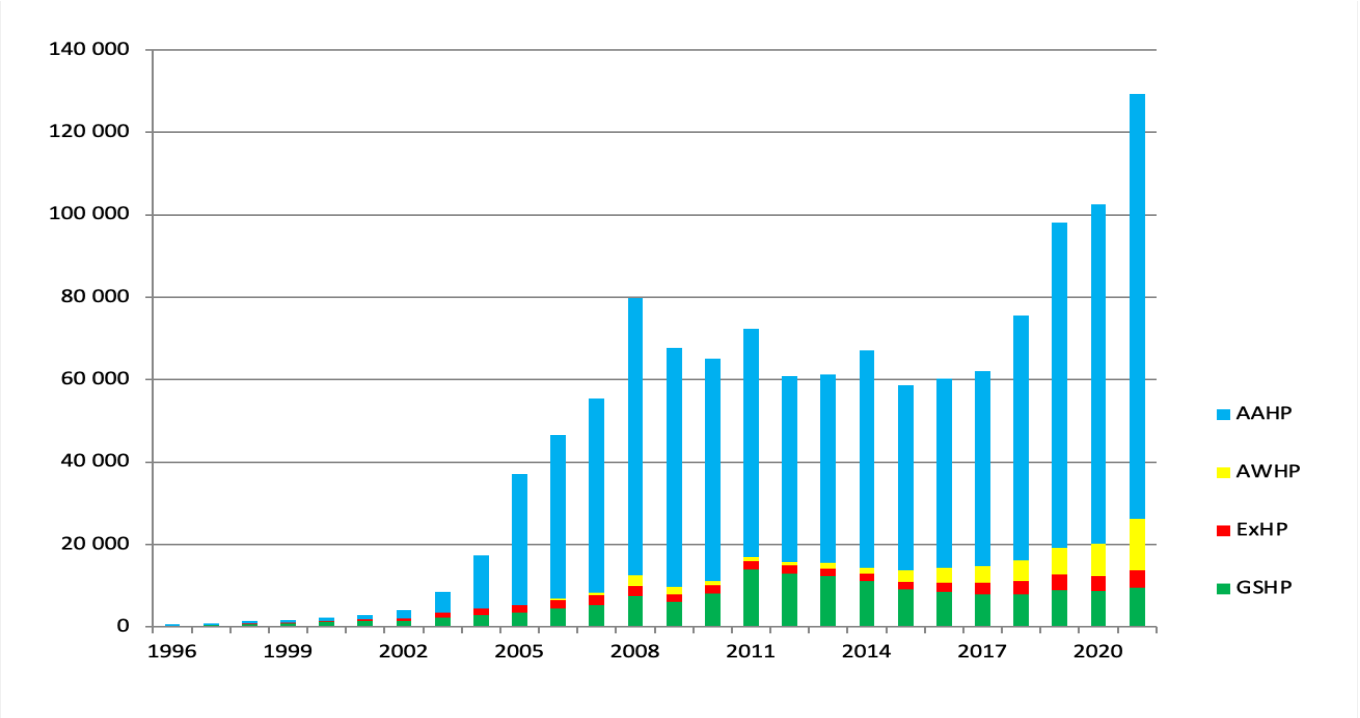
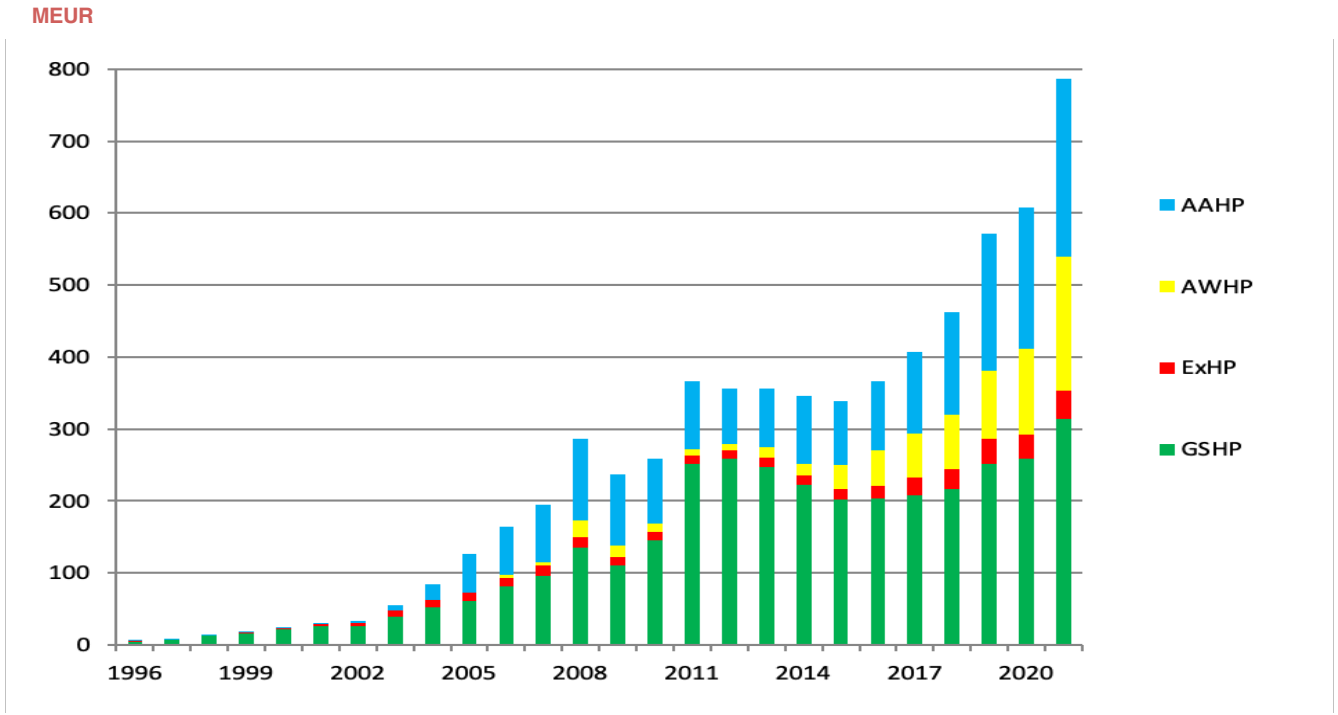
CUMULATIVE HEAT PUMP SALES IN FINLAND (PCS)



ANNUAL HEAT PUMP INSTALLATIONS IN FINLAND (PCS)

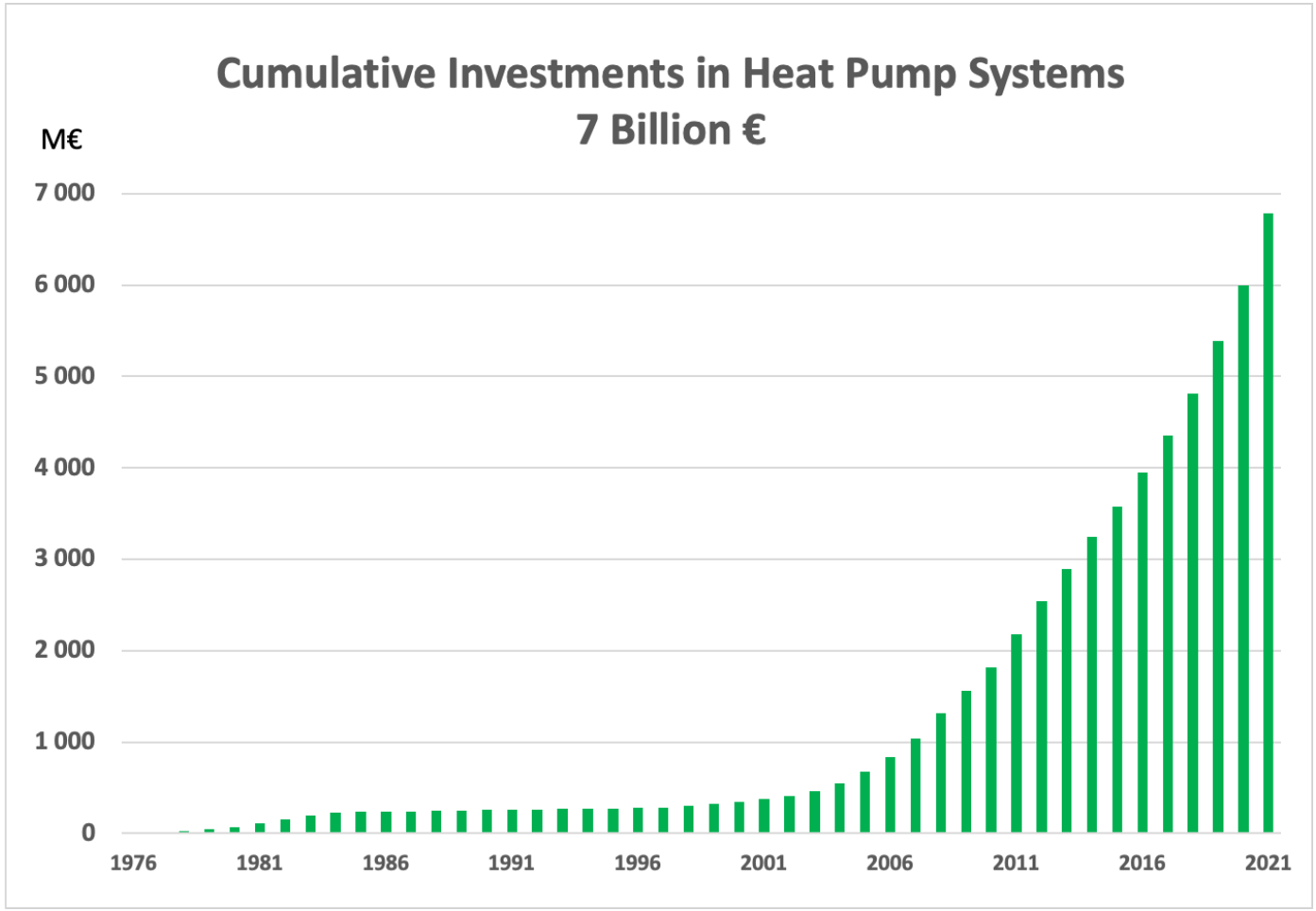


ANNUAL HEAT PUMP INVESTMENTS IN FINLAND 2021



Average investment: GSHP 33.000€, AWHP 15.000€, EAHP 9.000€, AAHP 2.400€

(emphasis by the capacity of sold heat pumps)


Cumulative Investments in Heat Pump Systems
7 Billion €
M€
7 000
6 000
5 000
4 000
3 000
2 000
1 000
0
1976
1981
1986
1991
1996
2001
2006
2011
2016
2021

Heat Pump Market Potential by sector

Oil burners (over 100.000 pcs) or water based electric heating systems (100.000 pcs)
- => GSHP or AWHPs
- 4-7 TWh/a

Direct electricity heated houses or cottages
- => AAHPs or GSHPs, AAWPs
- 0,5 million of 1,2 million still without HP or wrong HP)
- 5 TWh/a

30.000 district heated apartment houses with exhaust ventilation
- => Exhaust HP (+ GSHP),
- 3-7 TWh/a

Commercial and service buildings (shopping centres , IKEAs , office houses etc.)
- => GSHP heating and cooling
- xx TWh/a

Industry
- Waste energy + RES with HP (GSHP, AWHP…)
- 20 TWh/a?

Production of District Heating
- Waste energy + RES with HP (GSHP, See, Air…)
- xxTWh/a?

2030:

30 TWh/a heat production by over 2 million HPs

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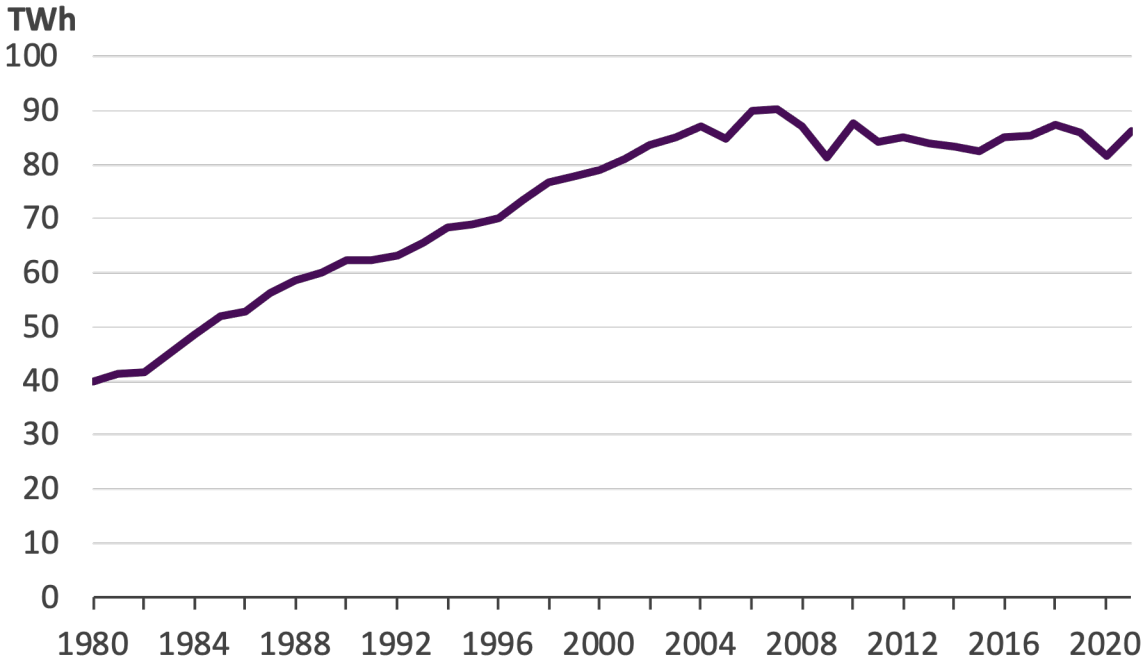
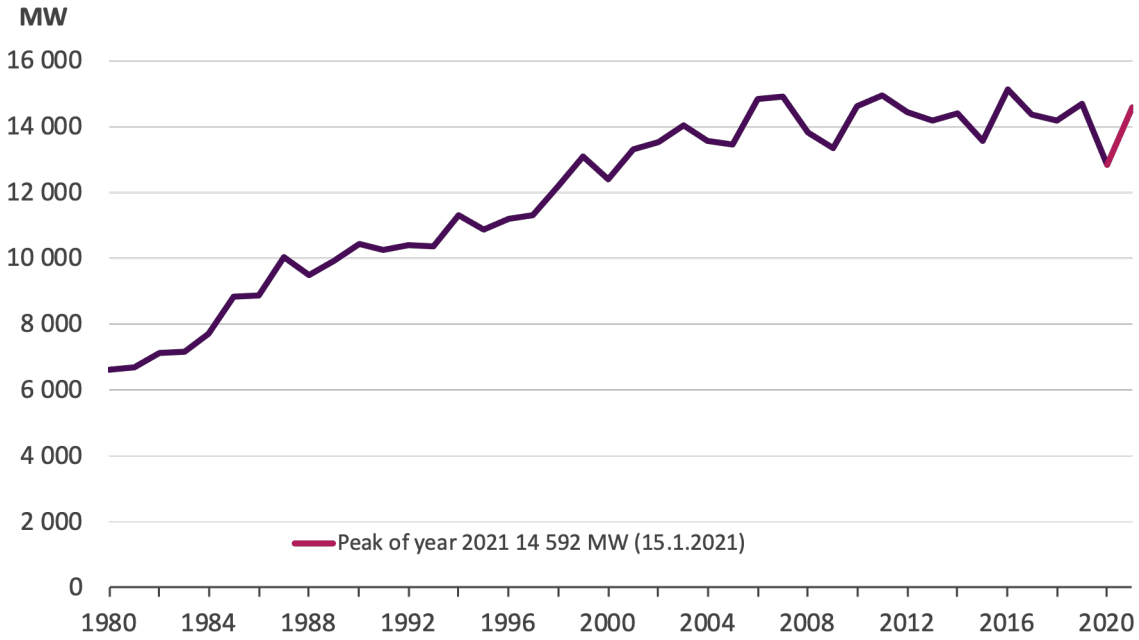
ELECTRICITY CONSUMPTION NOT INCREASED IN SPITE OF 1,2 MILLION HPS



- Electricity consumption 86 TWh in year 2021

Peak loads of electricity

(maximum electricity MW)



Policy

- Finland carbon neutral 2035
- Coal ban 2029
- Building and other codes (EPBD, RED, F-gas…) according to EU Directives, no special national requirements
- Primary Energy Factor PEF 1.2 for electricity helps
- Subsidies
  - Subsidising level modest about 50 M€/a for HP-related-systems
  - Small houses: 2500€-7000€ subsidy for replacing oil burner by HP, DH or Electricity
  - For apartment houses a subsidy for projects with which you improve energy efficiency subsidy can be even 4000€/flat
  - Modest subsidies (15 -40%) for pilot projects for industrial and corporate HP system investments
- Building permission situation challenging especially for drill holes. Fast lane plans in the works.

R&D

No special R&D program for HP sector => plenty of separate, fragmented projects

A lot of pilot projects like

- Medium-deep geothermal wells (1-2 km)
- Many energy storage projects (water caves , drill hole fields,

Customer behavior /role of social media - studies in Aalto University

IEA TCP HPT Annex 52 and maybe joining with NEXTHEPS project in Annex 58 (High temperature HPs /DH)

We have great HP market but spend too little money on HP R&D