Heat Pump Market and scenarios in Finland
RAPID GROWTH?

- The cumulative number of heat pumps in Finland reached a total of 670,000 in 2014.
- They are already extracting 5 TWh/a of RES local renewable energy from the ground, the rock or the air from around the houses
- Finns are already investing 400 million Euros a year in heat pumps
- 2030: 12 billion euros invested in heat pump systems and 22 TWh/a
Annual Heat Pump installations

Number of installations increasing annually by 60,000 units
Annual Heat Pump investments

Private end-users are investing 350 M€ annually

Average investment 2013: GSHP 20.000€, AWHP 11.000€, EAHP 7.000€, AAHP 1.800€
Finnish Heat Pump investments totalling 3 billion €
Ground Source 1850 M€, Air-Water 90 M€, Exhaust Air 160 M€ ja Air-Air 800 M€

Average investment 2013: GSHP 20.000€, AWHP 11.000€, EAHP 7.000€, AAHP 1.800€
What we reach today with our 700,000 HP stock?

- 5 TWh of Renewable Energy annually
- 200 M€ improvement in Trade Balance annually
- 2,000 jobs annually
- 400 M€ of private investments annually
- >10 % Return on Invested Capital
- >1 million tons in decreased CO₂-emissions annually
Heat Pumps have become the most popular main heating source in new built houses.
Heating replacement market

Today

- 200,000 oil boilers
- 100,000 other hydronic systems (electricity, wood)
- 500,000 direct electricity systems
- 500,000 summer houses
- 100,000 buildings outside District Heating networks

A potential of 1.4 million projects for

- Heat Pumps
- Biofuels
- District Heating
# Finland has the best potential for Heat Pumps in Europe

## Location
- Cold climate and a large country (338,000 km²)
- Small number of inhabitants (5.4 million)
- High energy consumption for heating (120 TWh/a)
- Best drilling conditions in Europe

## Infrastructure
- No extensive gas network
- District Heating only in cities and mostly for large buildings
- Wrongly heated houses
  - 220,000 oil boilers
  - 100,000 with electric heating and hydronic circulation
  - 500,000 with direct electricity
- 10,000 new built houses annually

## Prices
- Fossil fuel prices rising and technology prices decreasing
- Heating prices
  - electricity 12-13 c/kWh
  - oil 13-17 c/kWh
  - pellets 5-7 c/kWh
  - district heating 6-15 c/kWh
- Heat Pumps generate heat at price level 3-6 c/kWh
External Driving Forces
Heat Pumps will have a significant role in meeting future energy challenges

- **Oil price**: Consumer prices for Heating Oil remains high
- **Russia**: Desire to decrease dependency on imported energy
- **Economy**: Trade Balance has to be improved
- **Taxation**: Tax increases on fossil fuels and electricity will continue
- **Emissions**: Directives, construction rules and support policies are driving towards lower emissions and higher energy efficiency
Business Environment and Communication
Challenges in the Heat Pump Sector

Developing the business environment
- Studies and reports having significance and impact
- Co-operation with other associations and interest groups
- Influencing law makers and Public Authorities

Communication
- The role of Heat Pumps in achieving RES goals
- Significant benefits for end-users and the whole society

Research and Development
- Energy efficiency in construction and renovations (E-number, nZEB)
- Future Heat Pump Systems must meet changing external demands
- Starting and financing research projects (FIN, IEA HPP, EU)
Technology and Quality
Challenges in the Heat Pump Sector

System quality
- Dimensioning and planning
- Quality of Heat Pumps and related devices
- Guarantees and Service

Quality of operations
- Information sharing, marketing and sales
- Contracts
- Installation, taking into operation, educating end-users

Challenges in education
- Slow development of education programs
- 200,000 installation days in 2014
- So far the Finnish education system hasn't produced any Heat Pump technicians or installers
New buildings and replacements
GSPHs, AAHPs, AWHPs, Exhaust HPs

Gross production (RES/Energy saving)
2014: 6 TWh/a (4 TWh/a)
2020: 12 TWh/a (8 TWh/a)
2030: 22 TWh/a (15 TWh/a)

Cumulative investments:
By 2020: 4 billion €
By 2030: 12 billion €

- Consumer prices
- Without subsidies

Influences in CO2, employment, trade balance, economy of the state etc.
Some renewable energy figures in Finland 2014

<table>
<thead>
<tr>
<th>Energy Source</th>
<th>Amount (TWh/a)</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solar energy</td>
<td>0.01</td>
<td>(10 MW)</td>
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<tr>
<td>Wind</td>
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<td>(260 mills, 627 MW)</td>
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<tr>
<td>Heat Pumps</td>
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<td>(700,000 HPs)</td>
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<tr>
<td>Wood in furnaces</td>
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<td>(2 million furnaces)</td>
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<tr>
<td>Finland total</td>
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<tr>
<td>Electricity</td>
<td>84</td>
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</tbody>
</table>
Europe: 7 million Heat Pumps

Accumulated heat pump sales*

* Including sales before 2005 in DE, SE and AT.
FR, DE, IT, SE the biggest markets?

Heat pump sales 2013
by category

- Reversible air-air w/heating
- Reversible other
- Sanitary hot water
- Exhaust air
- H-ground/water
- H-air/water
Finland has passed Sweden, passing Norway?

Heat Pump Sales 2013 /1000 Inhabitants
Winner of the Heat Pump City of the Year 2015

City of Mäntsälä, Finland

- The project is a good example of successful multi-partnership: the city of Mäntsälä, Yandex datacenter and Calefa.
- 40 C waste energy to 100 C District Heating by Heat Pump (4 MW)
- The project aims to heat 4000 households.
- The overall annual carbon savings of 11 000t CO2
The Biggest Heat Pump Project

100 kilometers drill hole as a heat source and storage
Heat Pump – fantastic equipment