Local, renewable wood energy

Urpo Hassinen
2015
USE OF RENEWABLE ENERGY 2005 AND TARGETS 2020

Europe
Finland
North Karelia

2005 2020

%
USE OF FOREST CHIPS IN FINLAND

- Year 2013 total use was 8.7 million solid m$^3$
- Small houses used 0.7 million solid m$^3$
- Forest chips for heat- and power plants harvested
- 34 % logging residues
- 44 % small diameter trees (whole-tree and stem wood)
- 15 % stumps
- 7 % heavy, rotten stem wood

Source: Finnish Forest Research Institute Esa Ylitalo 2014
THE BEGINNING TOOK YEARS

The purpose is to produce heating energy by providing wood chips for the district heating plants

• The first meeting dealing with the topic took place in February 1996
• The meeting that led to the establishment was held on the 15th of September 1999. At the time of the foundation there were only 12 members (now 52 members)
OWN HEATING PLANTS

- Commercial operation started: 2000
- Bio boilers in the plant of Alakylä: $1.2 \text{ MW}_{th} + 0.8 \text{ MW}_{th}$
  Yläkylä: $0.8 \text{ MW}_{th}$ and Uimaharju $1 \text{ MW}_{th} + 1 \text{ MW}_{th}$
- Combustion method: mechanical grate
- Feeding: Stoker dischargers and drag chain conveyors
- Fuel storage: 100 loose-m$^3$ to 300 loose-m$^3$
- Heated volume 291 000 m$^3$, primary and secondary school buildings, high school, library, sports hall buildings, health centres, fire station, old people's home, business premises, church hall and terraced houses
- Heating pipe network: 9 800 m
- Heat production: 15 200 MWh
- Controlling: Automated GSM alarm and network connection for adjustment
- Owner and operator: Eno Energy Cooperative
ENO YLÄKYLÄ
UIMAHARJU
ENO ALAKYLÄ
HEAT SALES MONTHLY
ENO ALAKYLÄ

MWH


0  200  400  600  800  1000  1200

2012
A total of 7 bio boilers and 6,46 MW<sub>th</sub>
BUILDING OF THE HEATING PIPE NETWORK AND HEAT EXCHANGER
ADVANTAGES OF WOOD FUELLED HEAT PRODUCTION

• Almost all the capital investment stays within the municipality
• Positive effects on the area's local forestry and landscape
• Positive effects on employment
• 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
BENEFITS IN ENO

- Heat is cheaper for consumers compared to light fuel oil
- Heating centers replace about 2 million liters oil every year
- This amount is equivalent to approximately 27 000 loose-m³ forest chips
- About € 2 000 000 were saved by the local economy
- As a result carbon dioxide emissions were reduced by near 5 million kilos annually
- All employment effects of using the forest chips at this consumption rate are between 7-10 man-years
WOOD FUEL HARVESTING IN ENO

Raw materials

- Small trees by manual felling about 15%
Raw materials

- By multi-tree processing about 70%
YOUNG FOREST THINNINGS
ABOUT 200 HA EVERY YEAR

Before

After
Raw materials

- Logging residues about 15%
- Bark from the Uimaharju pulp mill (if available)
FOREST HAULAGE BY FORWARDER
HIGH QUALITY RAW MATERIAL
CHIPPING AND TRANSPORT BY TRUCK TO THE HEATING PLANT
CHIP SAMPLE FROM A CHIP LOAD
## CUSTOMER PROFITABILITY

### ROW HOUSE EXAMPLE, VAT 0 %

#### District heating

<table>
<thead>
<tr>
<th>INVESTMENT</th>
<th>Oil heating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entrance fee</td>
<td>Renewing of oil equipment</td>
</tr>
<tr>
<td>Heat exchanger and assembly</td>
<td>0€</td>
</tr>
<tr>
<td><strong>Tot.</strong></td>
<td>29 750€</td>
</tr>
</tbody>
</table>

#### VARIABLE COSTS

<table>
<thead>
<tr>
<th>Produced heat energy</th>
<th>220 MWh/y</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat price (heat energy meter)</td>
<td>63.4 €/MWh</td>
</tr>
<tr>
<td><strong>Annual costs</strong></td>
<td>100 %</td>
</tr>
<tr>
<td>Basic fee</td>
<td>3 120 €/y</td>
</tr>
<tr>
<td><strong>Operation</strong></td>
<td>0 €/y</td>
</tr>
</tbody>
</table>

**ANNUAL COSTS TOT.**: 17 057 €/y

**HEAT PRICE TOT.**: 78 €/MWh

#### PROFITABILITY

| Annual costs with oil                   | 22 388€/y |
| Annual costs with district heating      | 17 057€/y |
| Difference                              | 5 331€/y |
| Investment                              | 29 750€   |

**Interest-free repayment period without support**: 5.6 years

| Possible investment support             | 10 %       |
| **Interest-free repayment period with support**: 5.0 years |

This average row house has used oil about 26 500 liters per year.

Heated space 3 700 m³

Oil price: Average price in 2014 in Finland

Oil price: 82.2 €/MWh

Annual costs efficiency 83 % 21 788 €/y

Repair and maintenance 100 €/y

Operation 500 €/y

ANNUAL COSTS TOT. 22 388 €/y

HEAT PRICE TOT. 102 €/MWh
GREEN SUN ENERGY
”think globally act locally”

www.enonenergia.fi
Thank you!

Urpo Hassinen
The Finnish Forestry Centre
The Public Service Unit
North Karelia
Niskantie 17 FIN-81200 ENO FINLAND
Mobile +358 500 186 612
urpo.hassinen@metsakeskus.fi
http://www.metsakeskus.fi