



# FOREST BIOMASS IN ENERGY PRODUCTION

## IN CENTRAL FINLAND

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# Central Finland

Province of bioenergy  
and forest industry

*Five national parks*

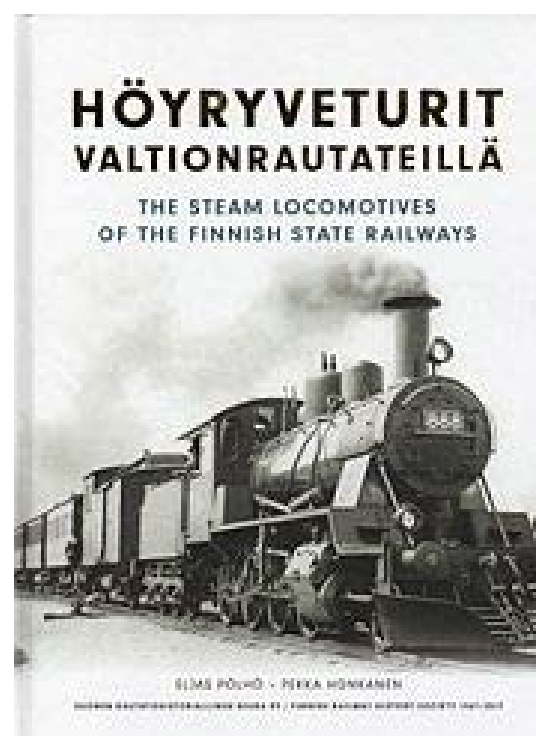




## History

Talking about  
bioenergy

- Wood used to be the main source of energy in heating, heavy traffic and industrial power production until 1950's.
- After the WW II, trade of oil and coal was released. That stopped all interest to use and develop bioenergy.



Suomen rautatiehistoriallinen seura, 2017



Fire-wood log storage, Pihtipudas, 1954 (Lusto)



A boy, tools and a pile of logs, Eastern Finland, 1920 (Lusto)

Pics: Viitasaari -seura



SS Viitasaari at Lake Keitele, Äänekoski

# History

- In Jyväskylä almost all the buildings changed from wood-logs to oil in less than 10 years in 1960's
- Oil-crisis in 1970's woke up the interest to develop local feedstock as energy source again

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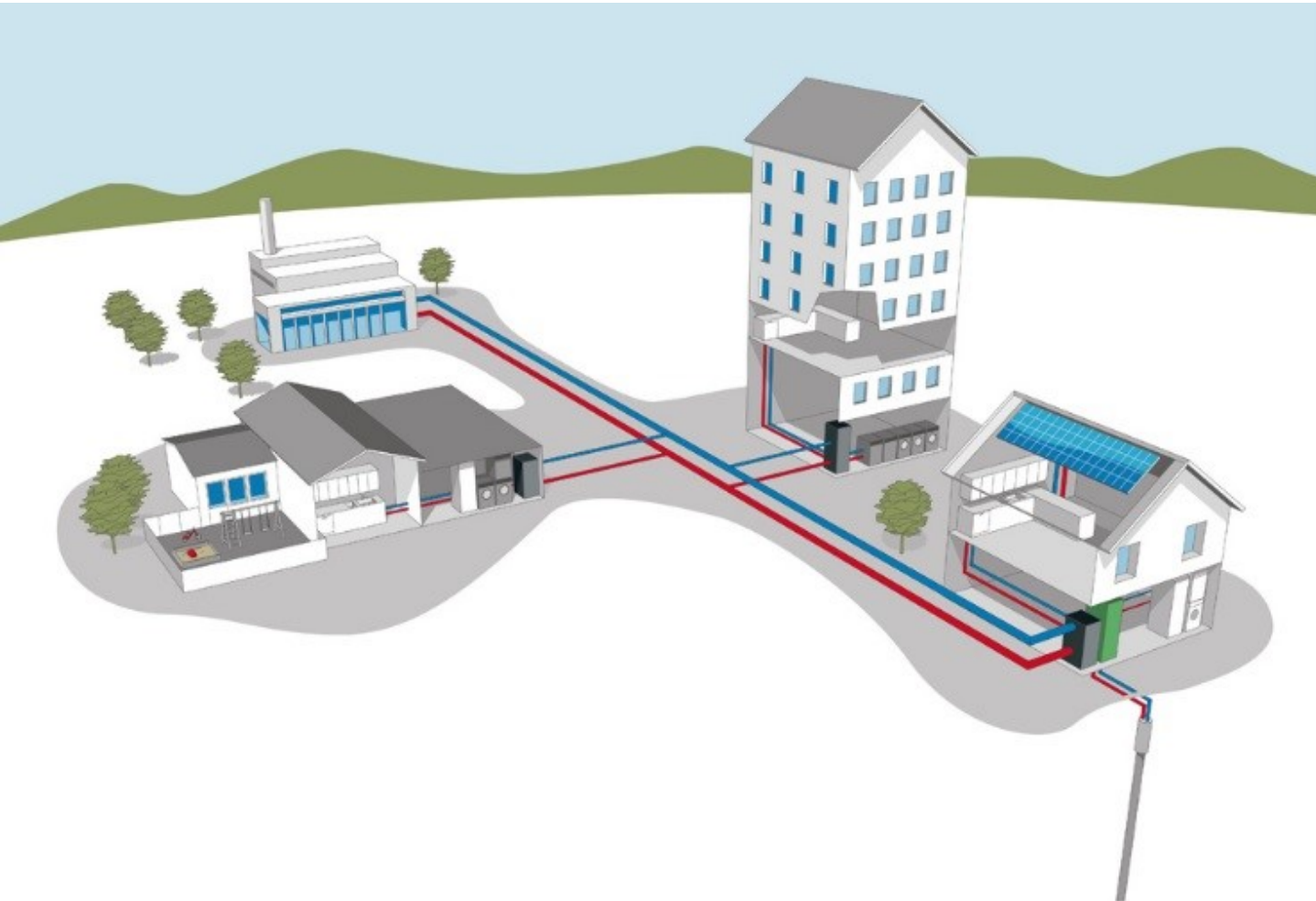


Pic: Jyväskylän maakunta-arkisto



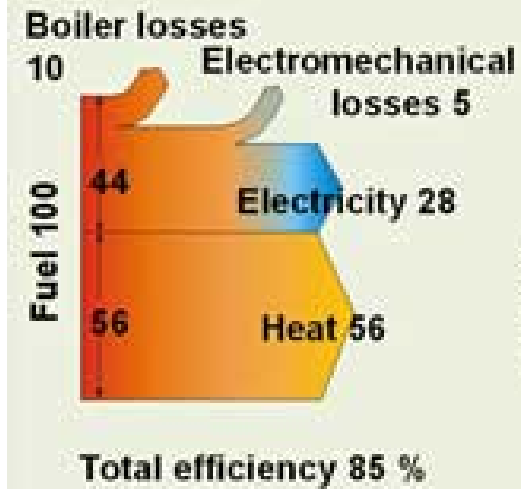
# District heating

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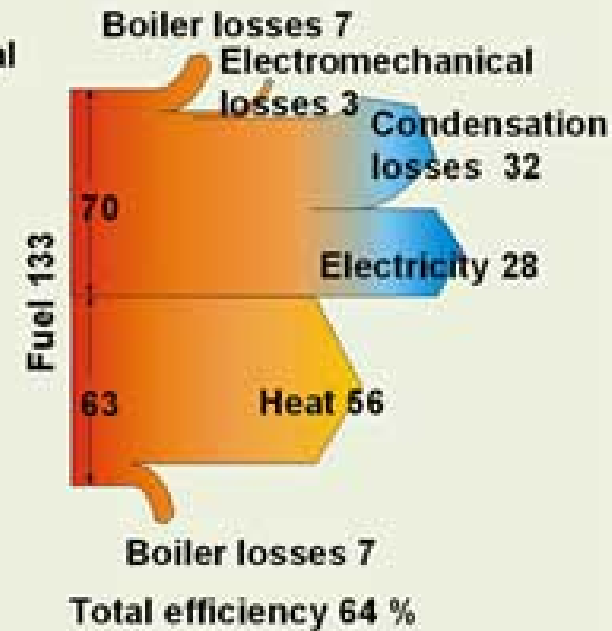


## CHP – combined heat and power

### COMBINED HEAT AND POWER GENERATION

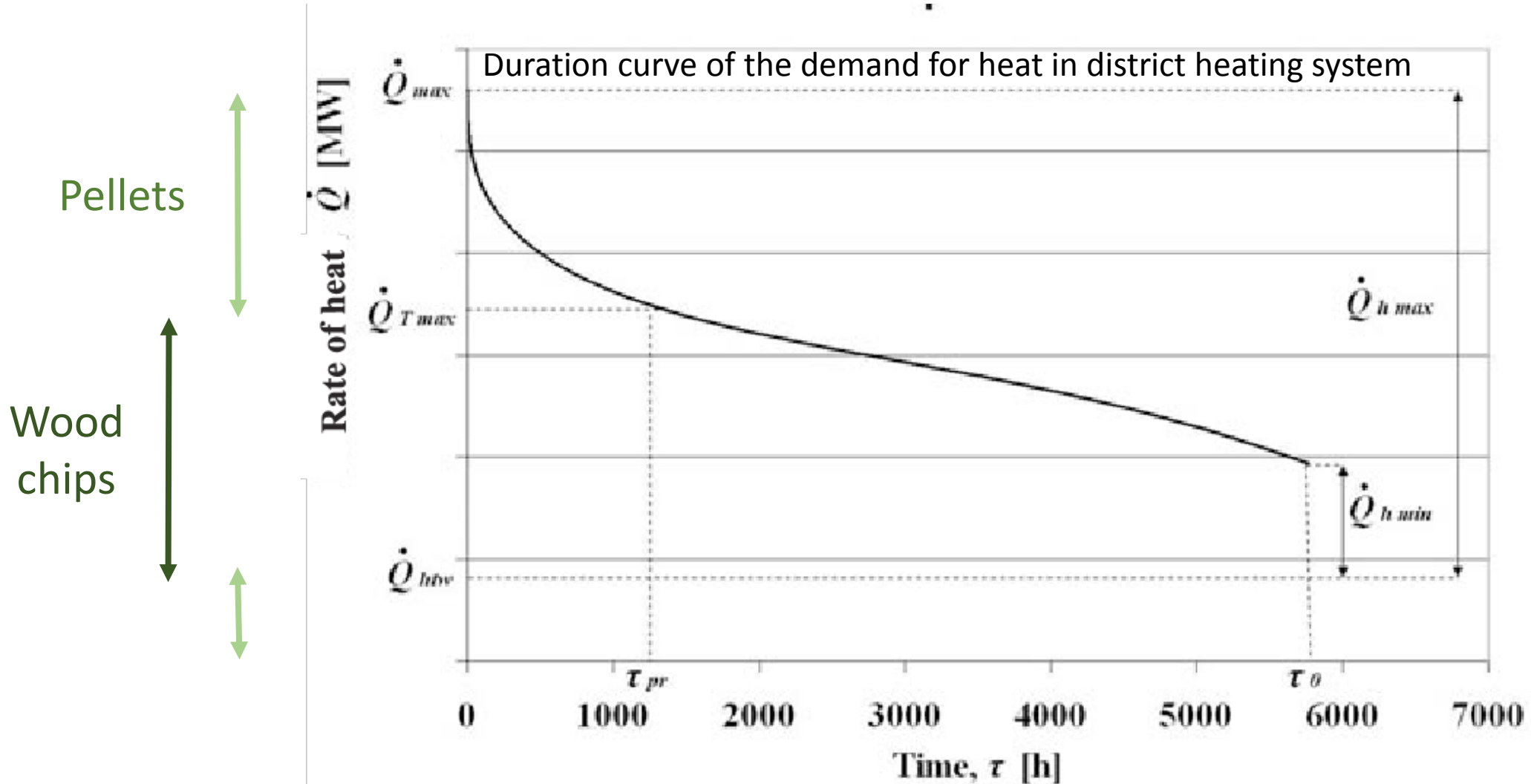


### SEPARATE HEAT AND POWER GENERATION



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bioenergy

# District heating



## History

1992 in United Nation's Climate Conference in Rio de Janeiro, they signed an agreement on climate protection. It really lifted bioenergy back to the energy palette.

*Talking about  
bioenergy*



## Use of wood chips in Finland since 1950's

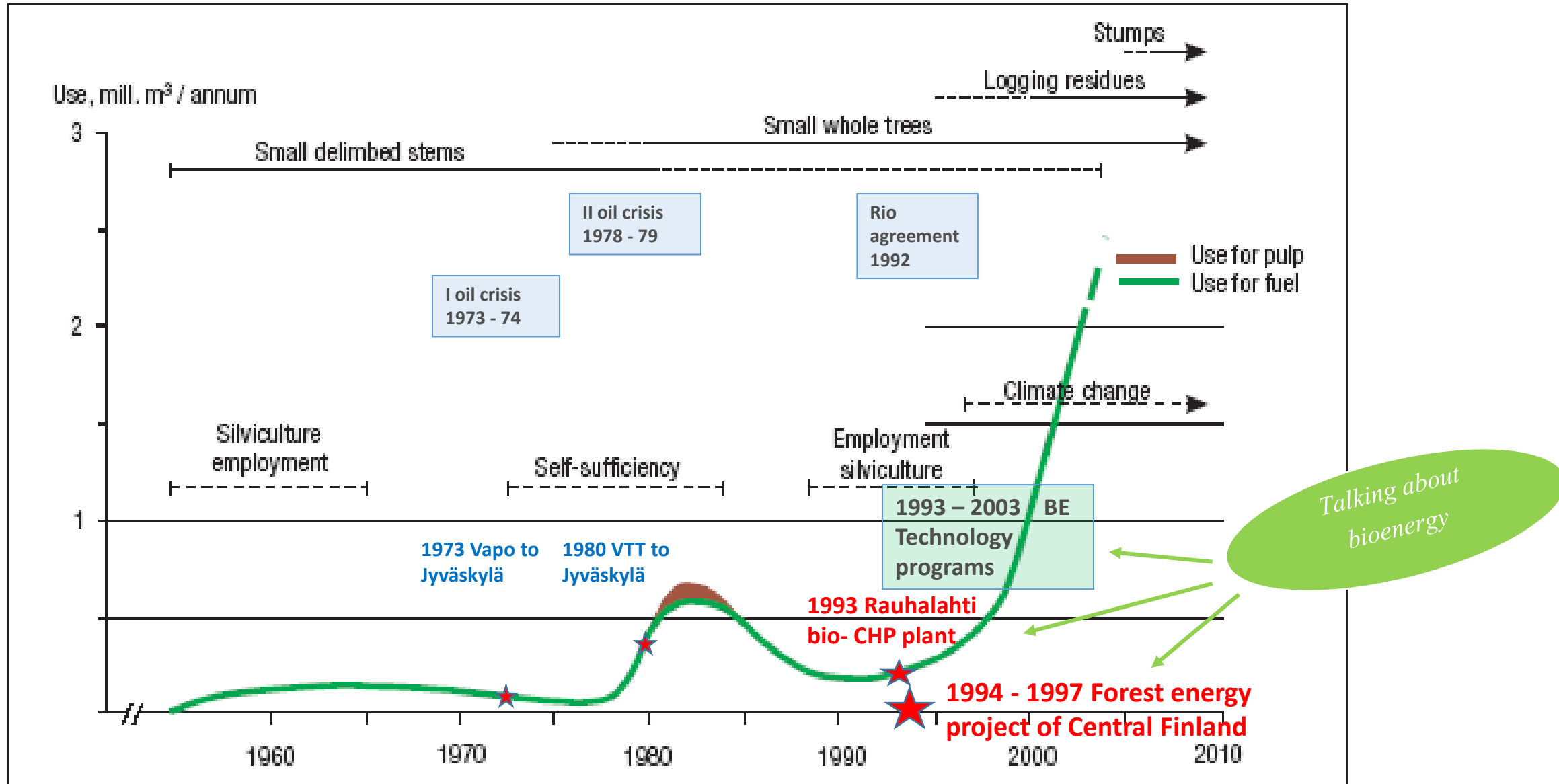


Figure 57. Use of forest chips since the mid-1950s (20, 103).



# Bioenergy technology program 1993 – 1998

- Set up and finance by the Ministry of Trade and Industry
- Execution and coordination by the Technical Research Centre of Finland (VTT) and Jyväskylä Science Park
- Aim: to develop new biomass harvesting and transportation technologies
- Target: new technologies enable competitive production cost of biomass fuels delivered to energy plants
- Wide participation from different sectors



# Power plant conversion to biomass fuels

**Jyväskylä Energia**

**Rauhalahti CHP plant**

**295 MW<sub>th</sub>**

- District heat
- Process steam
- Power
- **1986 Pulverized fuel boiler**
  - coal and peat
  - **NO<sub>x</sub> and dust emission limits exceeded often**
- **1993 conversion to BFB technology**
  - > enables biomass fuels
- **Initiative to a development project**





# Forest Energy Project of Central Finland 1994 - 1997

- Financed by *the Ministry of Trade and Industry and local municipalities*
- Coordination by *the Regional Council of Central Finland*
- Execution by *the Technical Research Centre of Finland (VTT) and the Central Finland Forest Centre*
- Aim: **to demonstrate** forest biomass fuel production chains based on new technologies developed in the Bioenergy Technology Program
- Target: to **introduce wood chip production system** that is capable to deliver large quantities of biomass fuels
- In **cooperation** with local energy companies, forest industry, several municipalities, forest owners associations, timber harvesting companies etc.



# Selected lessons learned

- Role of authorities in initiating new development
- Top down or bottom up?
- "Little bait – little fish, big bait – big fish"
- Keep it simple
- Demonstrations can change the mindset
- Bioenergy must be integrated deeply into a local society
- Decision-makers need information
- The essence of bioenergy is in three words:
  1. Feedstock
  2. Feedstock
  3. Feedstock





# Investment boom to bioenergy 1993 - 2010

- Total 500 M€
- 2 + 7 CHP power plants

**Puulaakson Energia,**  
Karstula 10 MWth,  
1 MWe (2000)



**Metsä-Botnia, Äänekoski,**  
240 MWth, 70 MWe (2003)



**Äänevoima, Äänekoski**  
173 MWth, 38 MWe  
(2005)



**Kumpuniemen Voima,**  
Äänekoski,  
32 MWth, 3,7 MWe  
(1989)

**Keuruun Lämpövoima,**  
Keuruu 20 MWth,  
5 MWe (2010)



**UPM, Jämsänkoski,**  
185 MWth, 46 MWe (2005)



**UPM, Kaipola,**  
104 MWth, 26 MWe (1991)



**Jyväskylä Energia, Rauhalampi,**  
295 MWth, 87 MWe (1993)



**Jyväskylä Energia,**  
Keljonlahti, 484 MWth,  
210 MWe (2010)

**BIOMASS BASED CHP 1540 MW**

**Fuel consumption 10 TWh/year**

# Investment boom to bioenergy 1993 - 2010



**Pylkönmäki Hospital**  
200 kW



**Kinnula district heat**  
2000 kW



**Summassaari Spa**  
400 kW



**Keuruu industrial area**  
700 kW

## BIOHEAT

~ 80 heating plants 0,5 – 40 MW, total 100 MW

~ Numerous household boilers 10 – 400 kW

Wood fuels 1,0 TWh/a



**Uurainen single-family house**  
20 kW



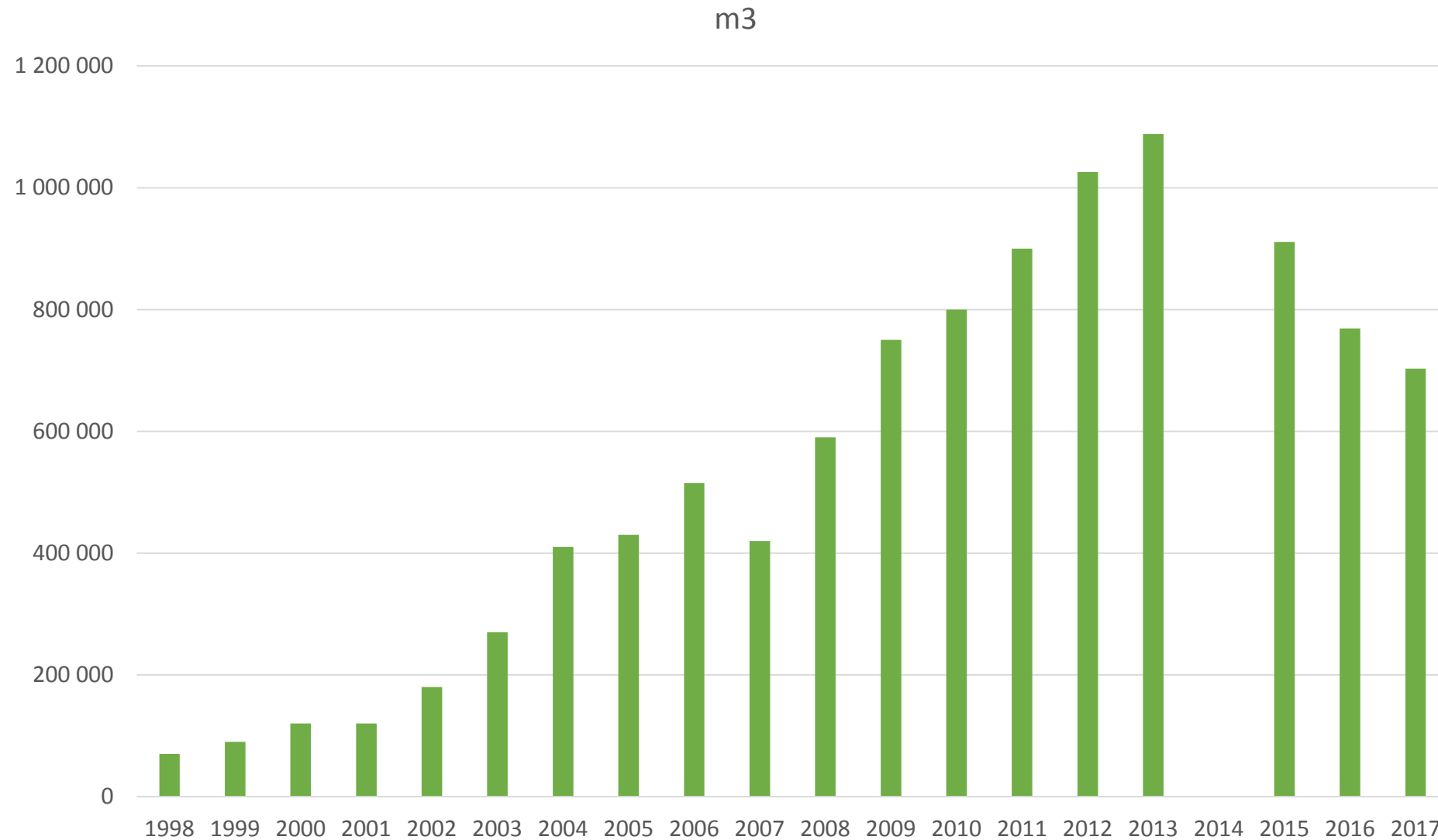
**Joutsa district heat** 4300 kW



**Äänekoski, district heat** 4000 kW



# Use of forest chips in Central Finland



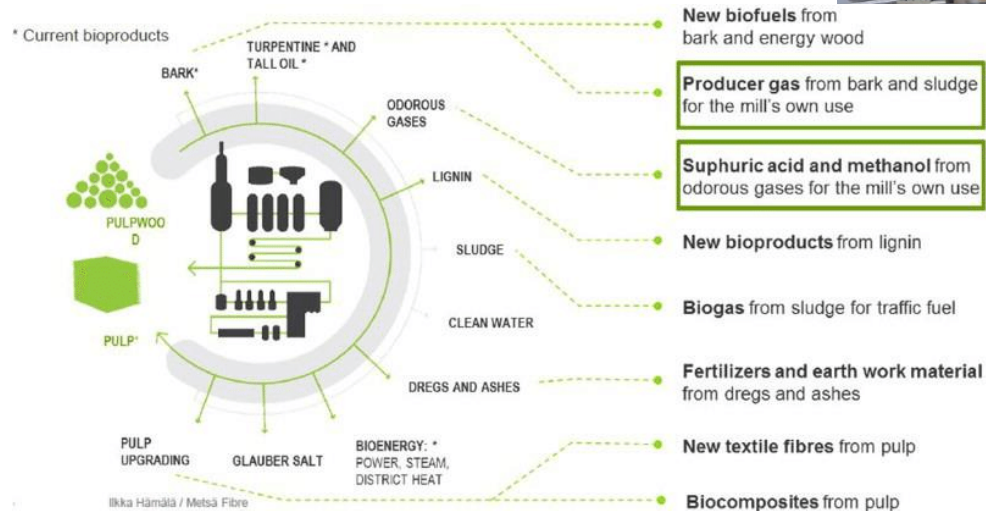
Source: LUKE  
(2014 data missing)

# A Jackpot for Central Finland



## Metsä Group Bioproduct mill, Äänekoski

- Inauguration 18 October 2017
- Investment EUR 1.2 billion
- Timber consumption 6,5 Mm<sup>3</sup>
- Pulp production 1,3 Mtons
- Surplus of bioenergy 140 %





# Promotion of bioenergy in three steps

## 1. What do you want?

- What are the best ways to get it?
- Capacity building
- Research, surveys, benchmarks, tests etc.
- Local application
- Shared targets

## 2. How do you introduce your applications to the market?

- Investment grants to the first customers (also PPP etc.)
- Public purchases
- Open and transparent demonstration platforms

## 3. How do you conquer the market?

- Fiscal measures, legislation, permitting etc.
- Norms, rules and recommendations
- Infrastructure development
- Skillful labour
- Information dissemination





Thank you  
Kiitos

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<https://www.youtube.com/watch?v=aiglinxb4X>