Case Stora Enso:

# Waste heat for energy production

Future Energy Solution -conference
11.9.2024 | Lappeenranta City hall

Vesa-Pekka Vainikka, CEO
Imatran Lämpö Oy

Imatran Lämpö

Environment friendly heat – with the most modern technology

IMATRA

# *Small city – the possibilities of a big city*

**The municipality of Imatra started in 1948 and Imatra received city rights in 1971. Imatra has been known for its rapids for a long time. It has already been mentioned in the Kalevala, Finland's national story.**

## The biggest employers

> 1. Stora Enso (1100)
> 2. The city of Imatra and its companies (850)
> 3. Ekhva / welfare sector (680)
> 4. Ovako Imatra (600)
> 5. The Finnish Border Guard (400)

**(Numbers are not exact))**

## About Imatra in short

> Area size: 191,6 km² (water area 36,3 km²)
> Population 25 100
> Income tax rate 7,36

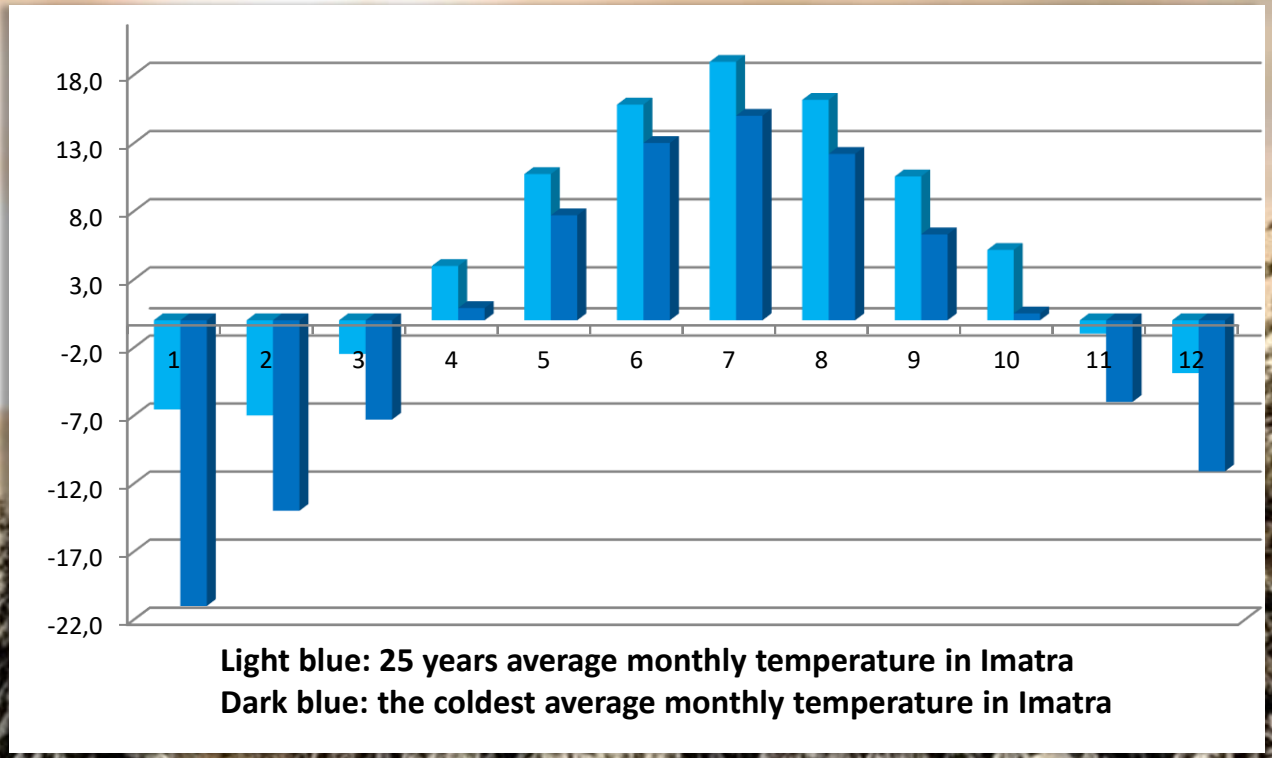
## International city

> Finnish tourism started with Imatra 250 years ago.
> An important export industrial city
> The famous architect Alvar Aalto's church is in Imatra
> Imatranjo –international road racing championship
> Future: wilderness and nature culture museum


imatra.fi

# Heat is needed!

## Average monthly temperatures




**Light blue: 25 years average monthly temperature in Imatra**
**Dark blue: the coldest average monthly temperature in Imatra**

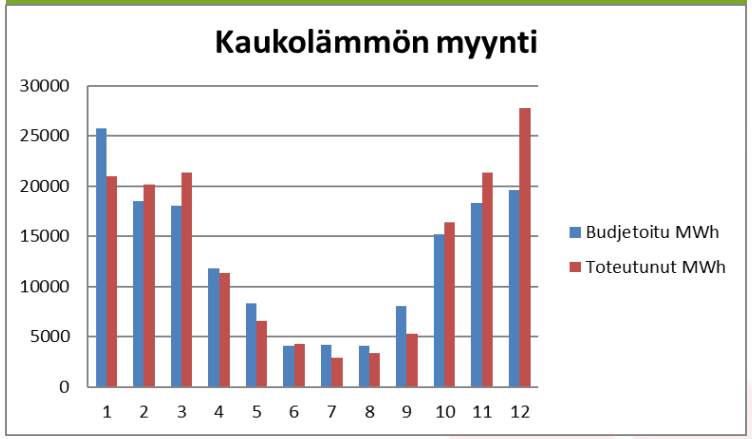
# Imatran Lämpö Oy

- Limited Company owned by Imatra city since Jan 1, 2014 (prior to corporisation a department in city administration)
- District Heat and Natural Gas supply in all conditions
- Maintains, designs ja constructs DH production plants and DH networks as well as Natural Gas distribution network
- Operates in fully competitive and open heating market

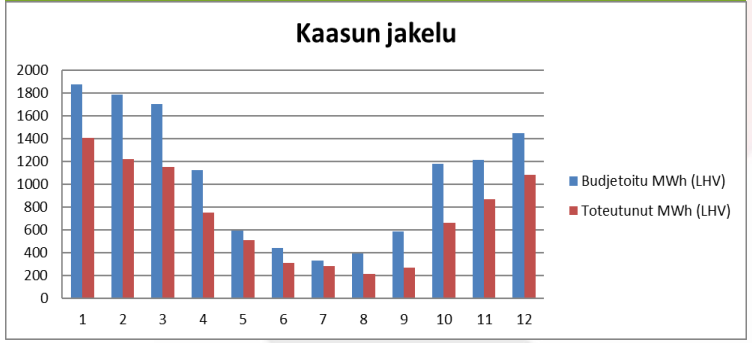
## Key figures

| District Heat | Natural Gas | Turnover |
|---|---|---|
| **12,5 M€** (162 GWh) | **1,1 M€** ( 9 GWh) | **13,6 M€** (energy) **15,5 M€** (total) |
| District Heat customers | District Heat network (trench) | Peak DH load (Jan 2016) |
| **799** | **100 km** | **60 MW** |
| Natural Gas customers | Natural Gas network (trench) | Personnel |
| **166** | **62 km** | **11** |

## District Heat sales MWh



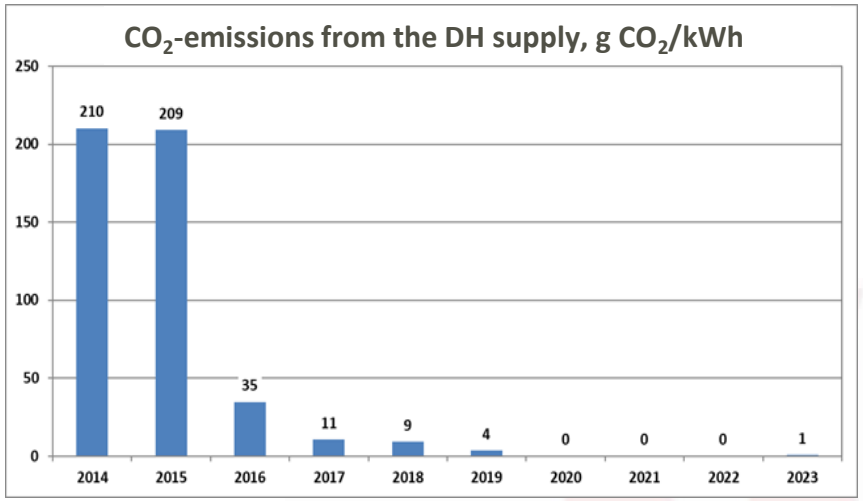

## Natural Gas distribution MWh



# From 100 % natural gas to 100 % RES in five years

## District Heat consumer price development

- Heat price (incl. capacity charges) reduction 20% - 22% in January 1, 2016
- Stable DH price between January 1, 2016 and August 2022
- Due to Russian attack to Ukraine since 24.2.2022 forest energy market and procurement changed completely and fuel prices increased
- Consumer DH prices were increased 22,9% in 2022 – 2023
- Importance of reliability and security of DH supply were even more emphasised




## Three new Biofuel Boiler Plants and DH transmission line

- New District Heat transmission line 6 km
- Project started year 2024, Investment cost 24 million eur
- Fuel: By-products of forest industry (bark), wood chips and forest residues.
- Biofuel Boiler Plants are remote operated and unmanned.
- Completely carbon free DH: In 2023 peak and reserve plants used biogas (0,5 % of total fuel consumption) by applying biogas certificates




# Ongoing actions

## Fortum Imatrankoski Hydro Power Plant

### - generator cooling heat recovery

- Heat pump plant 0,8 MW, 5 GWh/a of DH
- Started operation in January 2022
- Project received 197 000 euros grant financing from Business Finland (Finnish government)

# Ongoing actions

## Stora Enso Pulp and Paper Mills, waste water heat recovery, heat pump plant

Euroopan unionin rahoittama – NextGenerationEU

- 12 - 15 MW, 100 GWh/a of DH
- project implementation ongoing
- operative in the end of 2024
- Imatran Lämpö Oy invests on Stora Enso's site
- Procurement decision was made in September 2023
- The project will receive 3 million euros EU's RRF financing (grant)

Waste Heat Recovery and utilisation:

- Provides wider selection of energy sources for District Heating
- Decreases use of wood-based forest energy (and fossil fuels) in Imatra
- Lowers DH production cost (depending on power price)
- Helps to maintain competitive DH price
- At SE's p&p mill decreases the temperature of cleaned water lead to the lake Saimaa

# Stora Enso Pulp and Paper Mills

Imatran Lämpö

## waste water heat recovery, heat pump plant - LOCATION

# Stora Enso Pulp and Paper Mills

## waste water heat recovery, heat pump plant – PROCESS

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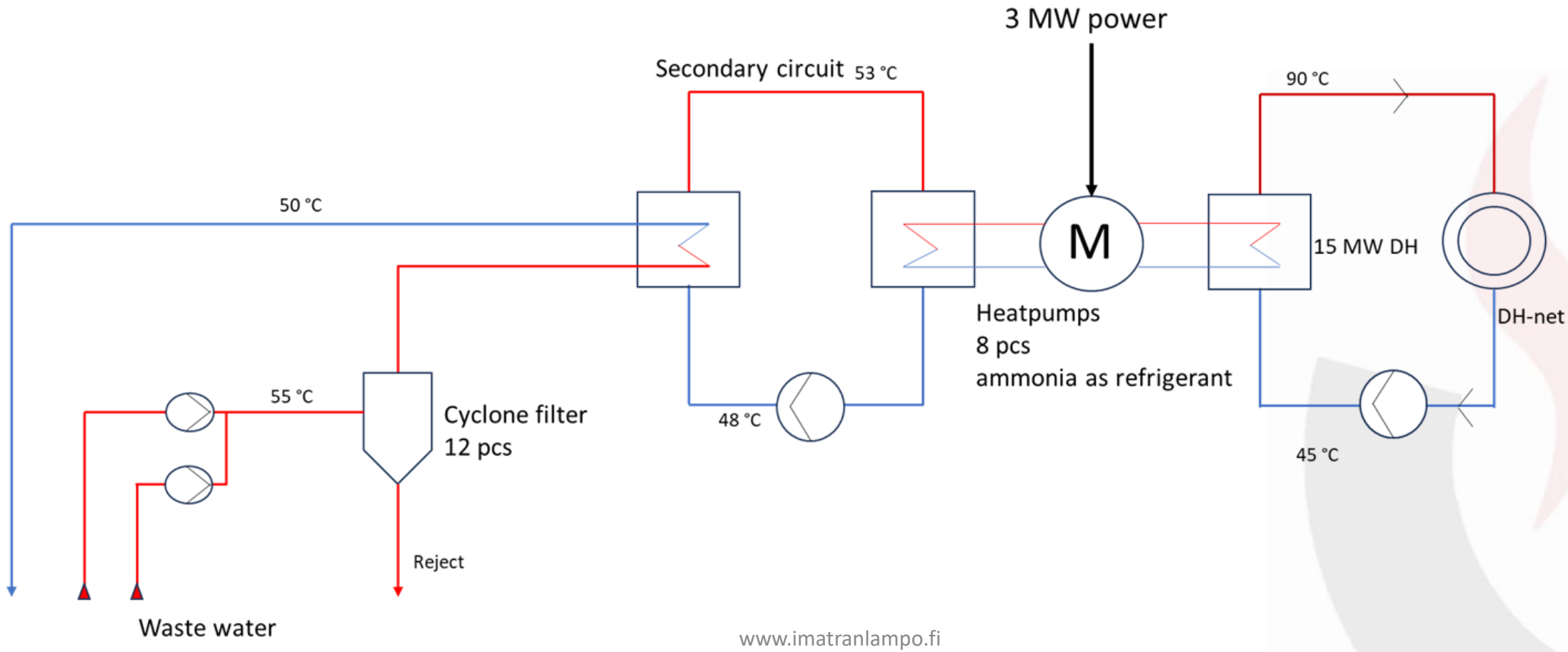
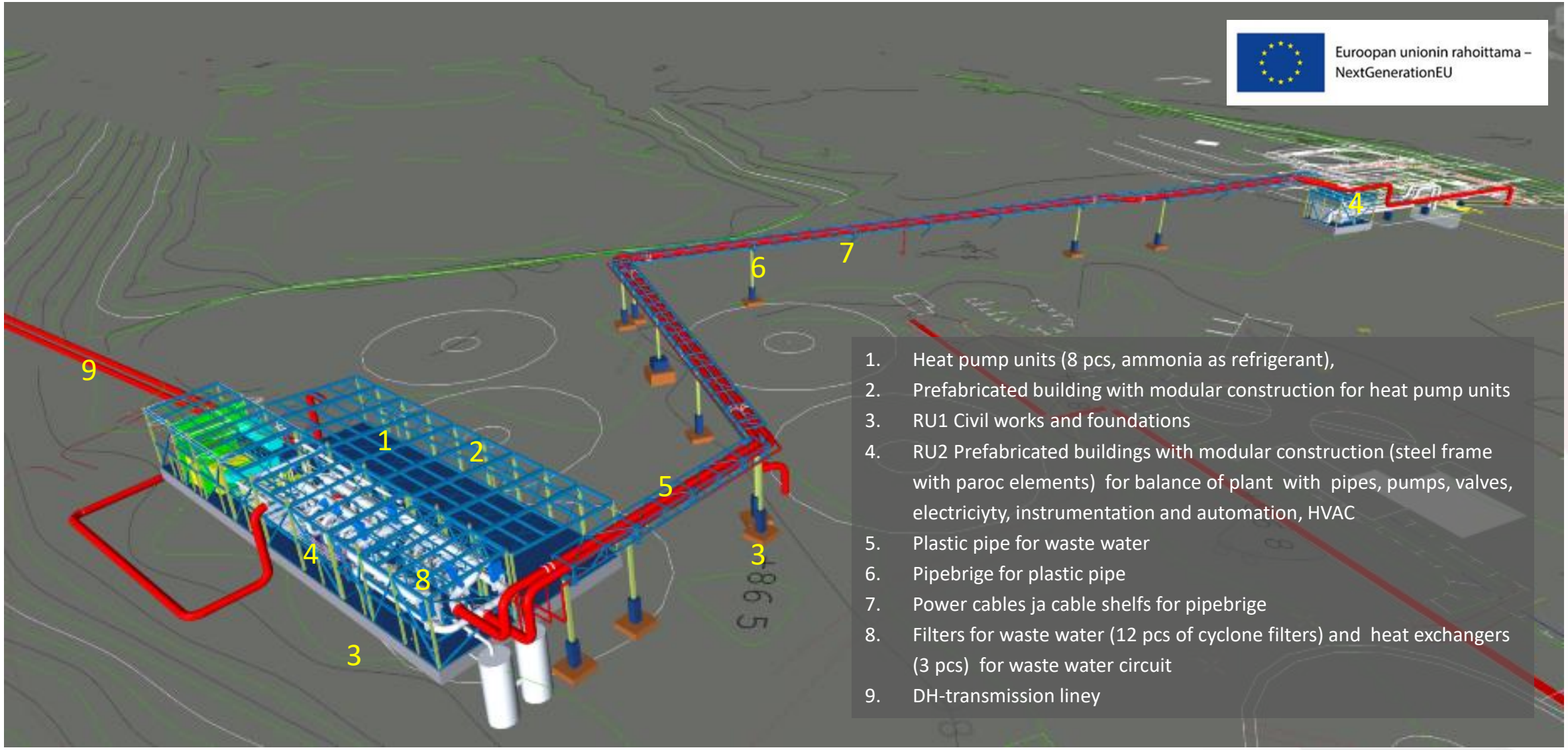


# Stora Enso Pulp and Paper Mills

## waste water heat recovery, heat pump plant – LAYOUT ON SITE



# Stora Enso Pulp and Paper Mills

## waste water heat recovery, heat pump plant – WORKSITE 3.9.2024

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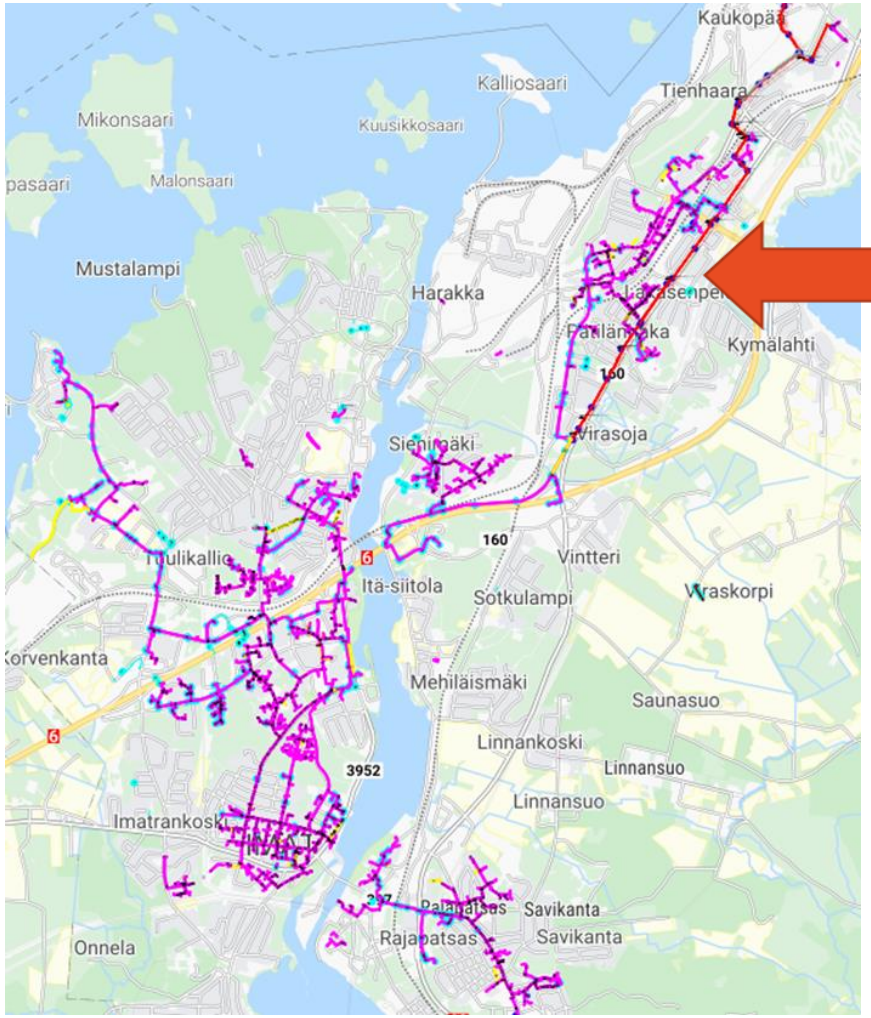
# Stora Enso Pulp and Paper Mills

## waste water heat recovery, heat pump plant – DH transmission line




DN300 DH transmission line
6 km (trench)

Distribution networks:

- District Heating 100 km (trench)
- Natural Gas 62 km

| | |
|---|---|
| Natural Gas | |
| District Heating | |

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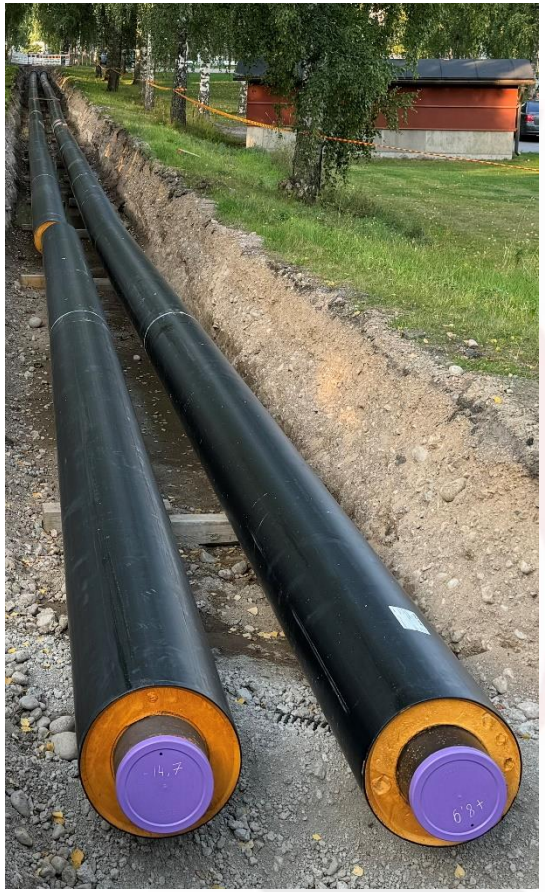

# Stora Enso Pulp and Paper Mills

## waste water heat recovery, heat pump plant – PROCUREMENT PACKAGES

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**Procurement packages / main contracts:**

1. Heat pump units (8 pcs, ammonia as refrigerant), *Suomen Tekojää Oy*
2. Prefabricated building with modular construction for heat pump units - *Suomen Tekojää Oy*
3. RU1 - Civil works and foundations - *Koneurakointi Ovaska Oy*
4. RU2 - Prefabricated buildings with modular construction (steel frame with paroc elements) for balance of plant with pipes, pumps, valves, electriciyty, instrumentation and automation, HVAC – *Calortec Oy*
5. Plastic pipe for waste water – *Sulmu Oy*
6. Pipebrige for plastic pipe – *Jousteel Oy*
7. Power cables ja cable shelfs for pipebrige – *Enersense IN Oy*
8. Filters for waste water (12 pcs of cyclone filters) and heat exchangers (3 pcs) for waste water circuit - *Hydac Oy*

**DH-transmissionline**

- (9) - *KVL Tekniikka Oy*

# Stora Enso Pulp and Paper Mills

## waste water heat recovery, heat pump plant – PROS & CONS, SO FAR

| Pros + | Cons - |
|---|---|
| ✓ The project is progressing and still on schedule | × The interest of main equipment suppliers is not as expected but weaker -> cost effect? |
| ✓ All procurement contracts concluded | × The amount of grant is less than expected |
| ✓ Excellent cooperation and operation with Stora Enso | × The price and terms of financing are weaker than before |
| ✓ Excellent and flexible cooperation and operation with the board and owner of Imatra Lämpö Oy, the city of Imatra | × The site and the project is more challenging than expected |
| ✓ Motivated designers who know what they are doing | × After pre-engineering, the design in all areas has not worked as expected in terms of quality, problems/errors and cost increases |
| ✓ Motivated suppliers/contractors who know what they are doing and understand the value of the project as a reference | × Do the delivery limits of the different procurement packages smoothly match each other in the implementation? - schedule and cost impact |
| ✓ The company's own staff learns and internalises the project and the future operation of the equipment, when they are involved centrally and with a large amount of work throughout the project | × Wastewater filtration and self-suctioning pumps are the biggest risks of commissioning and general operation |
| ✓ The project has attracted interest among those who know and understand the case | × The project has a big impact on the company's personnel |
| | × The Finnish holiday periods (2 summer and 1 Christmas) have fallen at critical points for the project and made project implementation challenging |

# Stora Enso Pulp and Paper Mills

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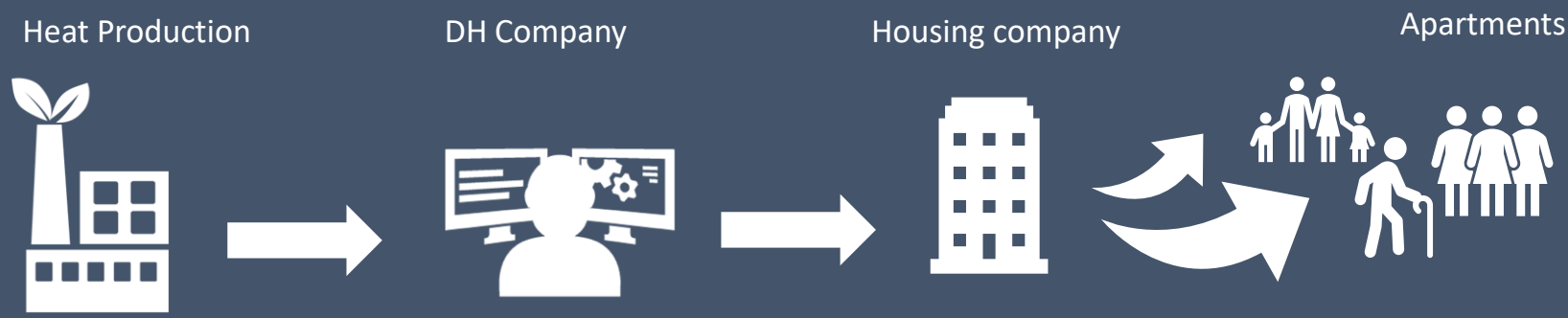
## waste water heat recovery, heat pump plant – LESSONS LEARNT, SO FAR

| | |
|---|---|
| Project challenges | The site / the project is more challenging than expected - the pre-engineering should have been more accurate and included more involvement by project owner - impact on costs and funding |
| Financing | In the beginning, more “contingences " should have been taken into the basic financing. |
| Grant amount | The first estimate of the amount of possible grant should not have been trusted |
| Clear responsibilities | Ensures, and does not assume, that the planning, including implementation and procurement planning, will certainly have competent and cooperative team members with clear lines of responsibility. |
| Usage of multiple planning offices | In order to ensure quality, a wider distribution of the different areas of implementation and procurement planning to different planning offices. |
| Areal knowhow | Further expansion of the use of high-quality designers in one's area, who know the areal market and sites and are motivated to work there, in order to guarantee cost efficiency and quality. |
| Definitions of interface<br>Additional resources | A more precise definition of the design interface between designers and suppliers could lead to a more cost-effective and even higher-quality end result.<br>Additional external resources for monitoring implementation should be considered and perhaps used more. |
| Holiday season | If possible, scheduling critical points of the project during the Finnish holiday period (summer and Christmas) should be avoided. Unfortunately, this is very rarely possible. |

# Responsibilities of Different Operators in DH System




DH metering unit and consumer substation

Technical, commercial and institutional characteristics
of the consumers are transparent and clear.
Heat production and distribution
can be built, maintained and operated
cost efficiently and ecologically.

According to changing circumstances and requirements
energy sources can be changed and
energy services can be developed
without major changes of customer equipment.

# Key advantages of District Heating

A socially responsible service

Part of national safety system

Flexibility for fuel changes, possibility to optimize fuel mix

Executor of energy transition

Easy to control and operate for the consumer – high quality and flexible heat supply service

Different sources of waste heat can be utilized

Small space requirement and safe operation

Enabler of energy revolution

Impacts viability of regions

Backbone of sustainable energy infrastructure

# Thank you!

Imatran Lämpö

More info about us:

www.imatranlampo.fi

Euro Heat & Power-video

Yearbook 2023