

Lowering heat losses by better network control

How to improve DH network operations without major CAPEX investments?

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Valmet's offering for energy producers

Orders received
EUR 5,194 million

Employees
17,548

Boilers and gasification plants → from fossil fuels toward Renewable!

- Boiler plants (BFB and CFB)
- Gasification plants
- Modular power plants
- Heat plants including biomass as primary fuel
- Rebuilds and conversions (coal to biomass)

Emission control technologies

- Air emission
 - Flue gas cleaning
 - **Flue gas heat recovery**
 - NO_x control
- Solid emission (Ash)
- Effluents

Services

- Spare and process parts
- Workshop services
- Filter fabrics
- Maintenance development and outsourcing
- Field services
- Process upgrades
- Industrial Internet solutions

Process
technology

Customer

Services

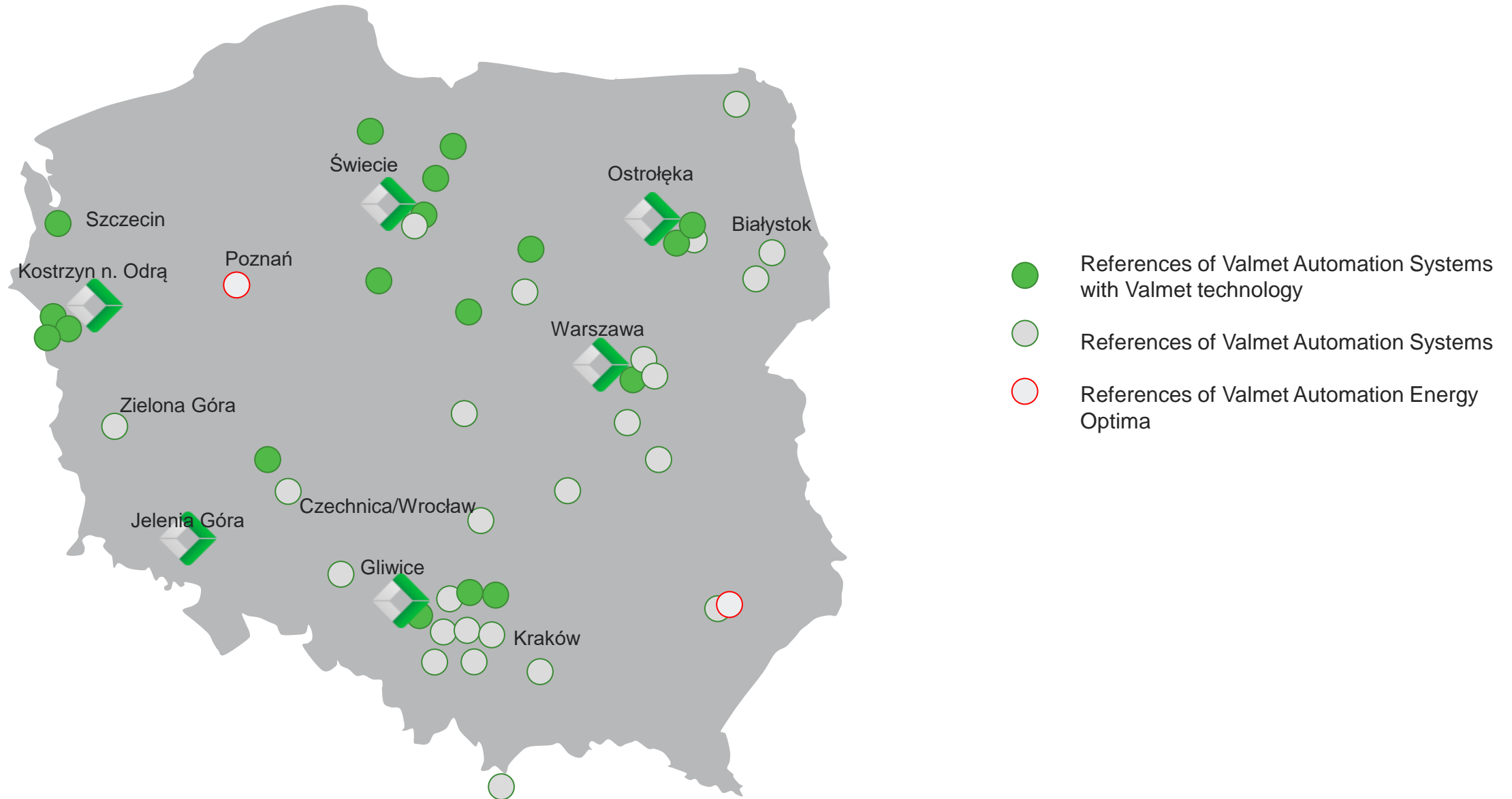
Automation

Flow Control and Automation Systems

- Valves
- Valve automation
- Valve controls
- **Distributed control systems (DCS)**
- **Plant/Fleet monitoring and reporting**
- **Optimization (APC)**
- Boiler diagnostic systems
- **Performance solutions**
- Turbine automation
- Analyzers and measurements

References in Poland, Valmet Automation Sp. z o.o.

INTERNAL



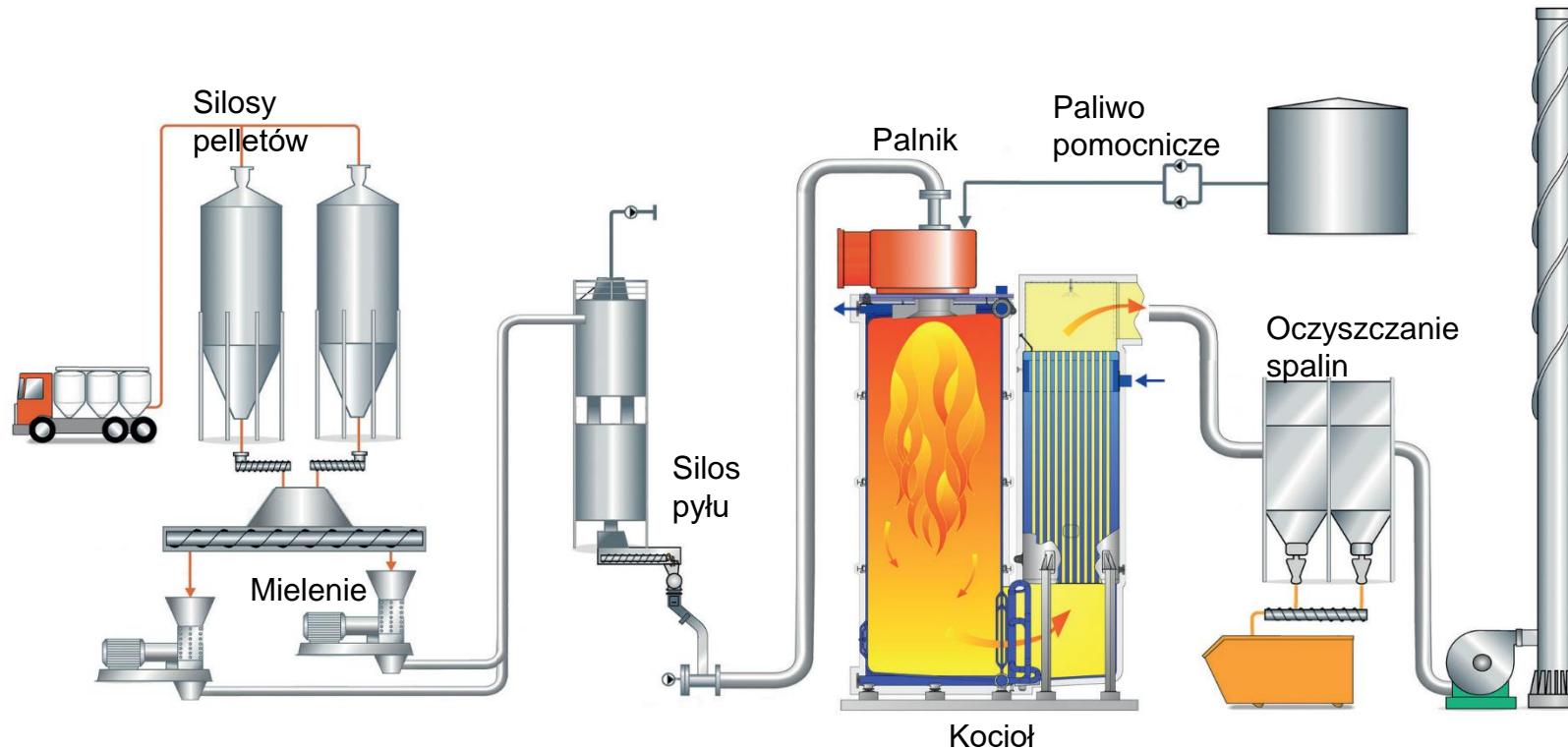
Principle of :Green (renewable)water boiler /Sarankulma, Finland

Pellets are stored in fuel silos whose capacity correspond to 2–5 days fuel consumption.

Pellets are pulverized in a hammer mill after silo storage.

Pulverized fuel is led to a dust filter to remove excess air.

Pulverized fuel is transferred to the powder silo for few hours before being pneumatically fed to the burner.



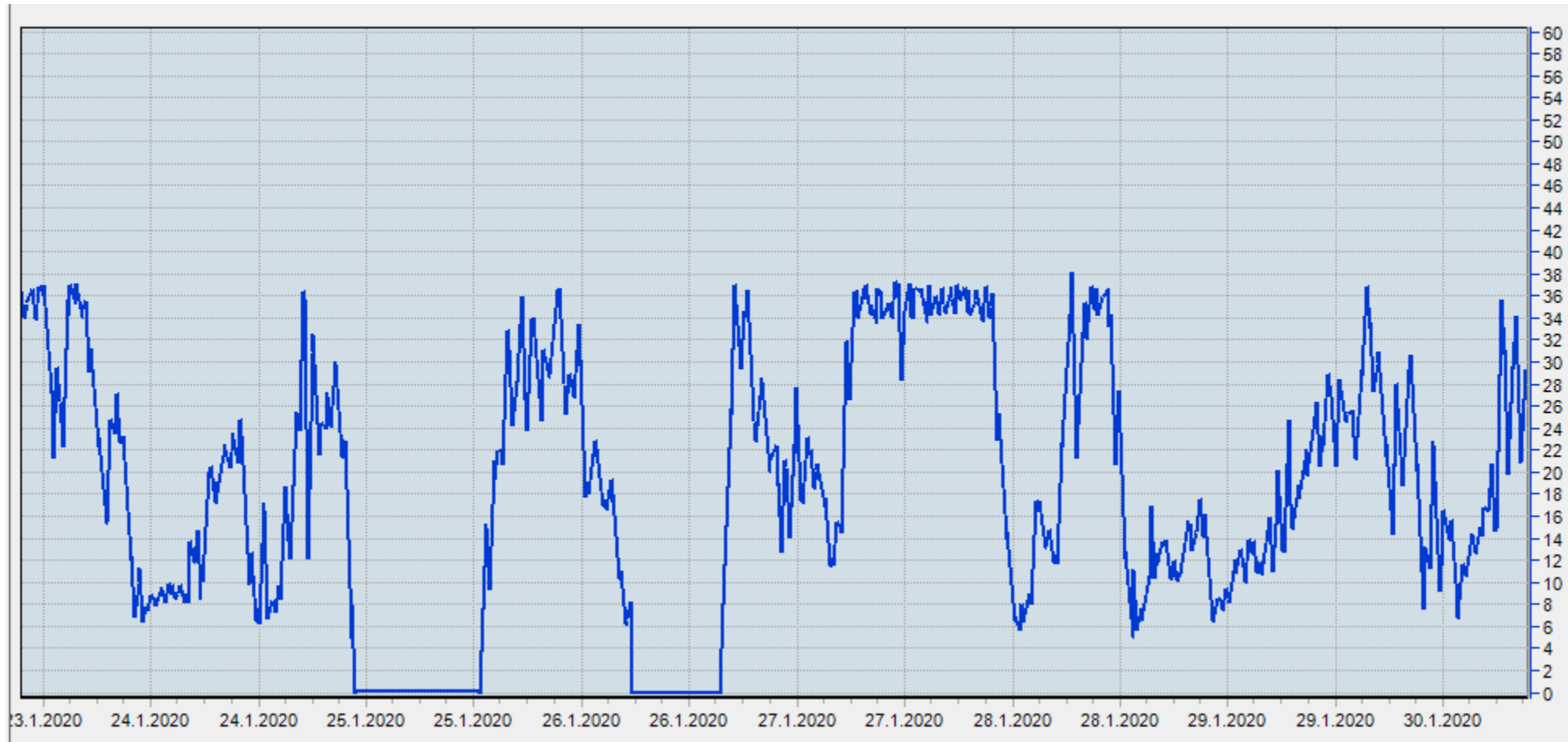
- Start-up w 2015
- Heat capacity 37 MWt
- District Heating supply
- Main equipment
 - 2 mills of wood pellets
 - pulverized pellets sili
 - pulverized pellet burner
 - kocioł
 - filtr workowy
- System Automatyki ValmetDNA
- **W pełni Automatyczna praca kotła , bezzałogowa !**
- **centralna nastawnia w elektrociepłowni Tampere**

Zobacz animację:

<https://www.youtube.com/watch?v=8OqyqSgWjMU>

Flexibility of load changes – biomass pulverized pellet heat boiler

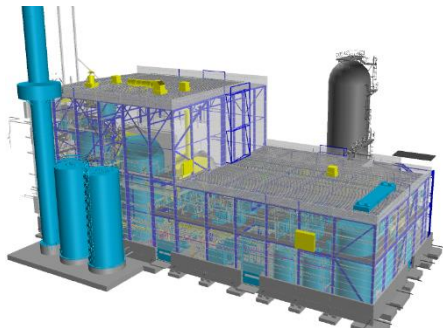
Cold startup time 1,5 – 2h- similar like gas fired, but Green! , excellent as peak boilers



Helen Vuosaari C bioenergy heating plant

Helsinki, Finland

- Valmet scope of supply:
 - Wet scrubber with heat recovery
 - Combustion air humidifier
 - Absorption heat pumps x 3
 - Condensate treatment for raw water and boiler make-up water
- 95 MW total heat recovery with heat pumps
- 123% plant efficiency
- 43 m³/h raw water & 15 m³/h demi water from flue gas condensate, zero waste water



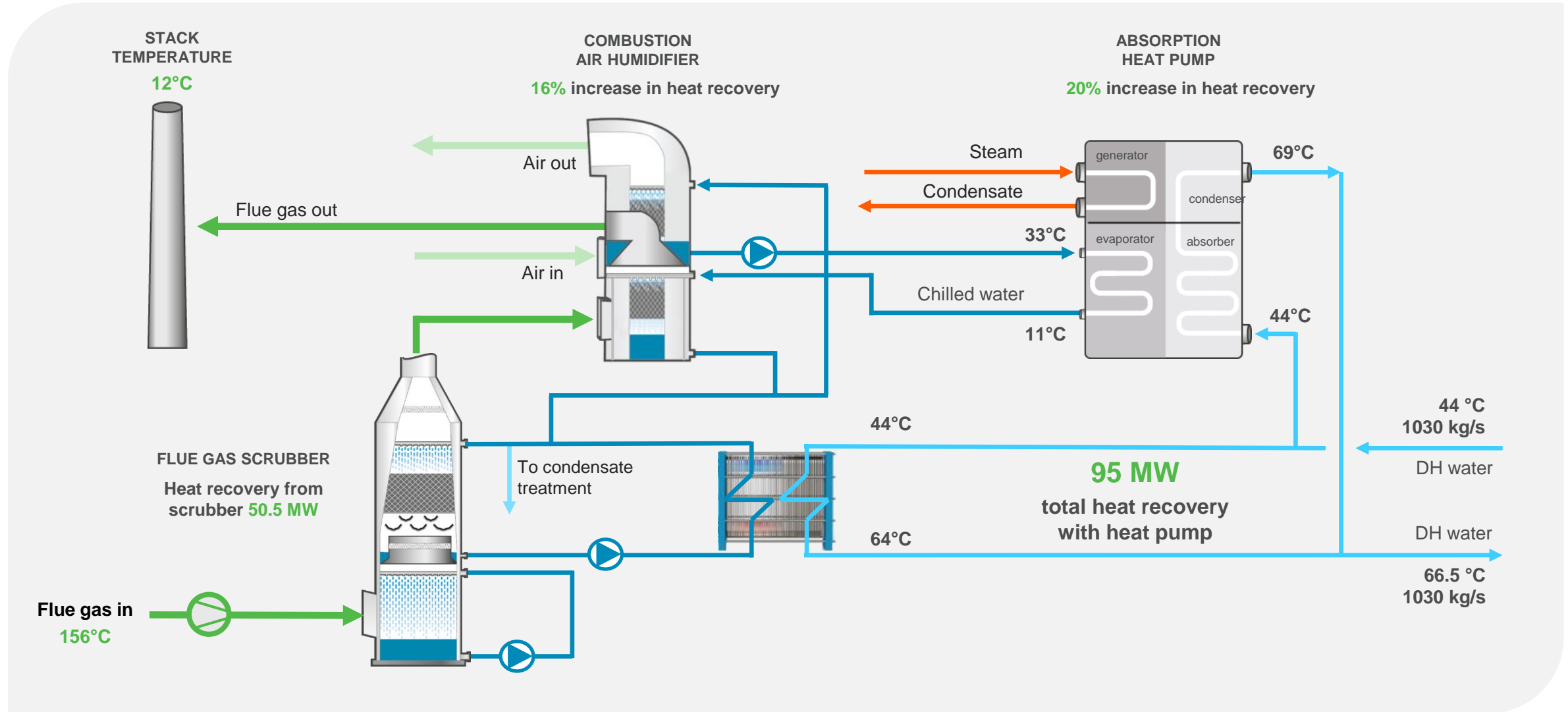
Plant

- 220 MW CFB (2022)
- Steam 288 t/h
- Biomass
- Delivery year 2022

Solver effect

“Carbon neutral energy generation by 2035 with outstanding energy efficiency”

Helen Vuosaari flue gas condensing plant



Absorption heat pumps

Optimizing heat recovery with 3 LiBr based absorption heat pumps



- Steam 5 bar / 165°C
- Weight: 85 t
- 12.2 x 2.95 x 4.25 per unit
- COP 1.7

Steam consumption

26.4 MW

Cooling power

18.5 MW

Heat recovery output

44.9 MW

Challenges for District Heating System

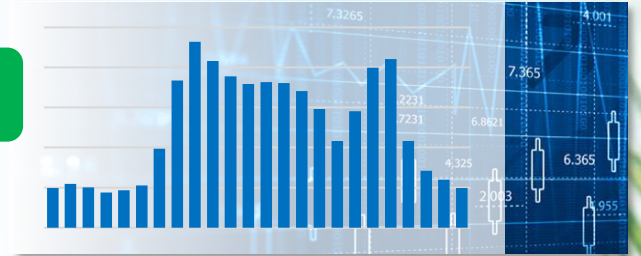
Changing Markets

Cheapest choice of fuel

Promote „Carbon Neutral” solutions

Reduce production costs

Lower CO₂ Emissions

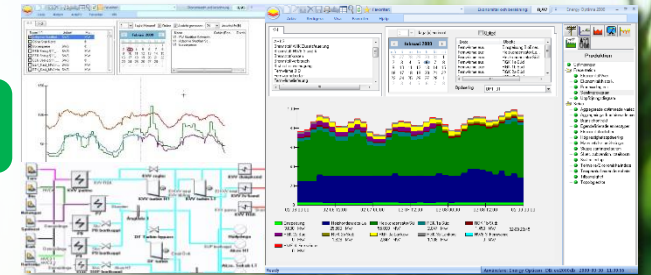


Demand for flexibility Diversity in production mix

Use units with the highest efficiency

Planning maintenance to optimal periods

Increase revenues from electricity trading



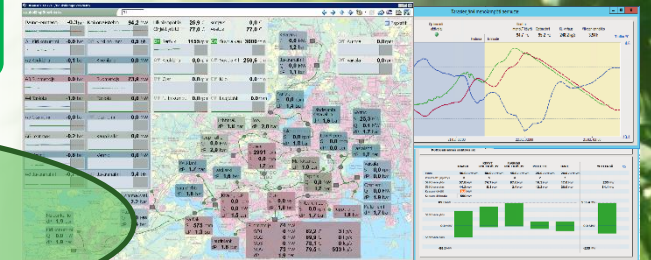
Daily production planning, trading Long-term investment planning Real-time operation

Avoid start and stops of units

Common planning

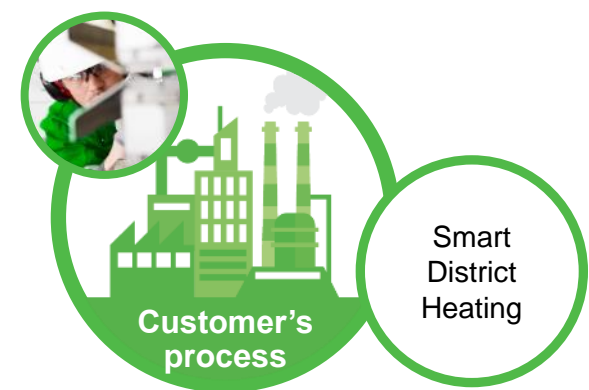
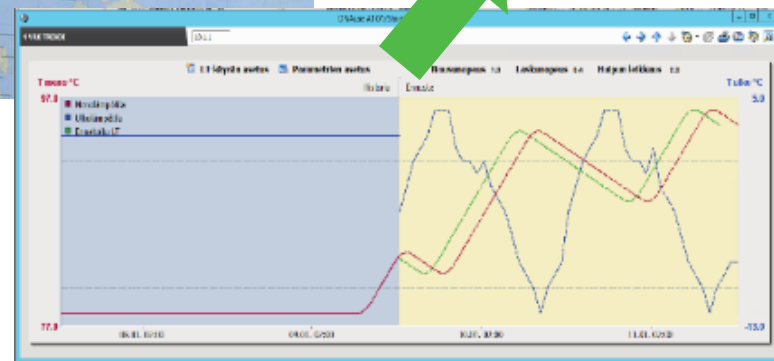
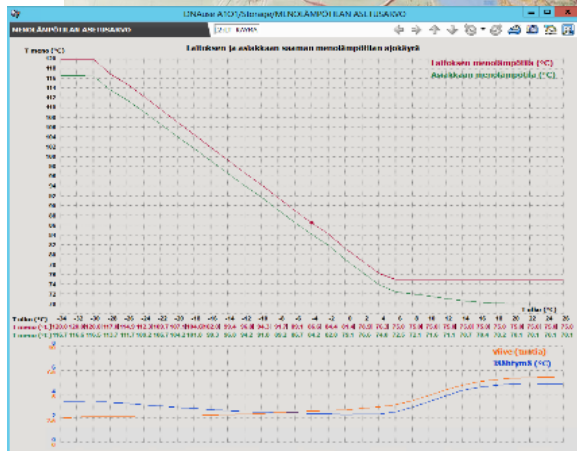
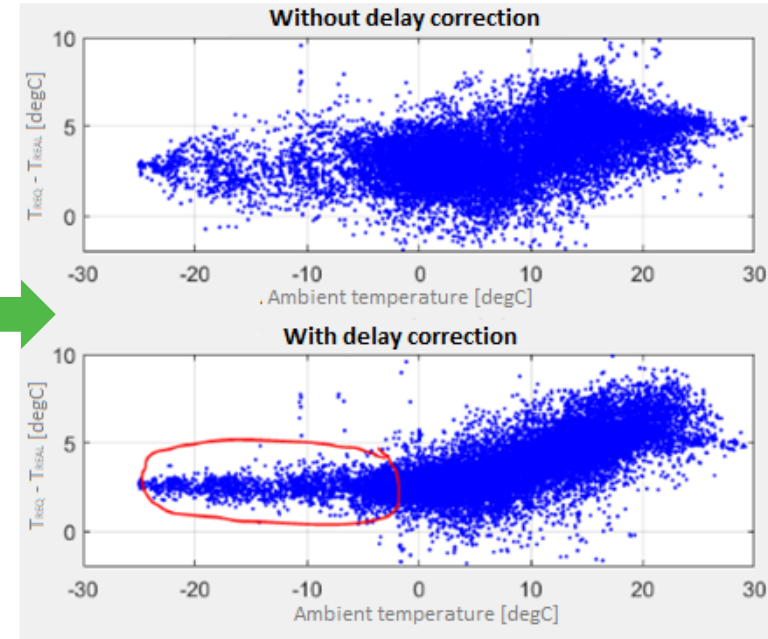
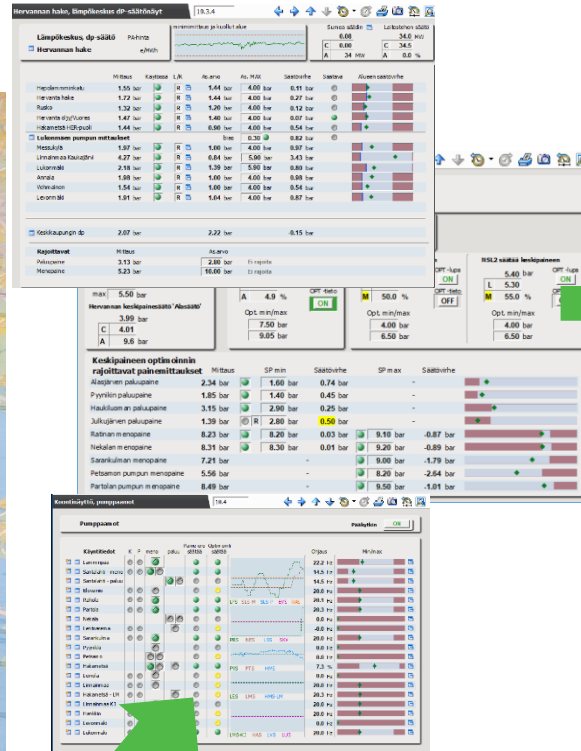
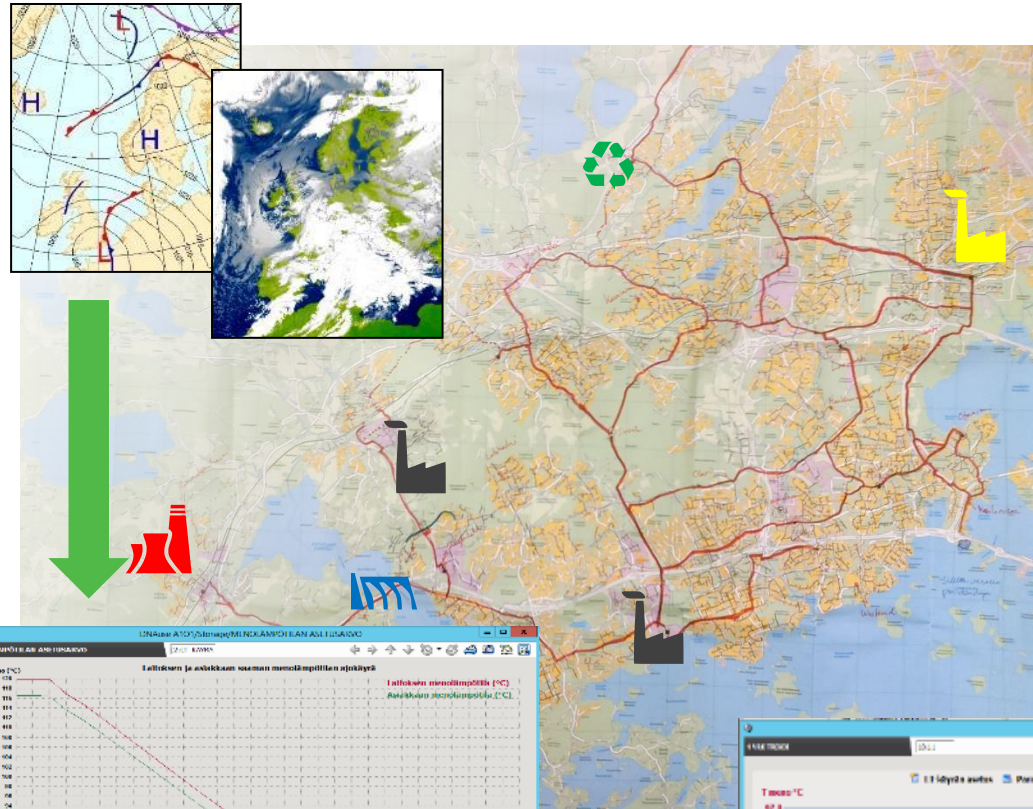
Finding optimum for control

Utilization newest APC application



Goal for Optimized control strategy

Fulfil demand, minimize costs = Predictive Supply Temperature Control



Valmet DNA District Heating Manager

7 running solutions

CO₂ reductions in energy production thru smother control of district heating and maximize cheap fuel mix

CO₂ reduction based on smother control of DH system which minimize supply temperature from heat sources. Active coordinated control among different CHP and Heat Stations increases optimization area significantly

DNA District Heating Manager is designed for

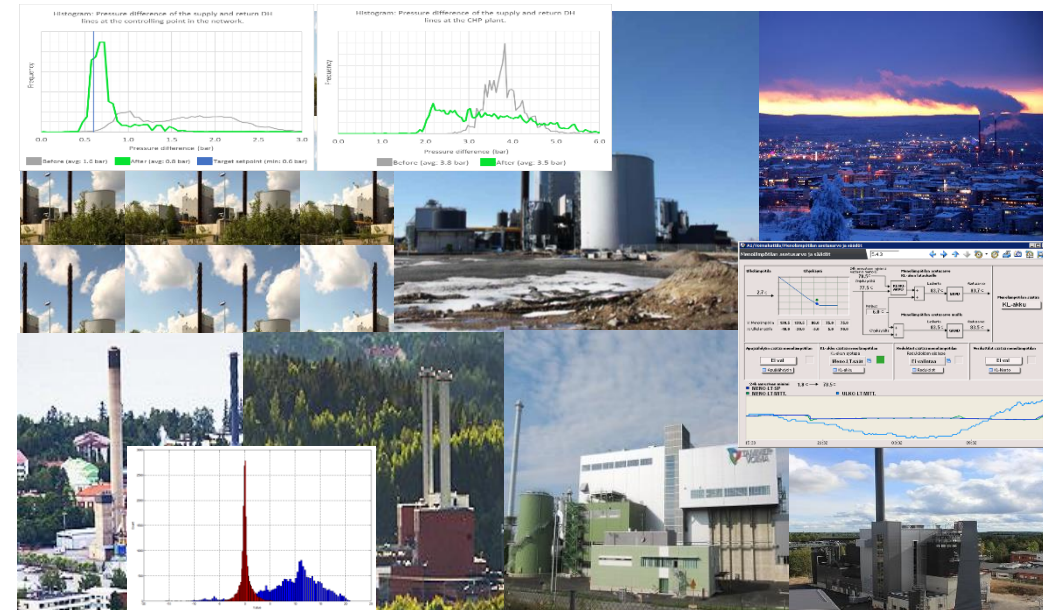
- District heating companies
- CHPs and heat station owners
- Multiutility companies who delivers heat and electricity to urban areas

Our solution

DNA District Heating Manager is an advanced process control (APC) application – based on Valmet's over 20 years experience of automation and optimization district heating systems.

Long term Performance Agreement and expert services (remotely and on-site) enables continuous development.

Production planning and Combustion Manager solutions available for enhanced CO₂ management for CHP plants.

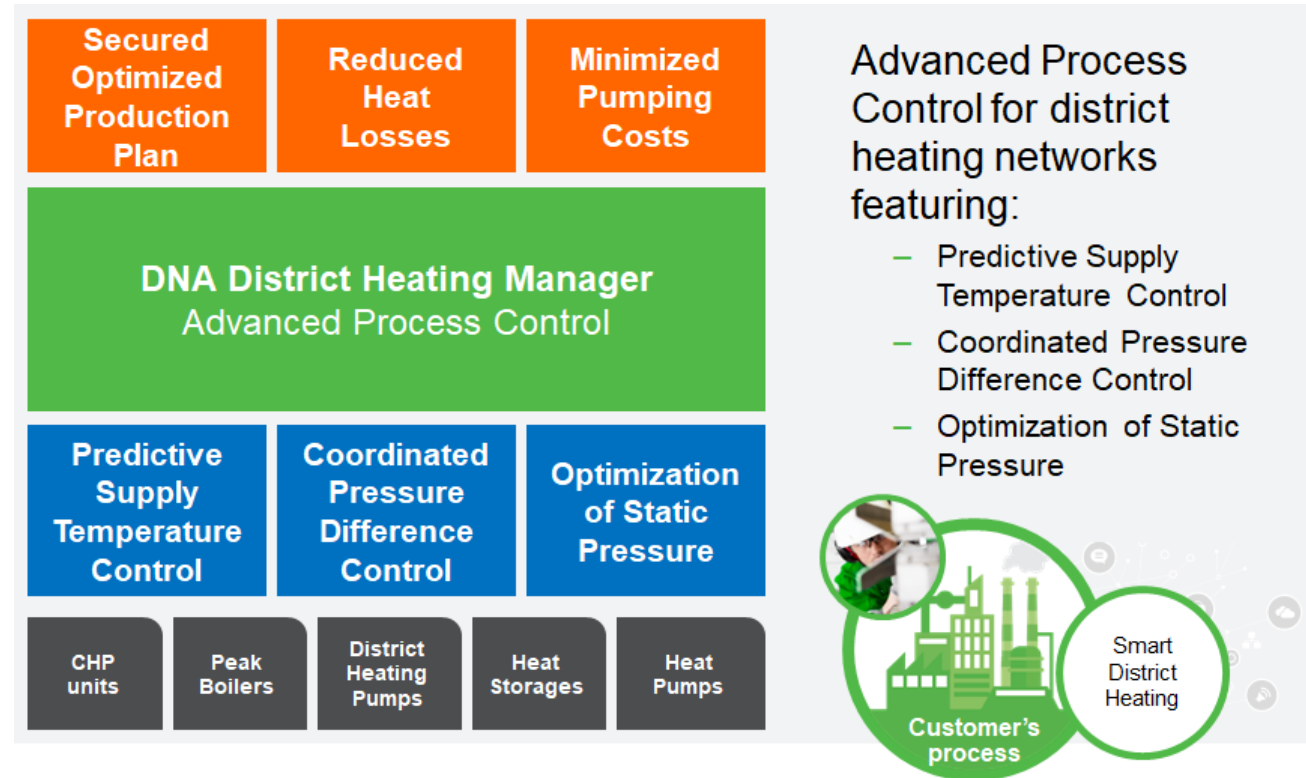


The average annual CO₂ reduction in Valmet DH Manager project **5.73 ton CO₂ per GWh of produced heat (1.6 kg CO₂ per GJ)**
Coordinated control between DH and CHP improves achievable goals to save 1.5 % of fuel costs !

References

District Heating Manager

- Fortum Espoo, Finland
- Lahti Energia, Finland
- Napapiirin Energia ja Vesi (Rovaniemi), Finland
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- Tampereen Sähkölaitos, Finland
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- Turun Seudun Energia, Finland
- Jyväskylän Energia, Finland
<https://www.valmet.com/media/news/press-releases/2018/valmet-to-supply-a-district-heat-network-optimization-solution-to-jyvaskyla-energy-in-finland/>
- Helen (Helsinki), Finland* <https://www.valmet.com/media/news/press-releases/2019/valmet-to-supply-an-optimization-solution-for-helen-ltds-district-heat-production-and-network-in-helsinki-finland/>







Energy Optima 3

Economic total optimization of integrated energy systems

Boris Jovanovic, Senior Energy Systems Engineer



Energy Opticon

Long experience, know-how and stability

Founded in 1989 and has over 50 satisfied customers in Europe and Asia.

Special expertise in production economy and renewable energy.

Competent service with single-point-of-contact.

Innovation company within cleantech

Delivers software for economic and environmental total optimization of integrated energy systems.

Many years of experience in innovation and research projects.

Re-invests over 40 % of the annual profits into new development.

Large international partners

Automation, Big Data, Electricity Trading and Consumer Flexibility.

Valmet  (Finland)

robotron[®]
MIT DATEN MEHR BEWEGEN. (Germany)

TRAYPORT
A TMX COMPANY (Germany)

NODA
Intelligent Systems (Sweden)

ISO certified

Certified for the quality standards of ISO 9001:2015.

Good structure and processes within the company.



Our business areas

Total optimization.

Economic production optimization
(short- and long-term)

Cloud

/// EnergyOptima 3

Management and quality-control of measurements

Optimization of the forward temperature in district heating networks

Accurate load and price forecasts

Support for energy trading

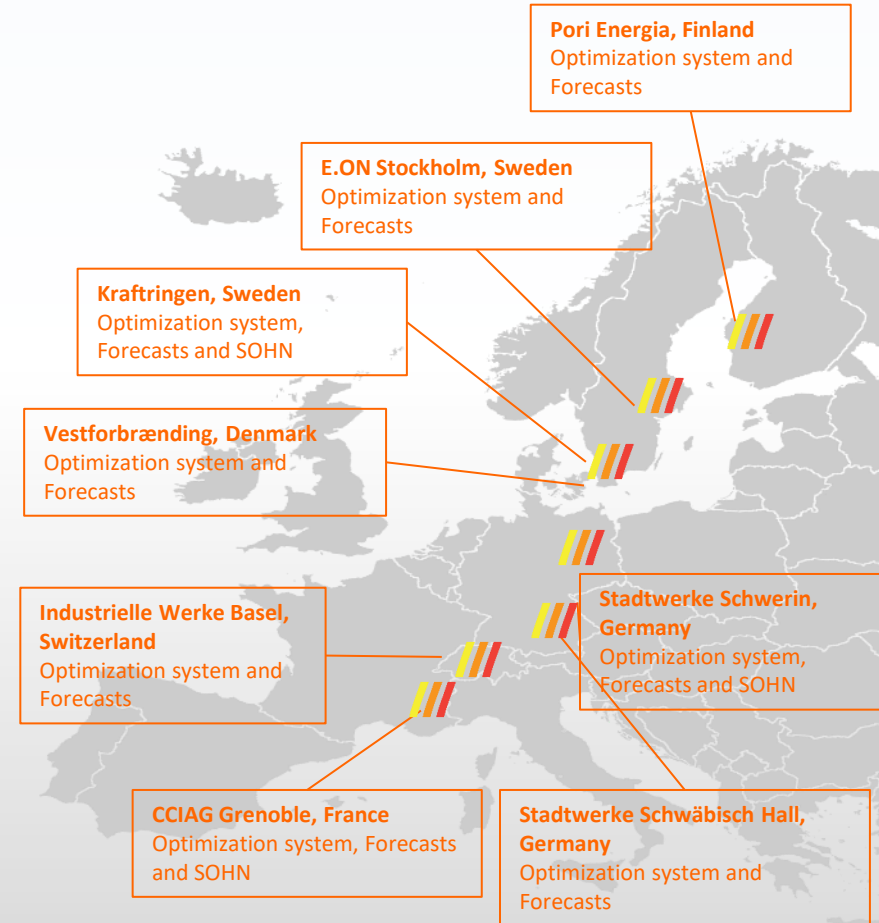
Advanced imports and reporting

Investment calculations and simulations
(new units, CO₂, fuels, hydrogen, CCS/CCU etc.)

Return of investment within one year

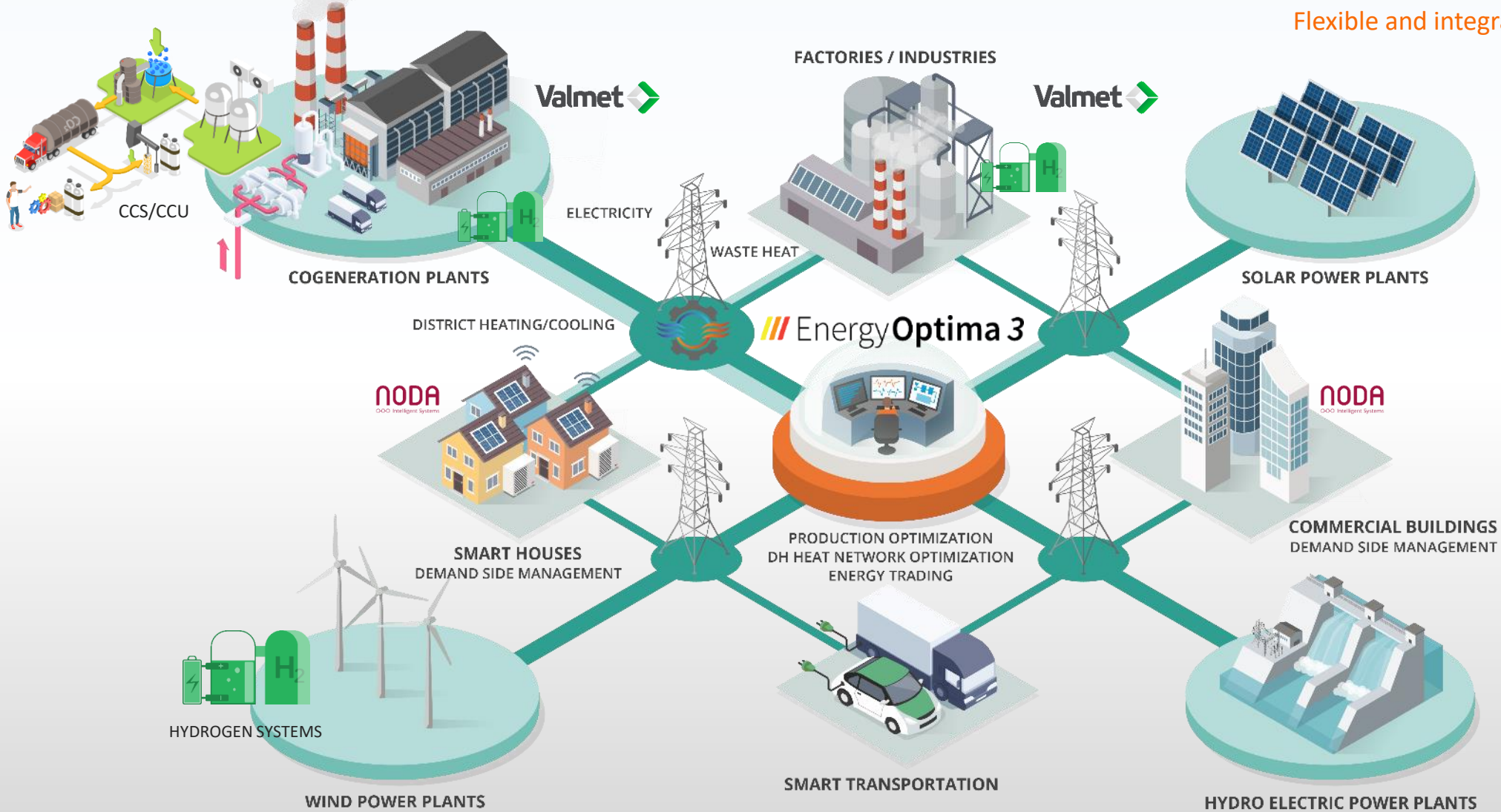
References in Europe

In Europe.



Total economic optimization of energy systems

Flexible and integrated energy systems.



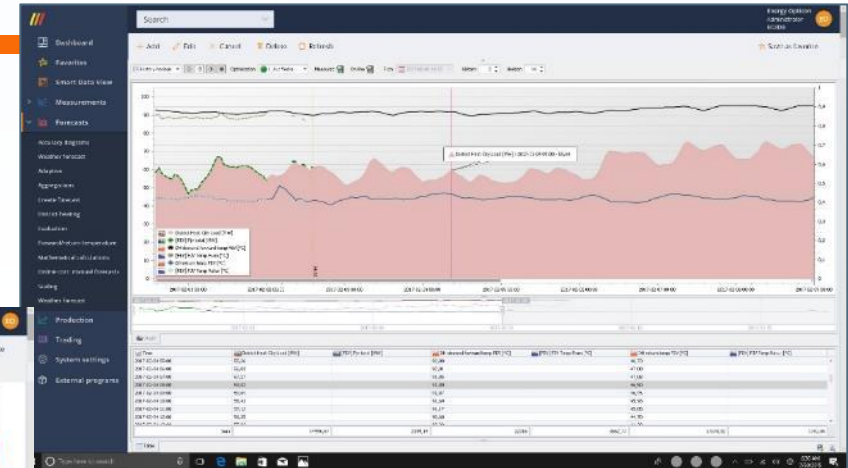
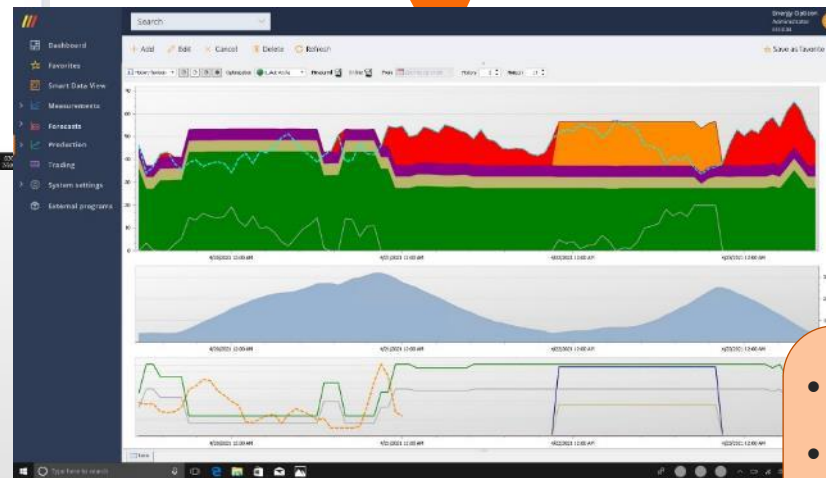
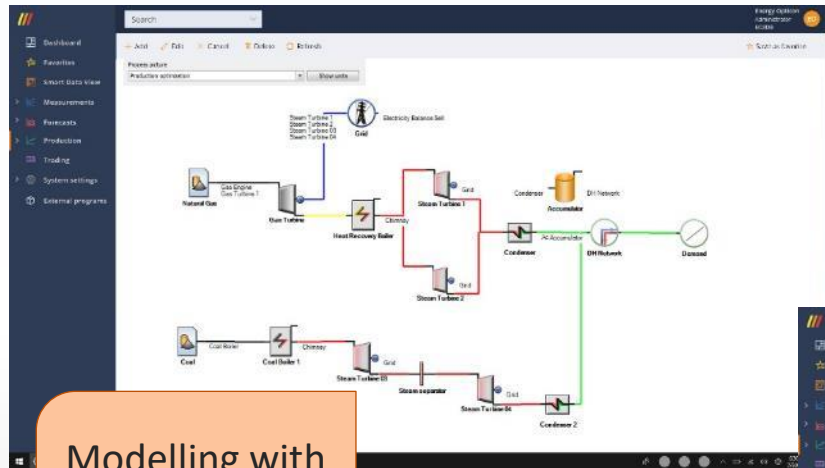
Optimized Production Plans

Optimize Your Energy.

Technical economic input data

Load and price forecasts

Optimization



Modelling with the Topology editor

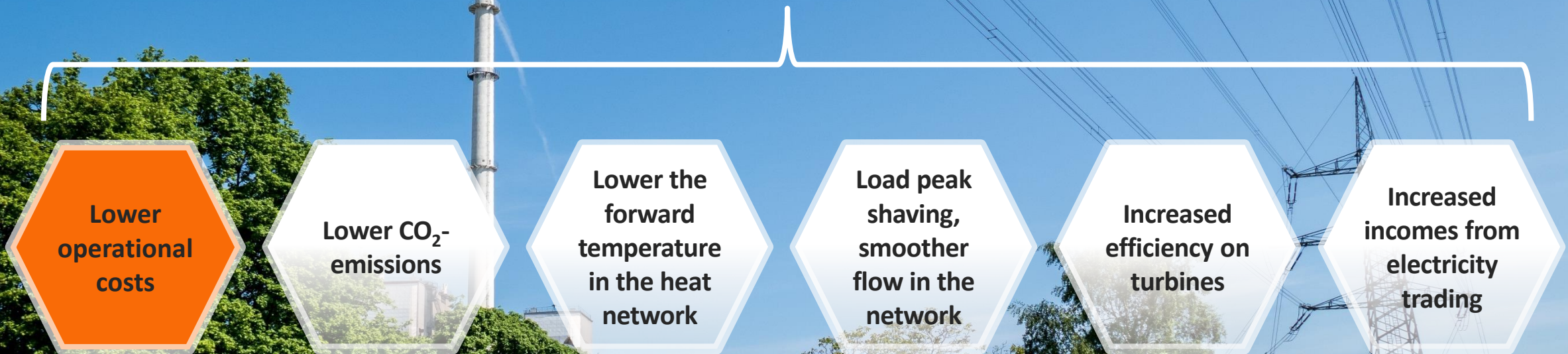
Optimized production plans (short- and long-term)

- Optimal load
- Optimal time for start and stop of units
- Optimal forward temperature

Smart Optima Heat Network (SOHN)

Possibilities & Gains

Unused potential in existing district heating networks



Hydrogen Innovation Projects at Energy Opticon

Hydrogen and PtX.

Economic and environmental model for:

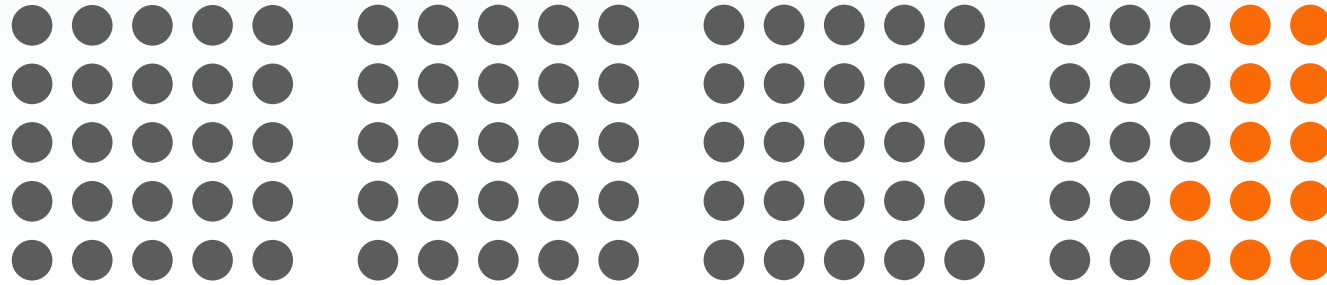
- Hydrogen and cogeneration
- CCU in combination with hydrogen production with electrolysis
- CCS, Bio-CCS
- Hydrogen production in combination with different electricity trading markets
- Industries with electrolysers connected to energy companies



→ Our investigations have proven high profitability and a Return of Investment within a few years!

Possible yearly reduction of variable production costs

Large proven gains for energy companies.



12%

Economic Production Optimization

Each year



15%

Economic Production Optimization
+ **Smart Optima Heat Network**

Also large CO₂ savings.

Future savings?

Case study: Kraftringen, Sweden

Co-optimization of the heat network of 3 different cities (Evita).



“ During the two first months (with SOHN) in operation, the forward temperature was in average lowered with 2 degrees and with an achieved savings of about 20,000 Euros. ”

David Edsbäcker, Project Leader for Smart Cities Accelerator, Kraftringen

The Solution

- **Economic optimization** of the energy system, the Evita pipeline (3 connected cities) and the district heating network.
- **District heating load forecast**, adjusted to the constraints /availability of the units.
- Optimization of **electricity contracts** (purchase and supply).
- **Yearly heat prod.: 1,100 GWh, yearly electricity prod.: 1435 GWh**

The Benefits

- Lower **production costs**
- Reduced **grid temperature**
- **Proactive** instead of reactive measures
- **Economic and environmental benefits**
- **100 % renewable goal** reached 2 years earlier

Case study: Helen (Helsinki), Finland

Big energy provider, 3 CHP plants.



“Managing a complex energy production system is impossible without a high-quality optimization software such as this.”

Tomi Jussila, Senior Advisor at Helen

The Solution

- Economically optimized production plans (short-/long-term).
- District heating load forecast, adjusted to the constraints/availabilities of the units.
- Optimization of electricity contracts (purchase / supply).
- Yearly heat prod.: 7200 GWh, yearly electricity prod. 6700 GWh.

The Benefits

- Reduced fuel costs and CO₂ emissions.
- Optimal combination of fuels and units.
- Less manual work, common basis for planning and decisions.
- Increased profits.

Thanks for listening!

- Optimize Production – Distribution – Demand
- Flexible and Integrated Energy Systems

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