

The district heating system in Oslo

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Vision

Energy solutions for the future – for you and the environment.

Core values

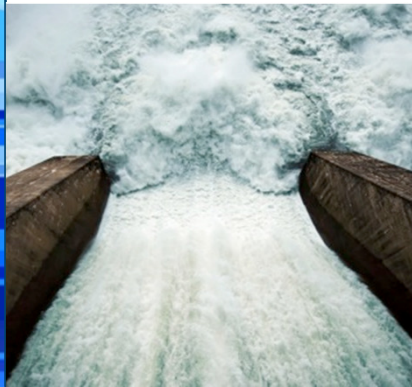
Integrity, courage and spirit.

Hafslund will be characterized by integrity, courage and spirit to employees, customers, suppliers and partners.

HAFSLUND GROUP – BUSINESS AREAS

PRODUCTION EL

- Production, Glomma river
- 3,1 TWh/year



NETWORKS/GRID

- Largest in Norway
- 680 000 customers



HEAT

- District heating in Oslo
- Heat and steam to industry in the Østfold region
- 1,7 TWh/year = Normal production, Oslo and Gardermoen
- 2,0 TWh/year = Total prod



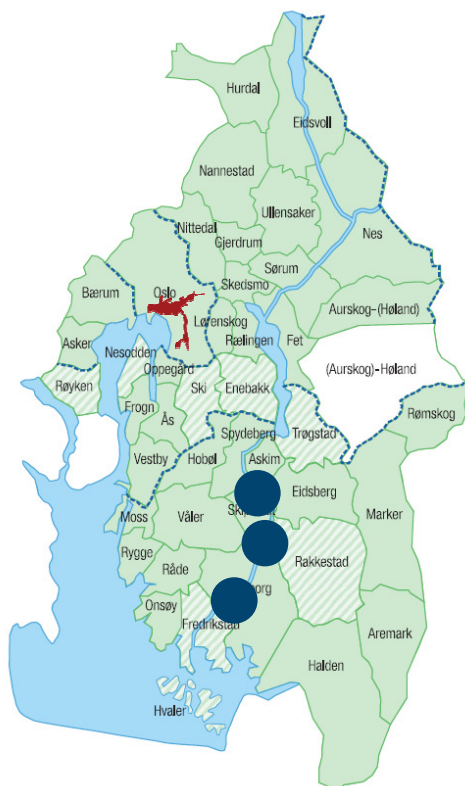
MARKET - EL

- Fifth largest in the nordic region
- Over 1 000 000 customers



Geographic focus

PRODUCTION, NETWORK AND HEAT

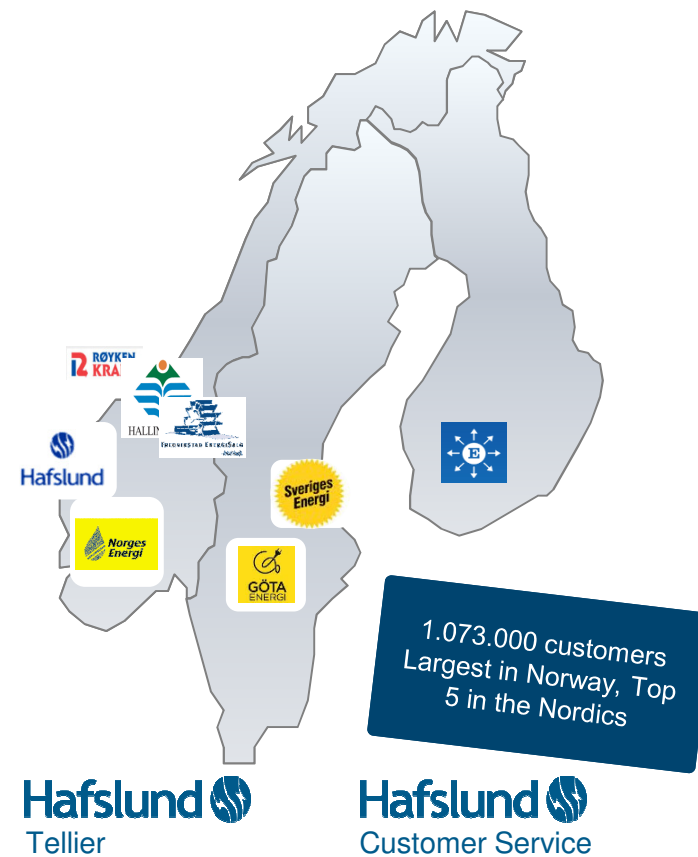


Regional distribution grid 100 % in Oslo, Akershus and Østfold

Distribution grid ownership:

- 100 % ownership
- Part-ownership
- No ownership
- Heat
- Hydropower

MARKETS



Hafslund

Hafslund Heat

- The Hafslund District Heat Division includes district heating in Oslo and the production of heat and steam to industry in Østfold
- Hafslund is the largest district heating operator in Norway with approx. 36 % of total production
- The installed capacity is 1,047 MW for the Oslo assets, covering ~25 % of Oslo's total heating demand
- The assets outside of Oslo have an installed capacity of 103 MW
- Hafslund's district heating business had sales revenues of NOK 1,1 billion in 2014



Hafslund Heat

- The heat production is mainly based on the incineration of waste, biomass and bio-oil. In addition, Hafslund Heat recovers energy from the main sewer in Oslo.
- In the cities of Sarpsborg and Fredrikstad in Østfold county Hafslund Varme has waste incineration plants that produce steam, which is supplied to the local industry. The Fredrikstad plant also produces district heating and some electricity.
- The fossil oil share of energy supply in the district heating production in 2014 was below 1 percent.



Hafslund Heat



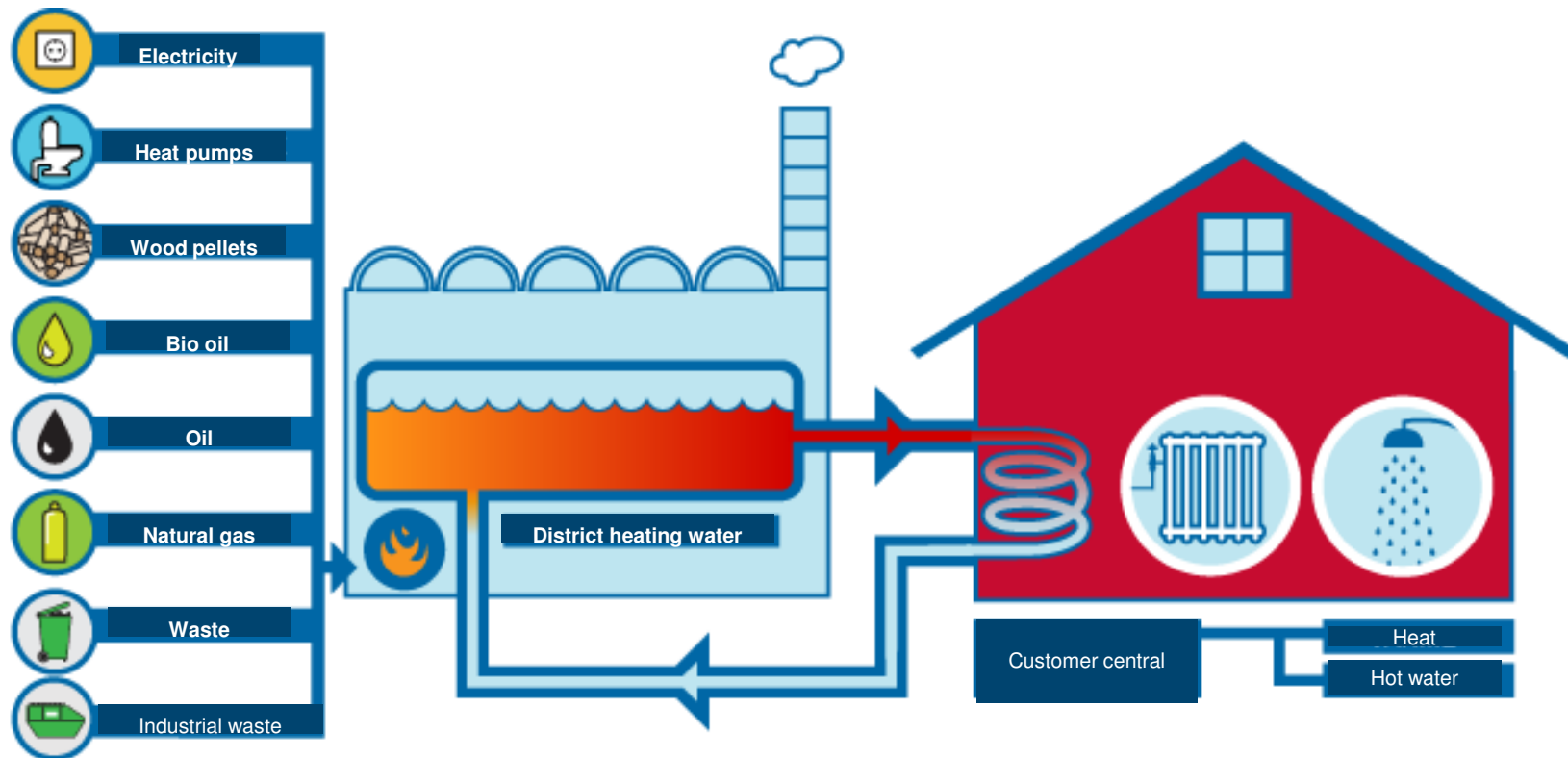
Hafslund's district heating grid in Oslo



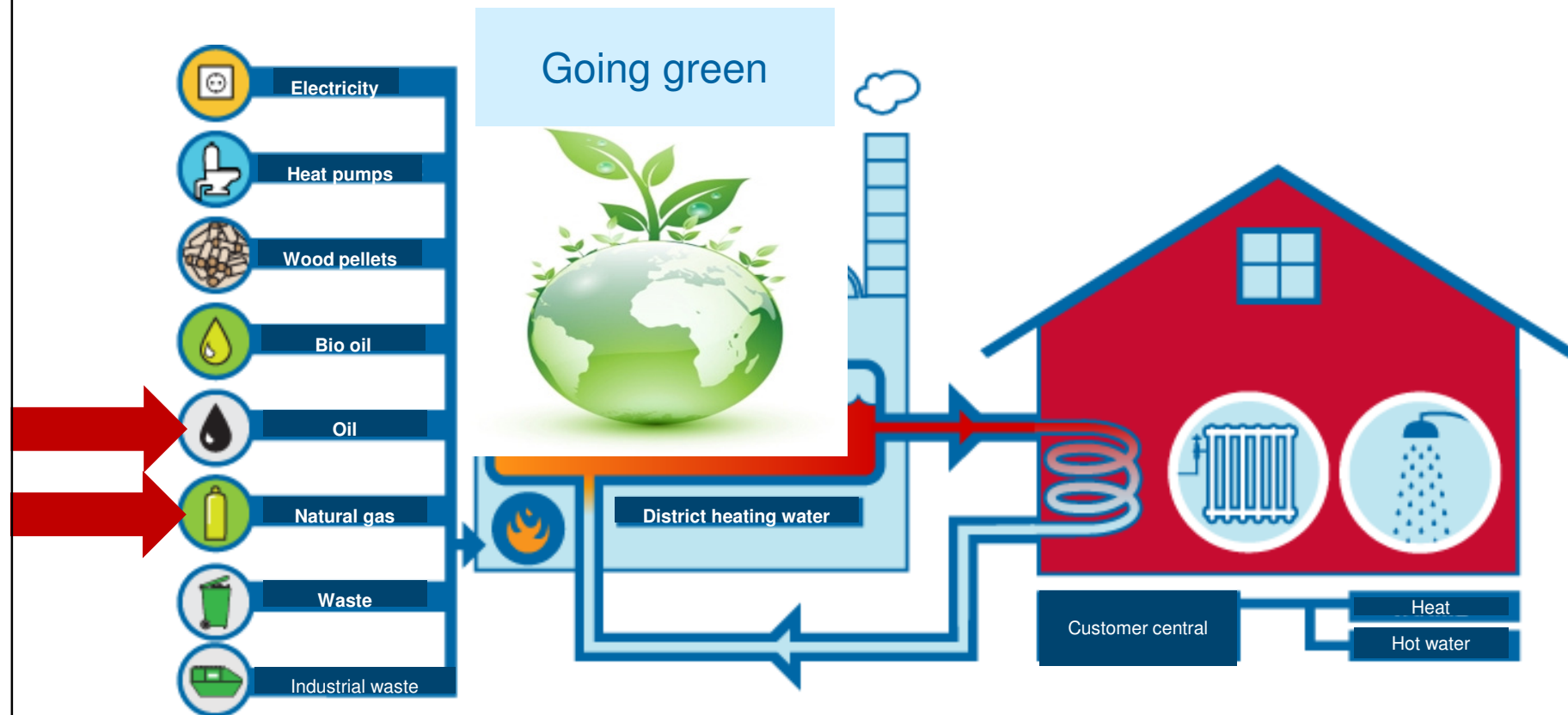
The map shows that Hafslund has a license for district heating supply to large parts of the Oslo area.

District heat is mainly established in the most densely populated areas

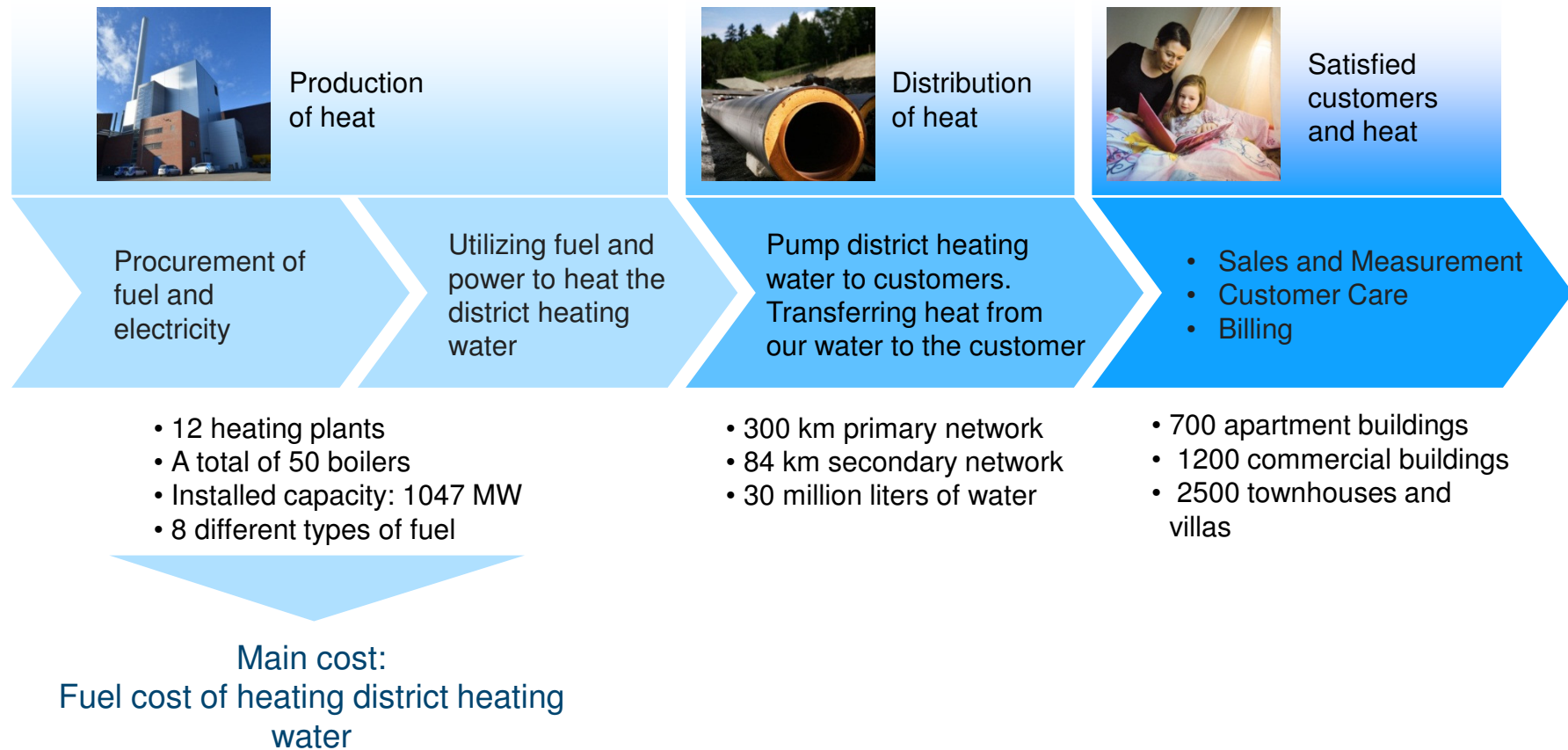
District heating - flexible energy supply



District heating - flexible energy supply

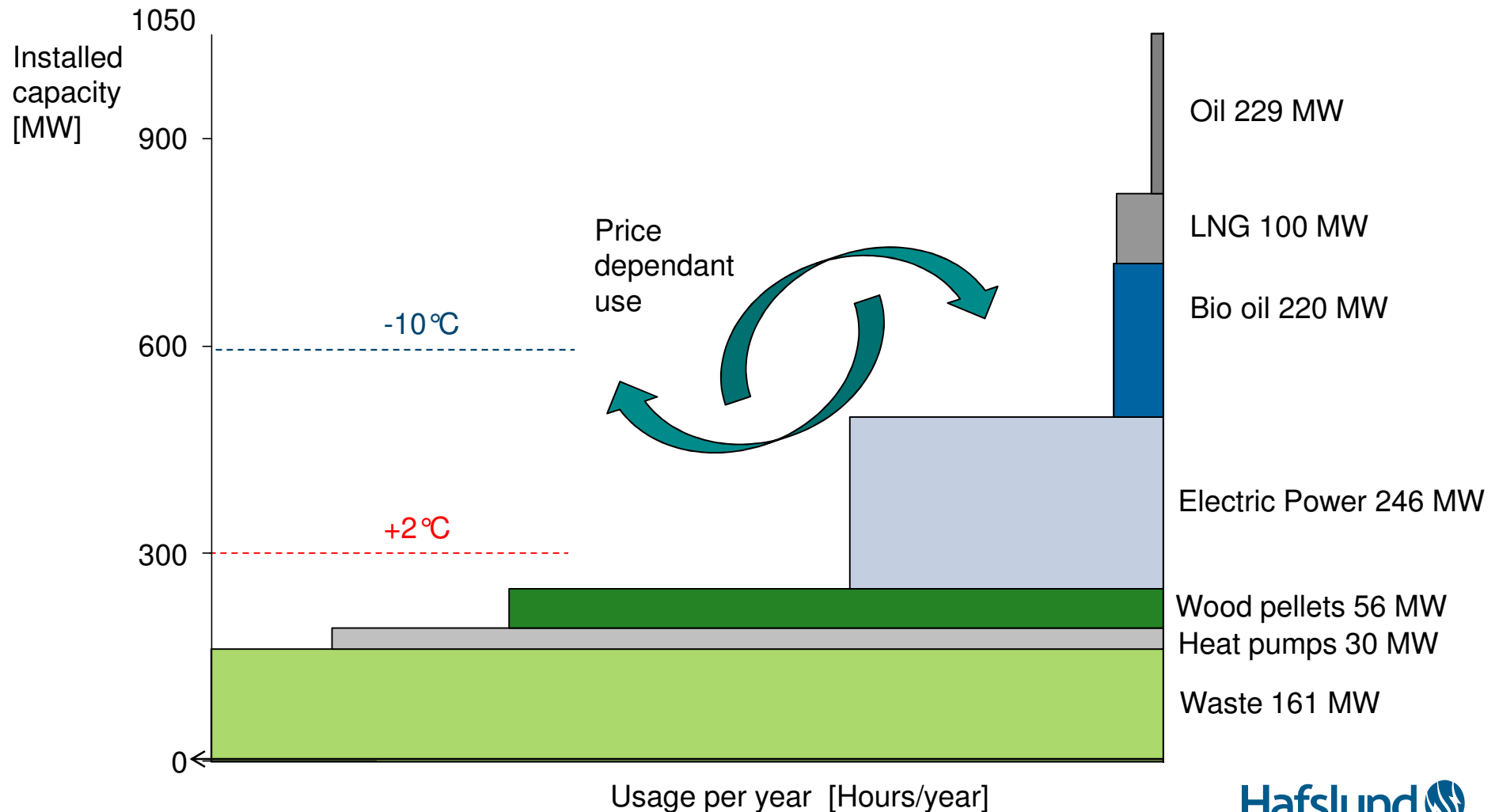


District heating in Oslo – value chain



Production capacity for district heating in Oslo

Fuel mix depending on heat demand and prices of energy carriers



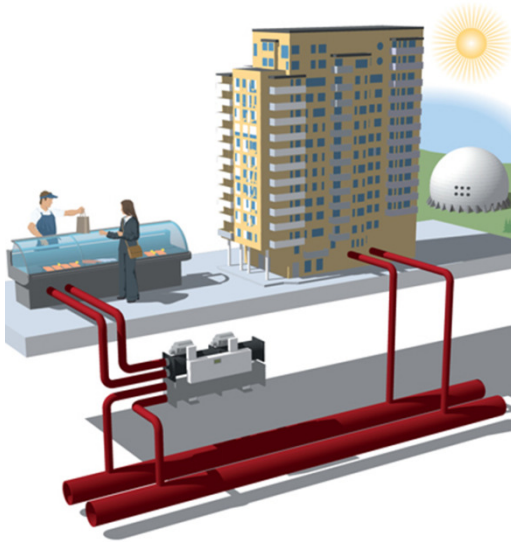
Recovered heat





District heating in Oslo: Resources that would otherwise not be utilised

There will probably be developed low temperature network in new areas in Oslo, and most of them will be connected to the existing district heating system



Innovative solutions. Heat to be used from:

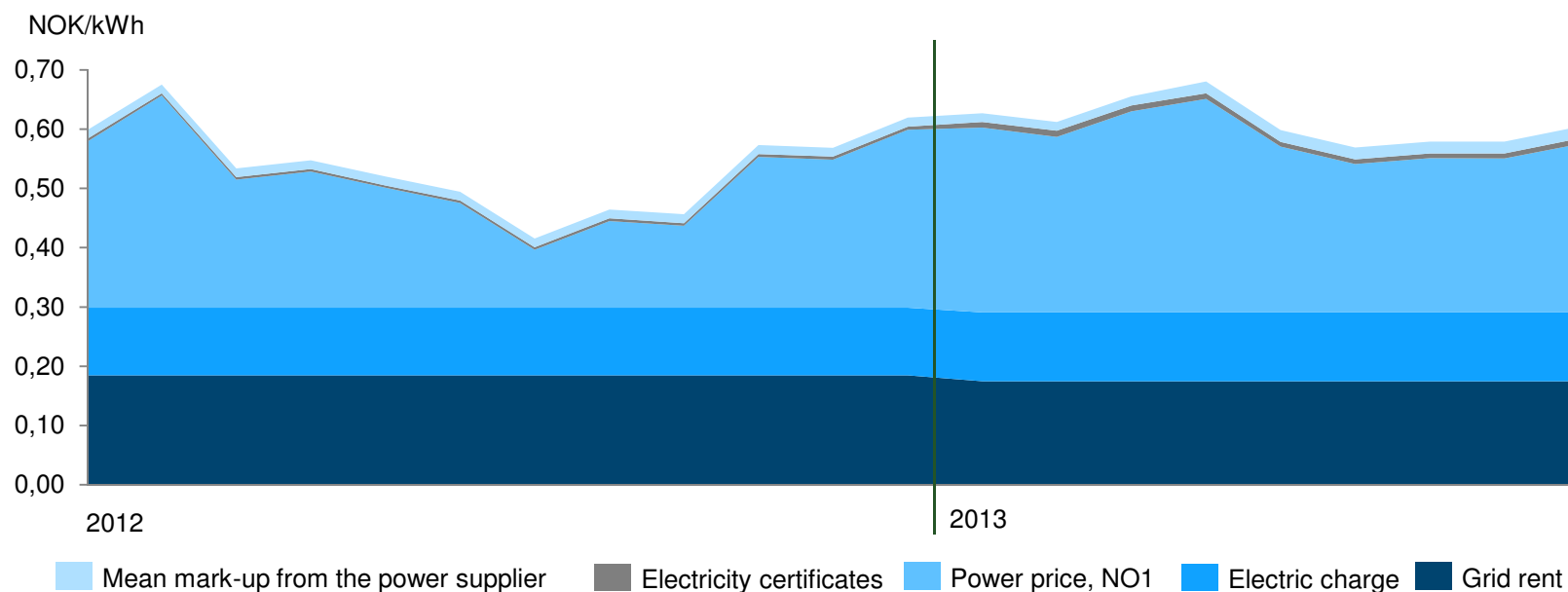
- Hockey stadiums
- Server parks
- Climate cooling systems
- Stores
- Solar systems



District heating – never more expensive than electricity

Norwegian Energy Act § 5-5 governs allowed price for the supply of district heating

§5-5 "The price of district heating shall not exceed the price for the electric supply in that area"



The graph illustrates the price cap for residential customers. Prices for industrial customers are regulated by the same model, but pricing depends on the individual customer's network tariff and power output.

**56 MW wood pellet boiler
(woodpowdersystem) at Haraldrud,
Oslo**

Production start : November 2013



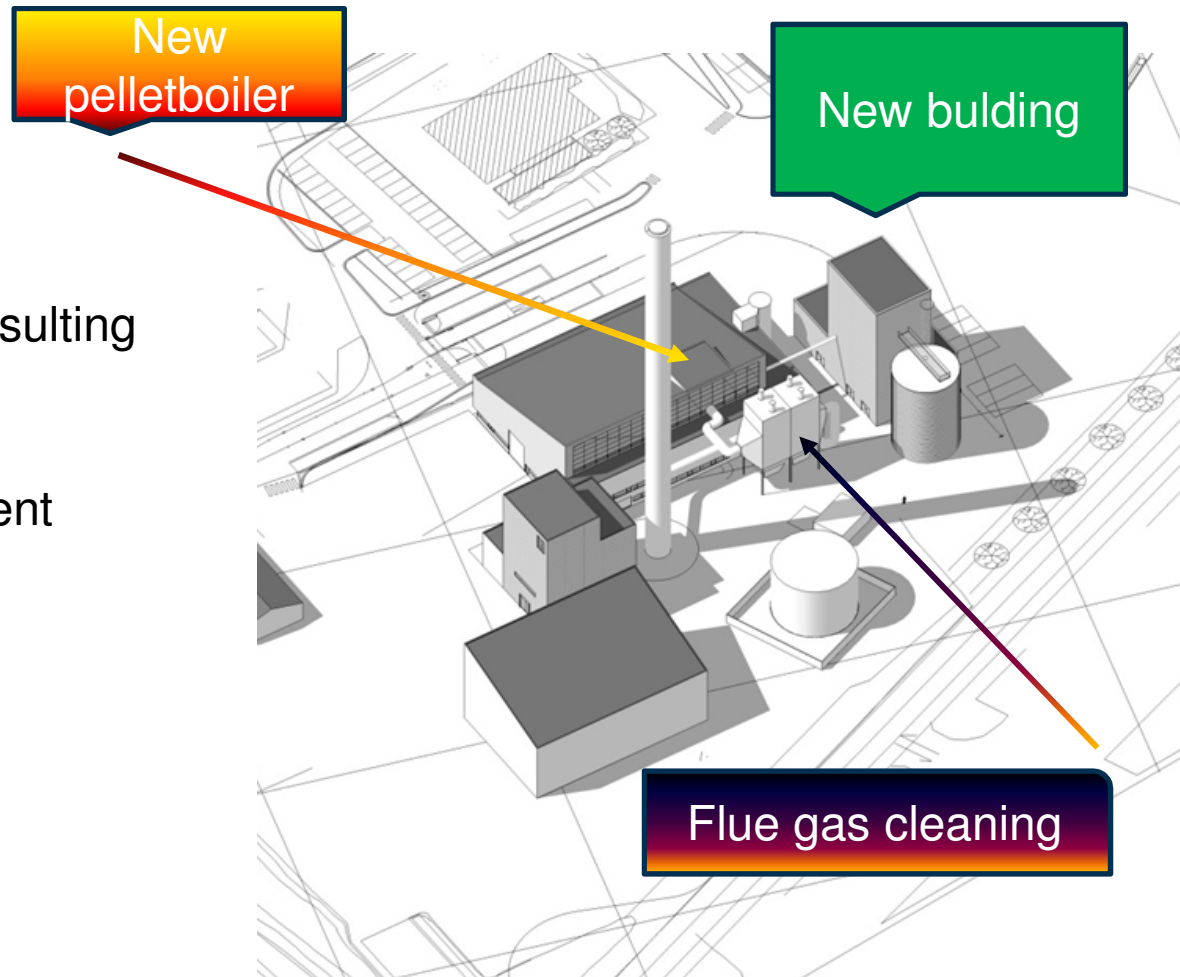
Wood pellet – from producer to Hafslund Heat

- Directly from producer with truck to Haraldrud , or.....
-Bulktransport on ship to Fredrikstad Harbor.
- Capacity at harbor – HV rent 4500 m²
- Transport with trucks to Haraldrud, 8 -10 trucks/24 h at max. distribution.
- Stored in 2000 m³ pellet silo.
- Demand of pellet; Approx. 13 tonn/hour
– 40 000 tonn/year.

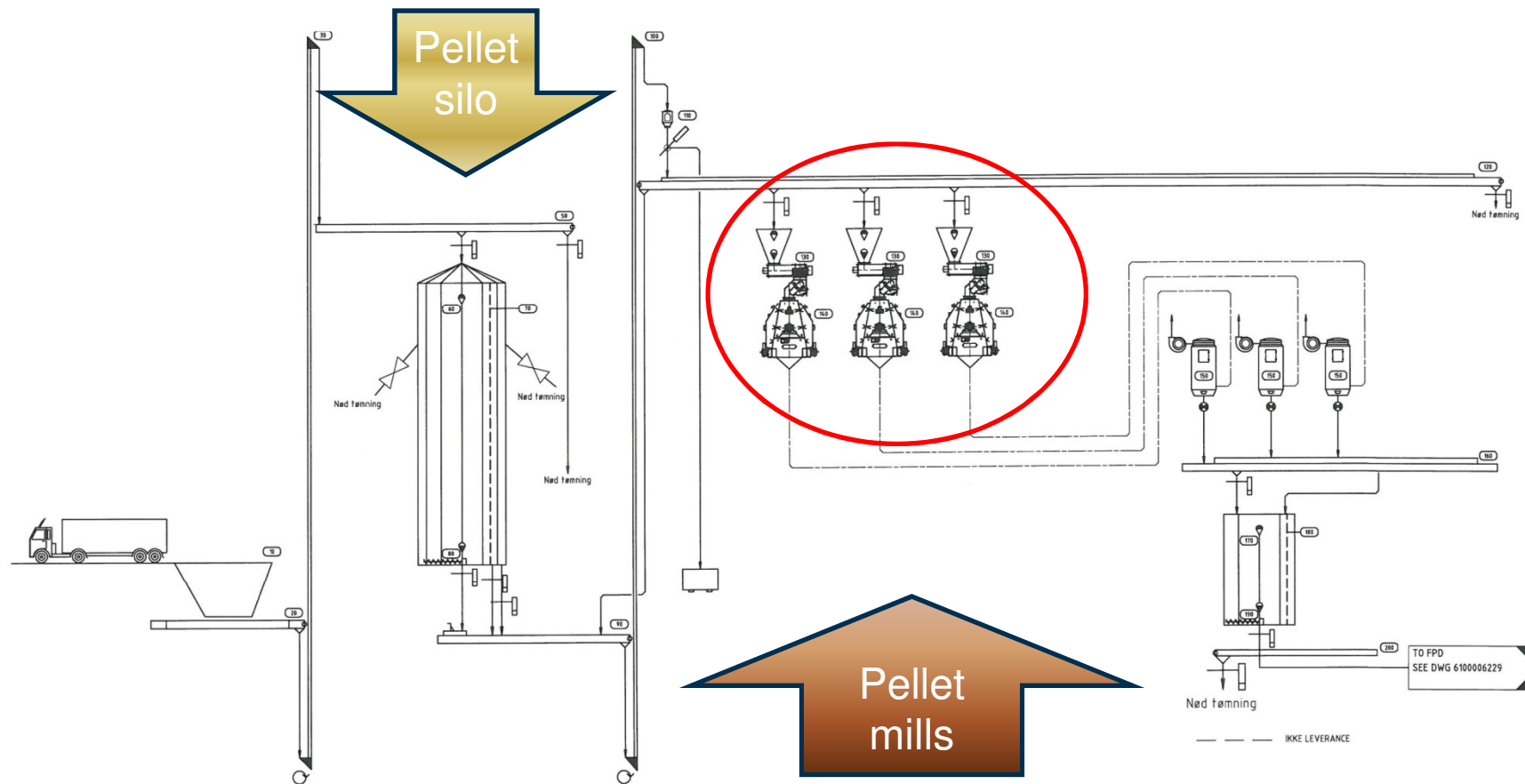


The project

- Preliminary study
- External support from consulting firm
- Project – split into 3 different contracts:
 - New building
 - The process
 - Chimney – planning and construction



The proses - Logistics & pellet mills

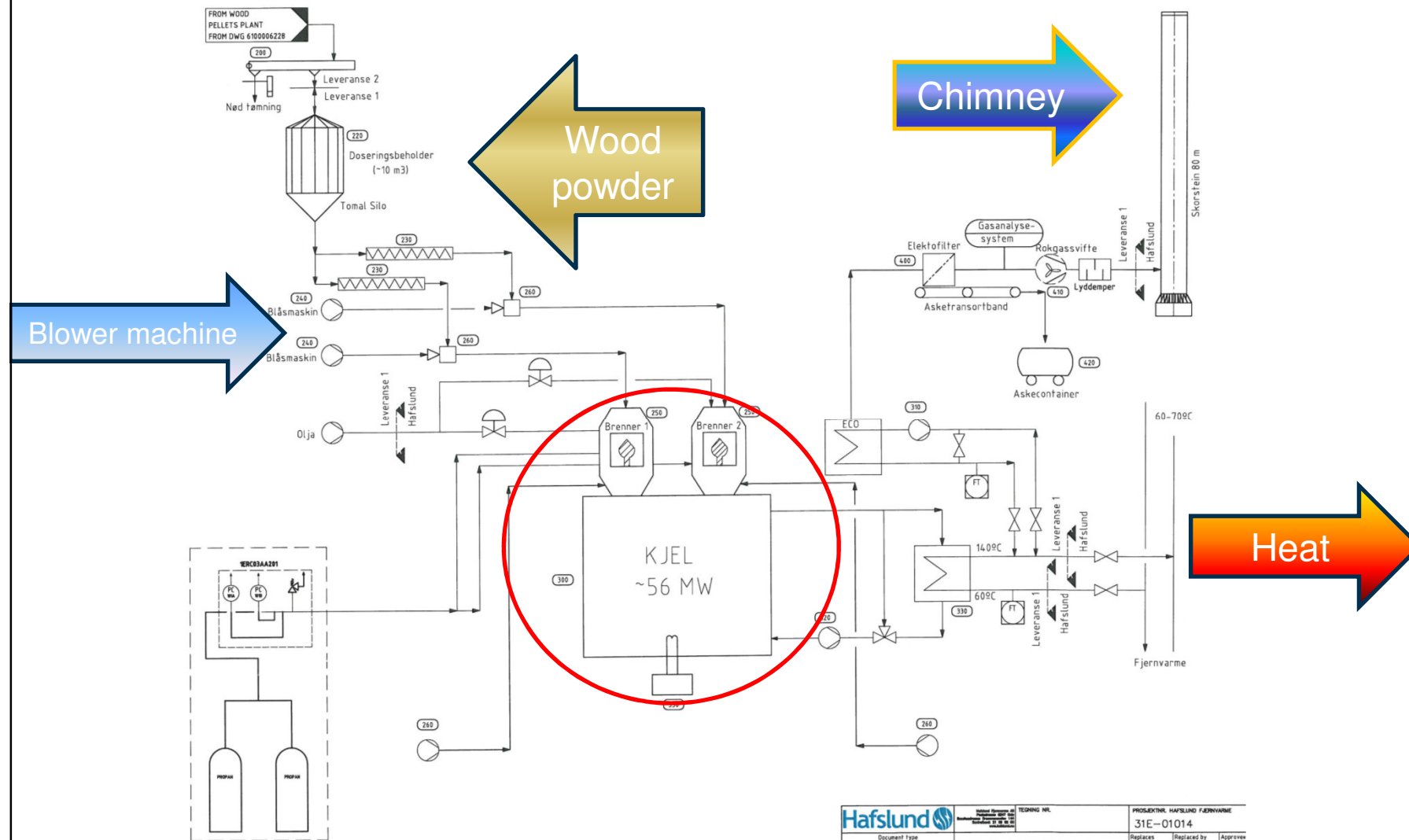


Hafslund

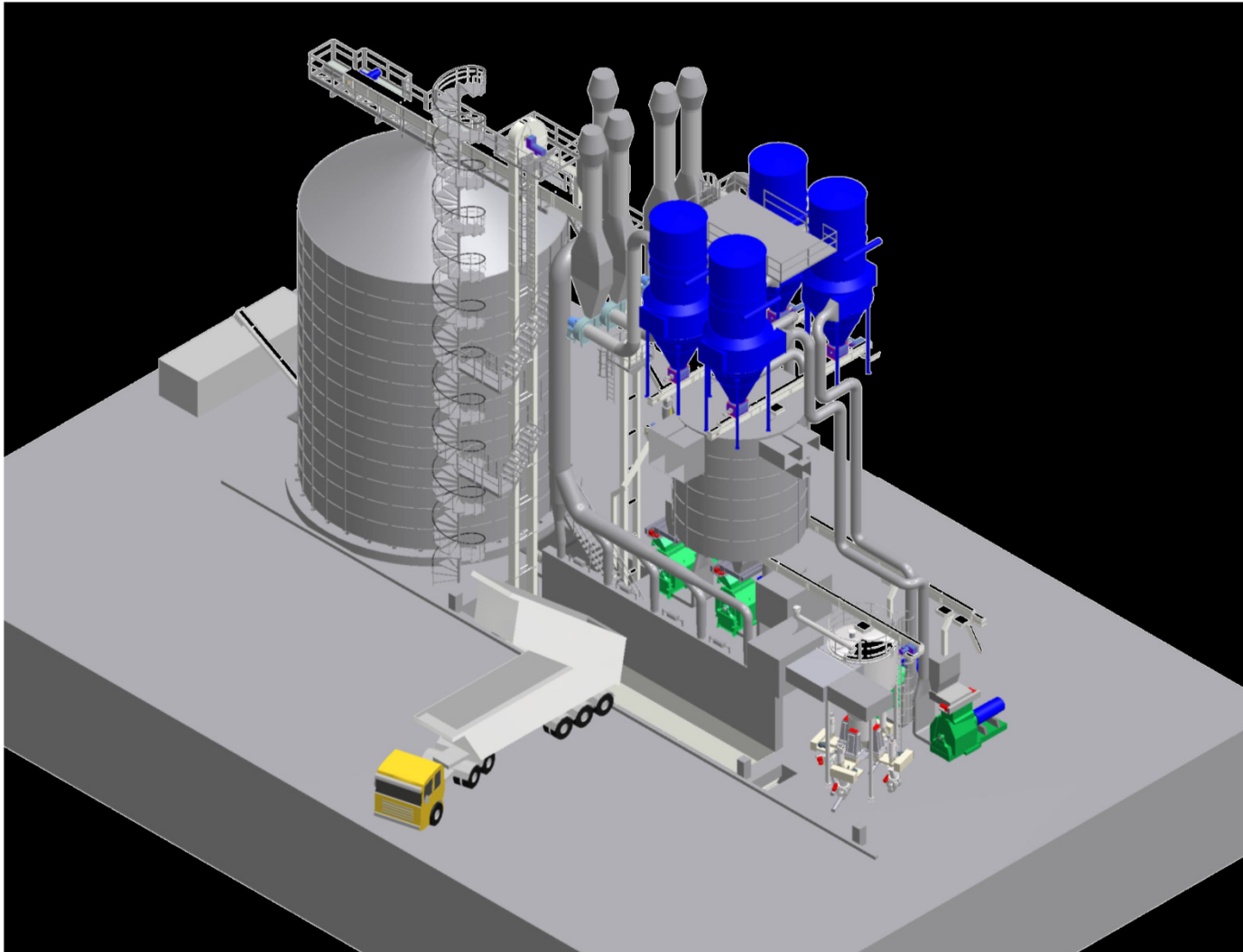
TEKNIK NR.

PROSEKTR. HAFSLUND FJERNVÄRME
31F-01014

The process - Boilersystem



The process – Logistics & pellet mills



Hammermill & Filter



s.2
2



Hafslund 

Extractors – Blower machines - Dosage



Extractors



Blower machines

Cell feeder



Hafslund – a part of the solution

PRODUCTION



Renewable energy

HEAT



Renewable heat

NETWORK



Electrification

MARKETS



Efficient energy use





Hafslund

www.hafslund.no