




BORÅS  
**ENERGI** UD **MILJÖ**

Ingår i Borås Stadshus AB



**District Heating in Borås**



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## **District Heating in Borås**

*Accumulator at Ryaverket Power Plant*

# Borås Energi och Miljö

- Founded 1891
- City of Borås
- Turnover 100 million EUR
- 330 employees

## *Energy businesses*

- District Heating / Steam
- District Cooling
- Renewable electricity CHP
- Renewable electricity Hydropower
- Biogas/CBG





# Our challenges

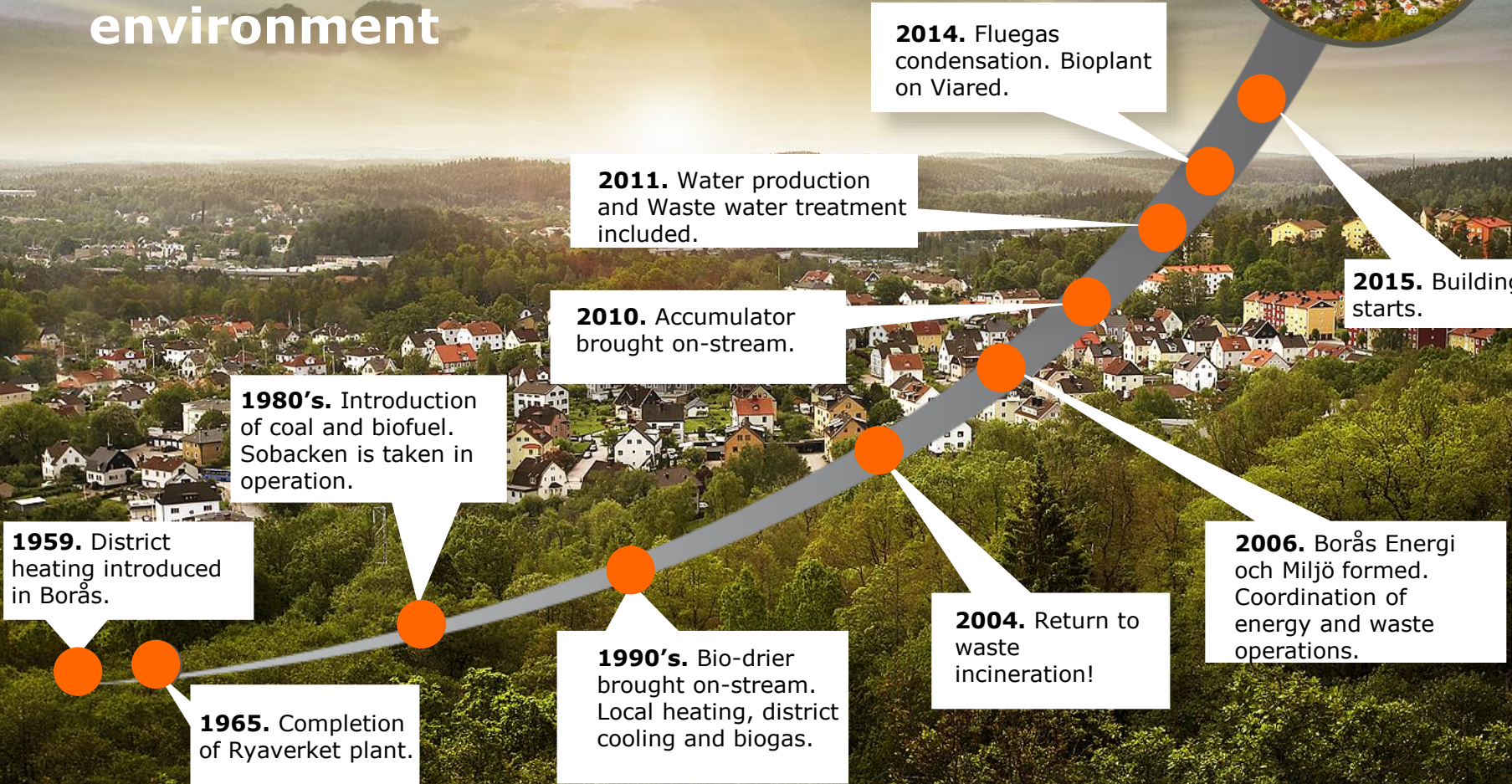
- Replace fossil fuel based heating in Borås
- Increase the use of non-fossil based vehicle fuel
- Produce more renewable electricity
- Help our customers to save energy





# The journey to realise our dream

– from infrastructure to the environment



**1959.** District heating introduced in Borås.

**1965.** Completion of Ryaverket plant.

**1980's.** Introduction of coal and biofuel. Sobacken is taken in operation.

**1990's.** Bio-drier brought on-stream. Local heating, district cooling and biogas.

**2010.** Accumulator brought on-stream.

**2011.** Water production and Waste water treatment included.

**2014.** Fluegas condensation. Bioplant on Viared.

**2004.** Return to waste incineration!

**2006.** Borås Energi och Miljö formed. Coordination of energy and waste operations.

**2015.** Building of starts.

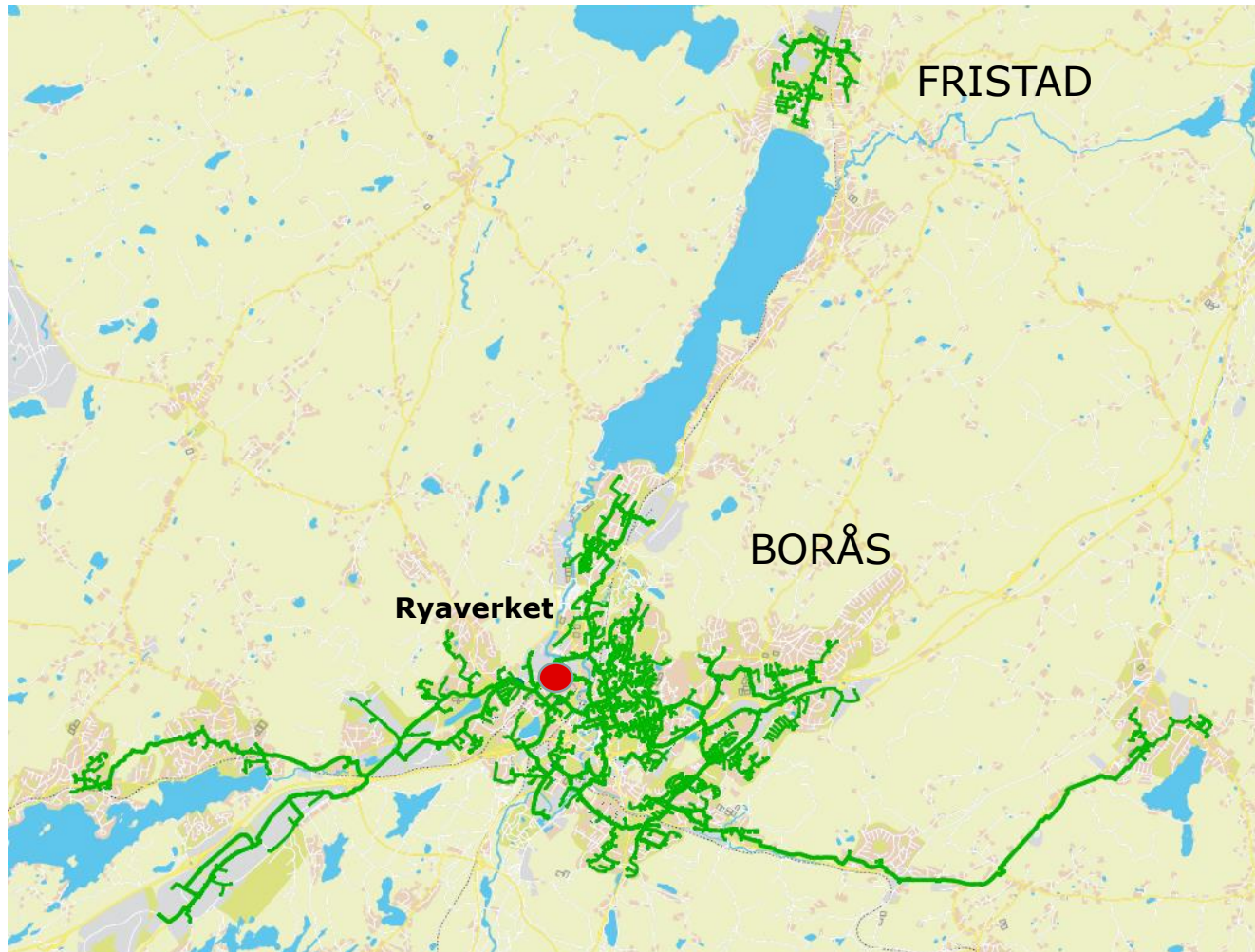
# District heating in Borås

- >300 km district heating pipes in Borås
- >30 000 households (apartments and houses)
- Combined Heat and Power, new CHP-plant in 2019
- 37 000 m<sup>3</sup> TES (accumulator)
- Yearly sales; DH 630 GWh, DC 8 GWh, Electricity 170 GWh





# District Heating network in Borås



# District Heating in Borås – production plants

- Combined Heat and Power (CHP)
  - Waste incineration (industrial and household waste)
  - Biomass (wood chips)
- Heat-Only Boilers
  - Wood pellets
  - Biooil
  - LPG / oil
- In 2019 – a new biomass fired CHP-plant at Sobacken
- (Heat pump - heat source water from sewage plant)



# Ryaverket CHP

Waste  
Biofuel (wood chips)  
Bio oil/Propane/Fossil Oil

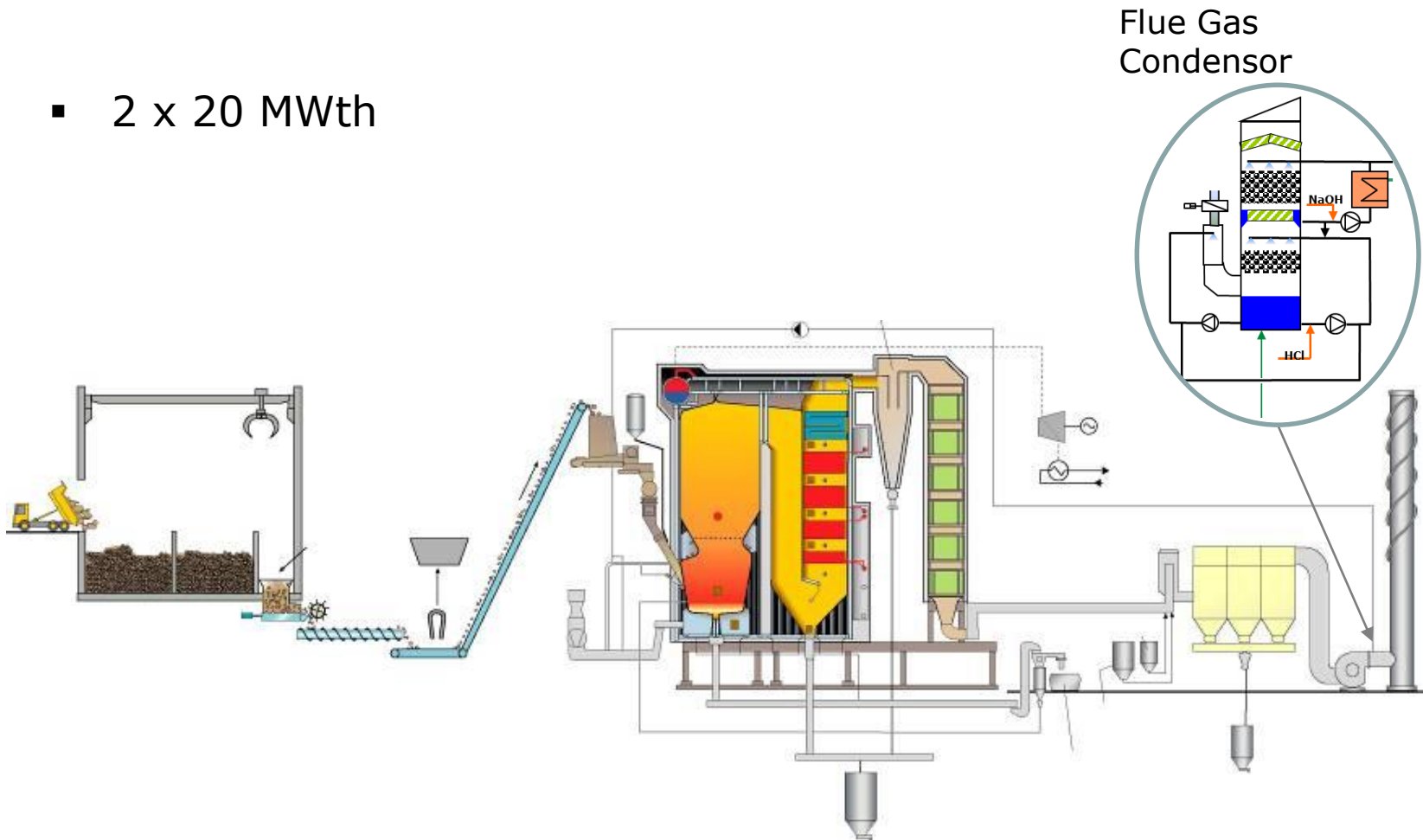
becomes...

**Electricity**  
**District heating**  
**Steam**  
**District cooling**



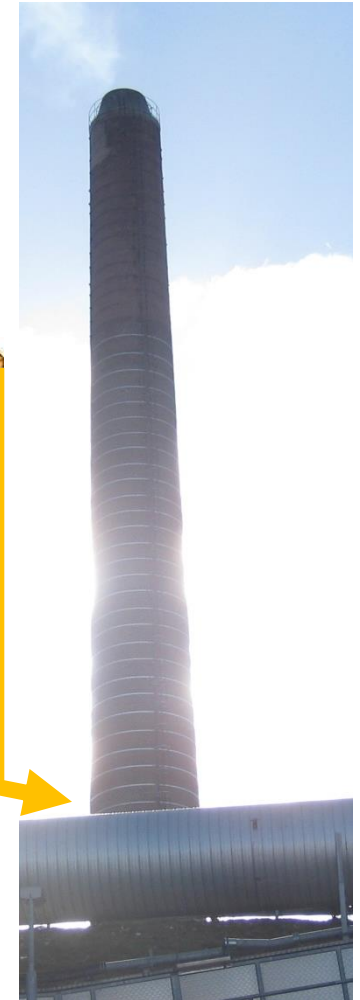
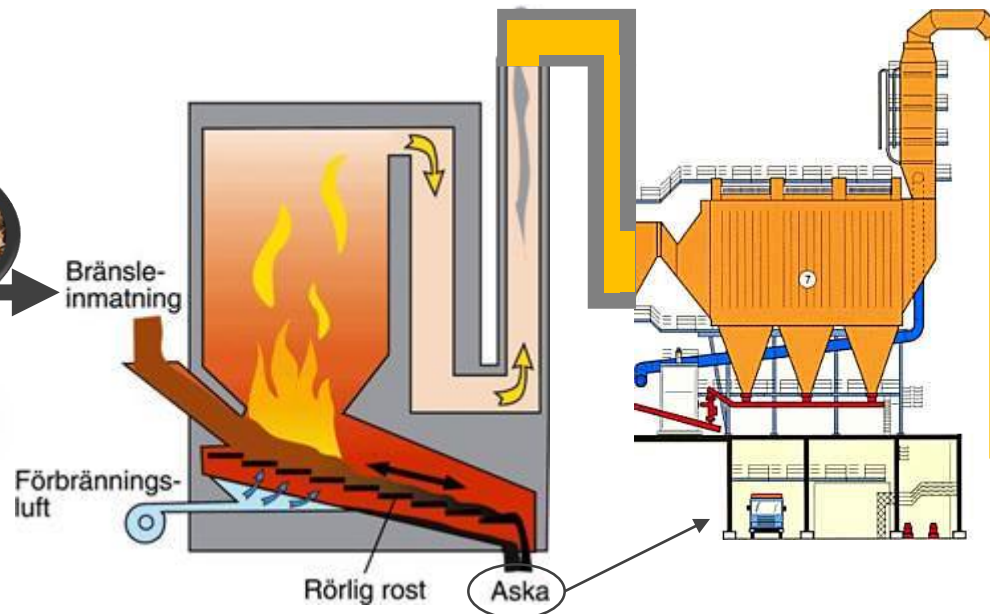
# Ryaverket - Waste incineration plant

- 2 x 20 MWth



# Ryaverket - Biofuel incineration

- 2 x ~60 MWth



# Sobacken CHP in 2019

120 MWth, 45 MW electricity

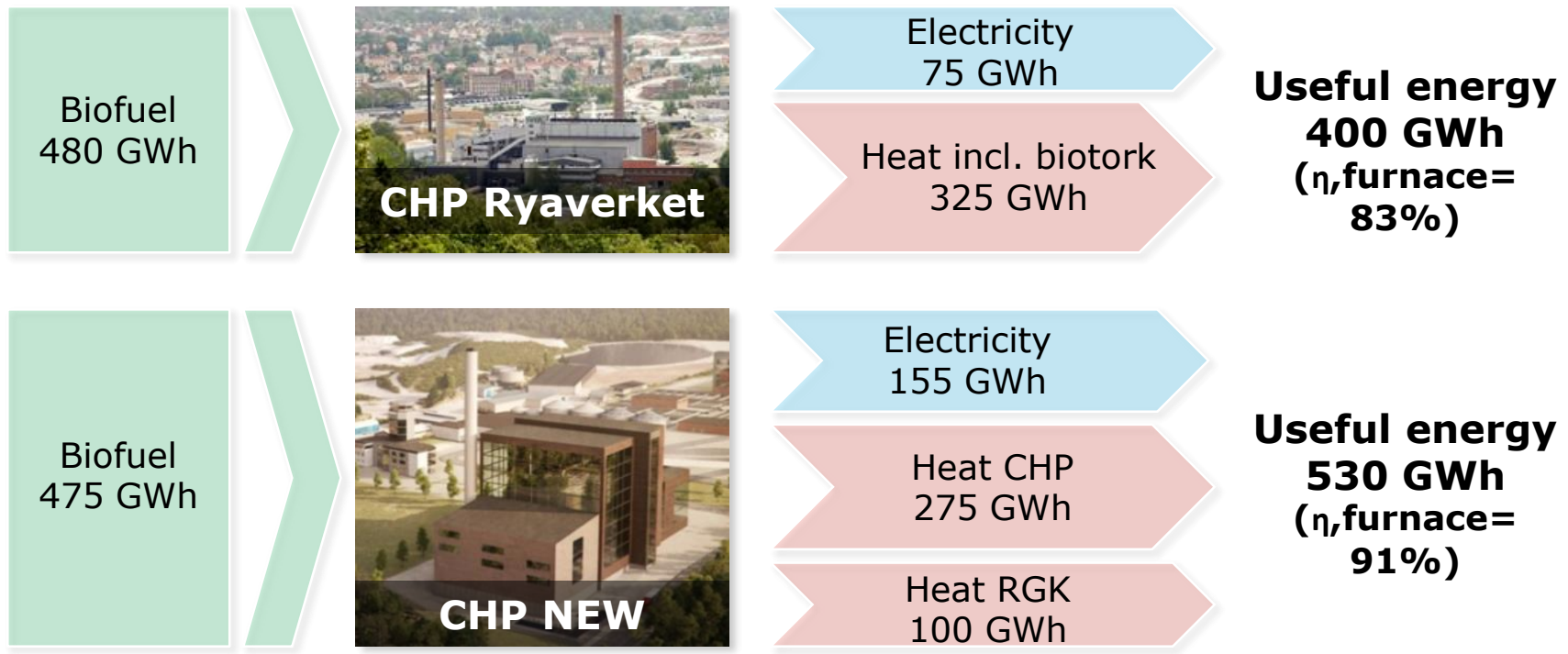


District Heating in Borås

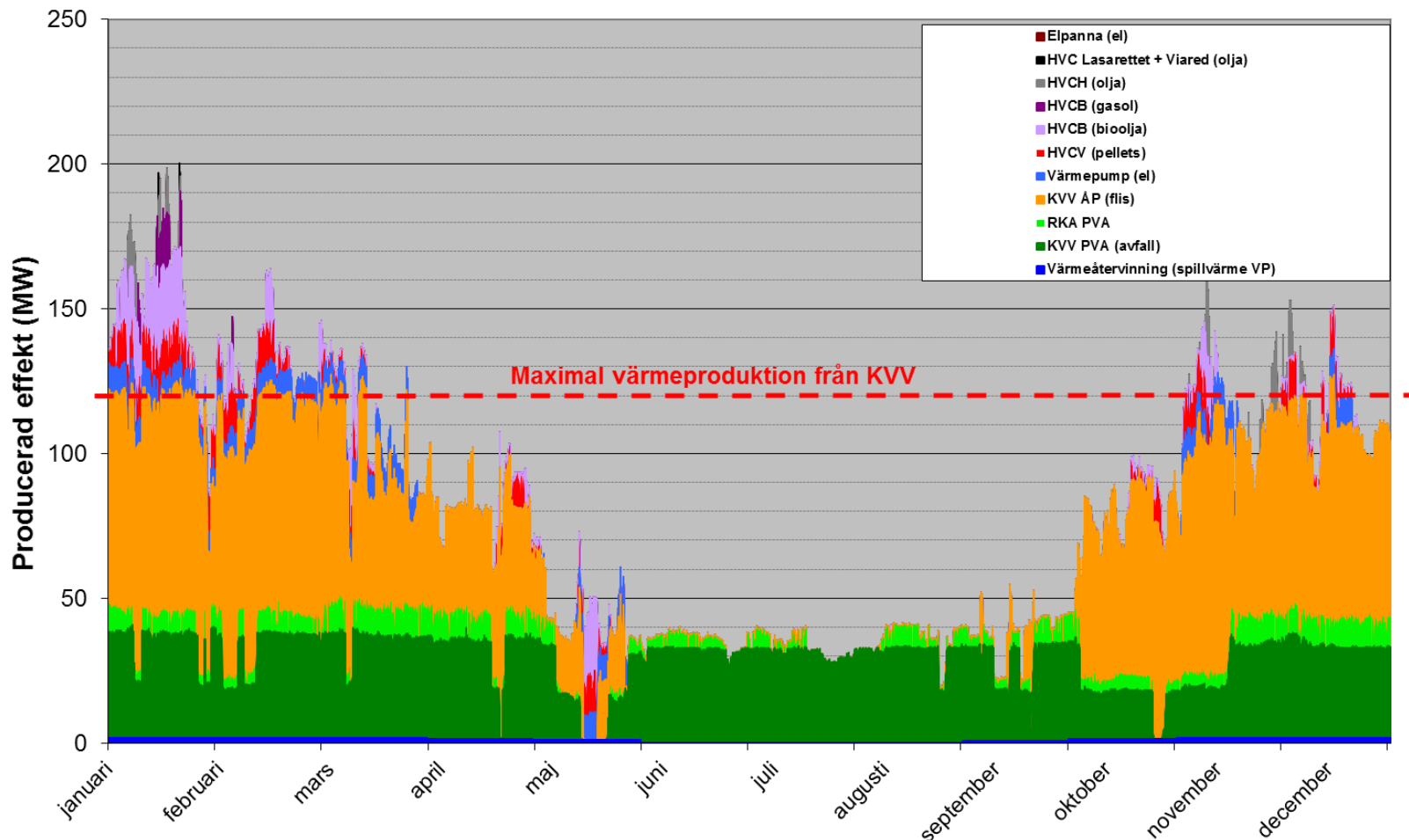


# Comparison – Currant CHP and new CHP

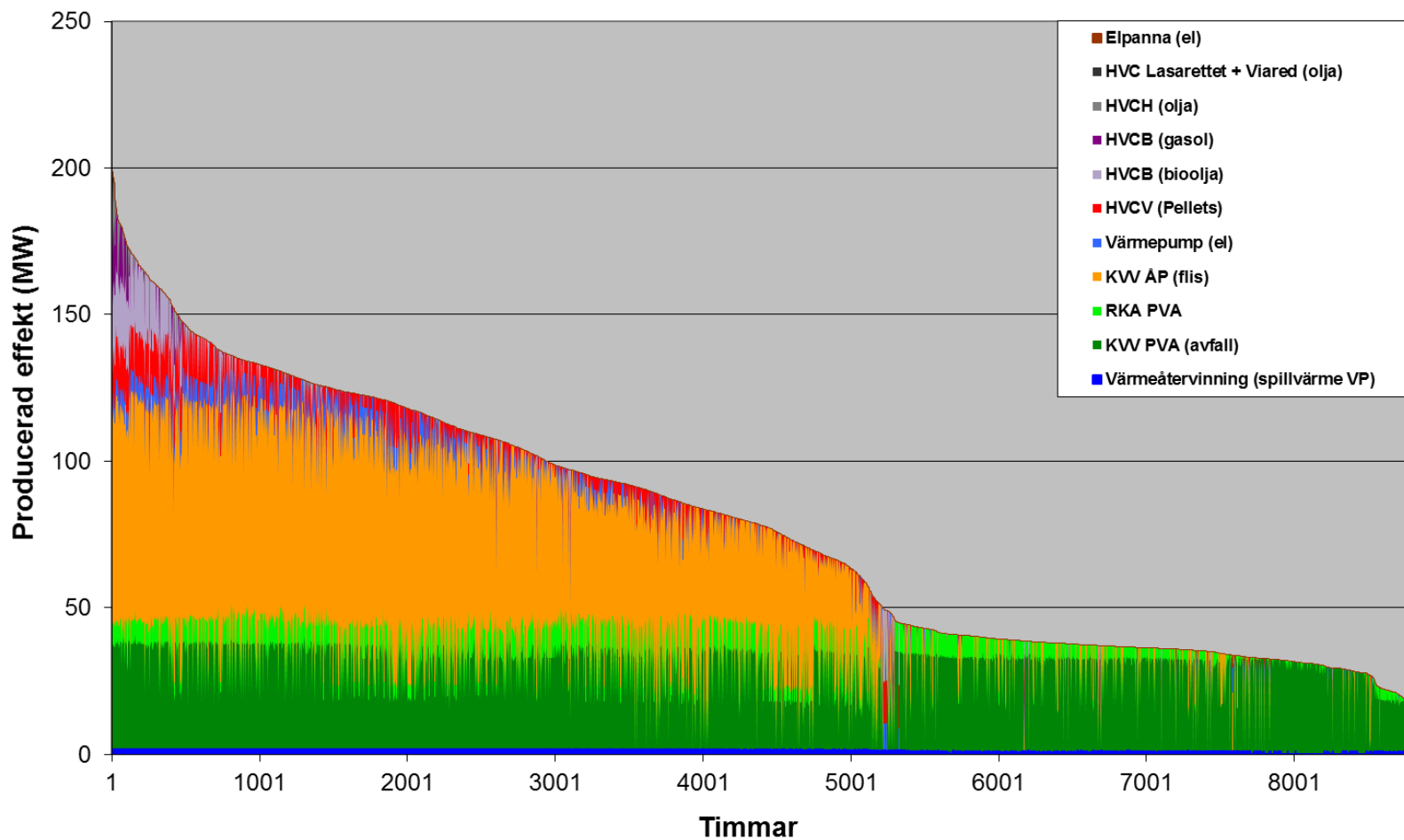
- Doubled electricity generation
- Electricity certificates for 15 years (“investment grants”)
- Increased access and increased efficiency
- Significant reduction of nitrogen oxide emissions (from about 130 tonnes to about 40 tonnes)



# Production of district heating

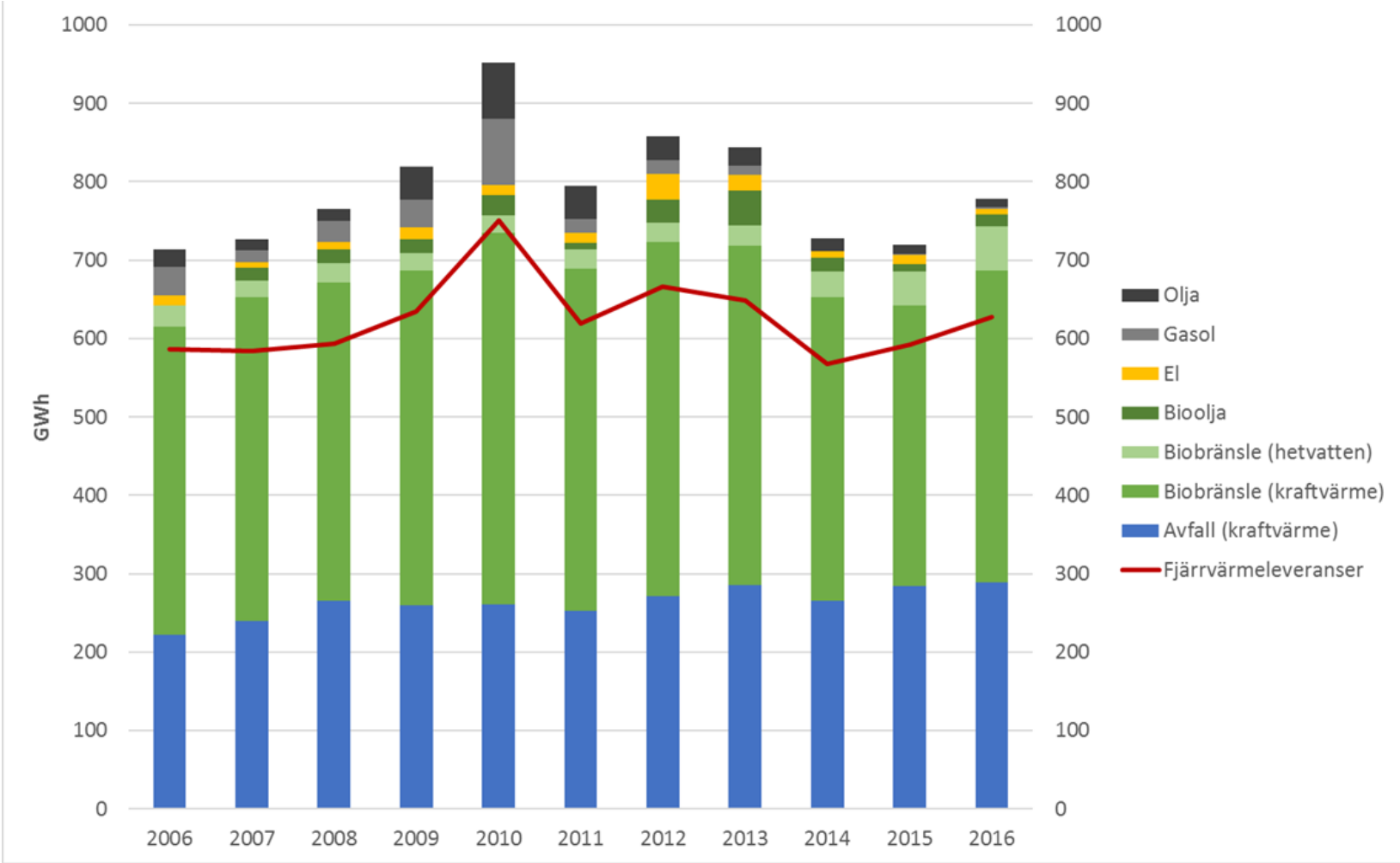


# Duration of district heating production

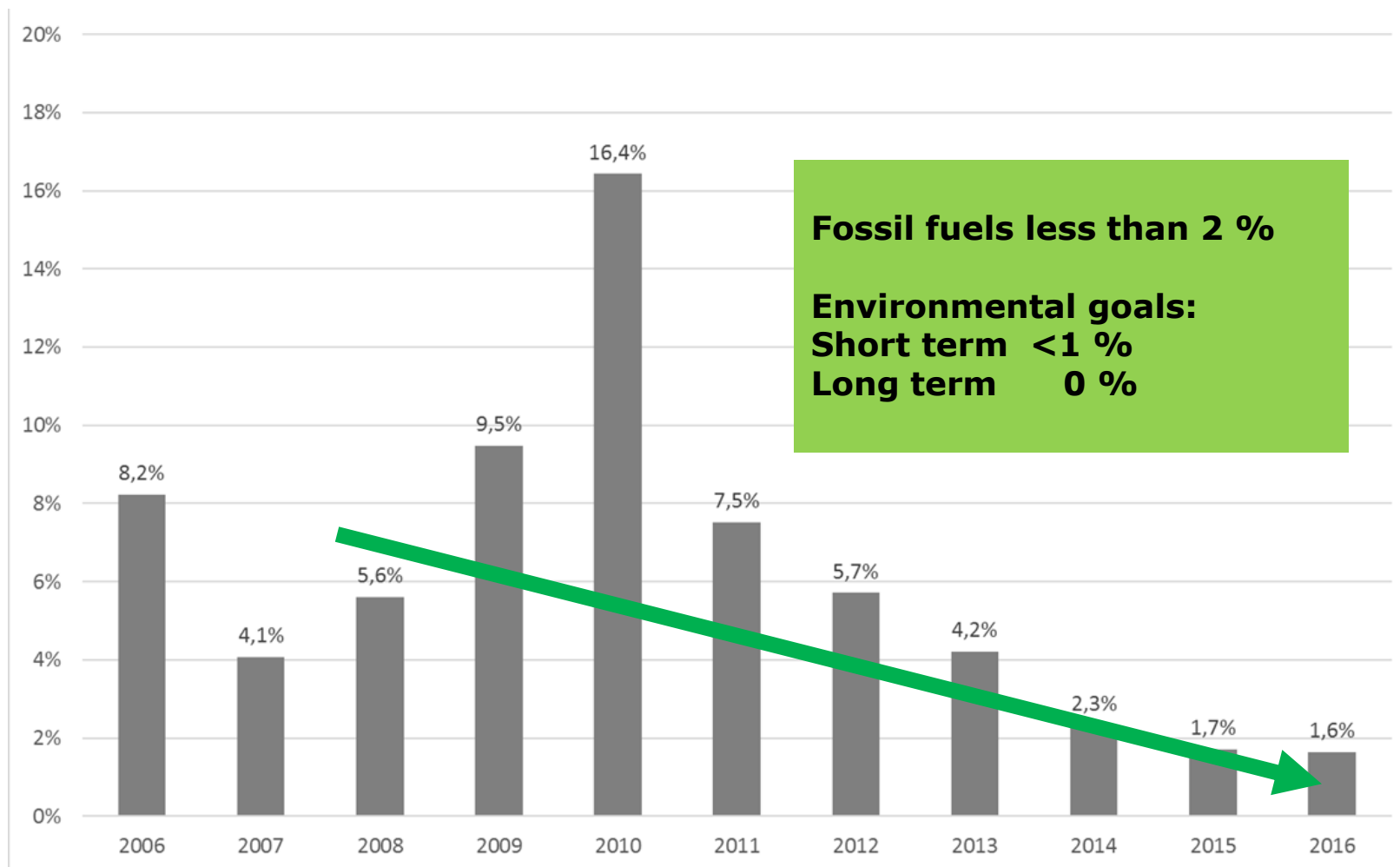




# District Heating Borås - Fuel mix



# District Heating Borås – Fossil fuels



# Thermal Energy Storage

Located at Ryaverket

37.000 m<sup>3</sup>





# Why thermal energy storage?

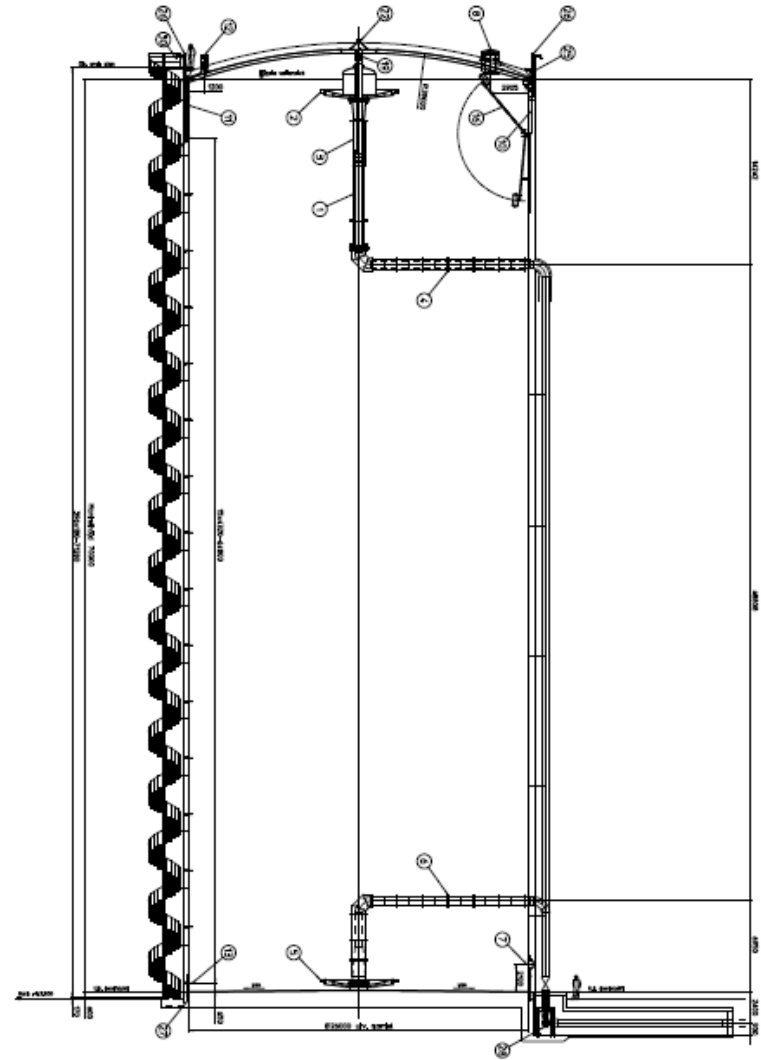
- Increased use of CHP (biomass)
- Increased production of renewable electricity
- Reduced use of fossil fuels and less CO2 emissions
- More stable and flexible heating production
- Reduced costs, profitable investment

# The project – accumulator Borås

- Investment, total ~10,5 MEUR
- Contract accumulator ~6,5 MEUR (Rodoverken)
- Required installations in distribution system
  - 2 stations (heat exchanger/pressure exchanger)
  - 5 pressure vessels
  - “Braked” distributionpump

## Some facts

- Atmospheric tank
- Height 70 m
- Diameter 27 m
- Volume 37 000 m<sup>3</sup>
- Energy 1500-2000 MWh
- Capacity ~50 MW
- Thickness 8-38 mm
- Insulation 50 cm





**VÅR DRÖM**  
EN FÖREBILDENDE OCH LITIS  
Måttprojekt: Arkitekturförank  
Kommunstyrelsen 2011

**District Heating in Borås**



# Accumulator Borås – film web-camera (short)



# Rodoverken – construction tanks

- Constructing tanks with the Spiral Method



# Lighting at the accumulator

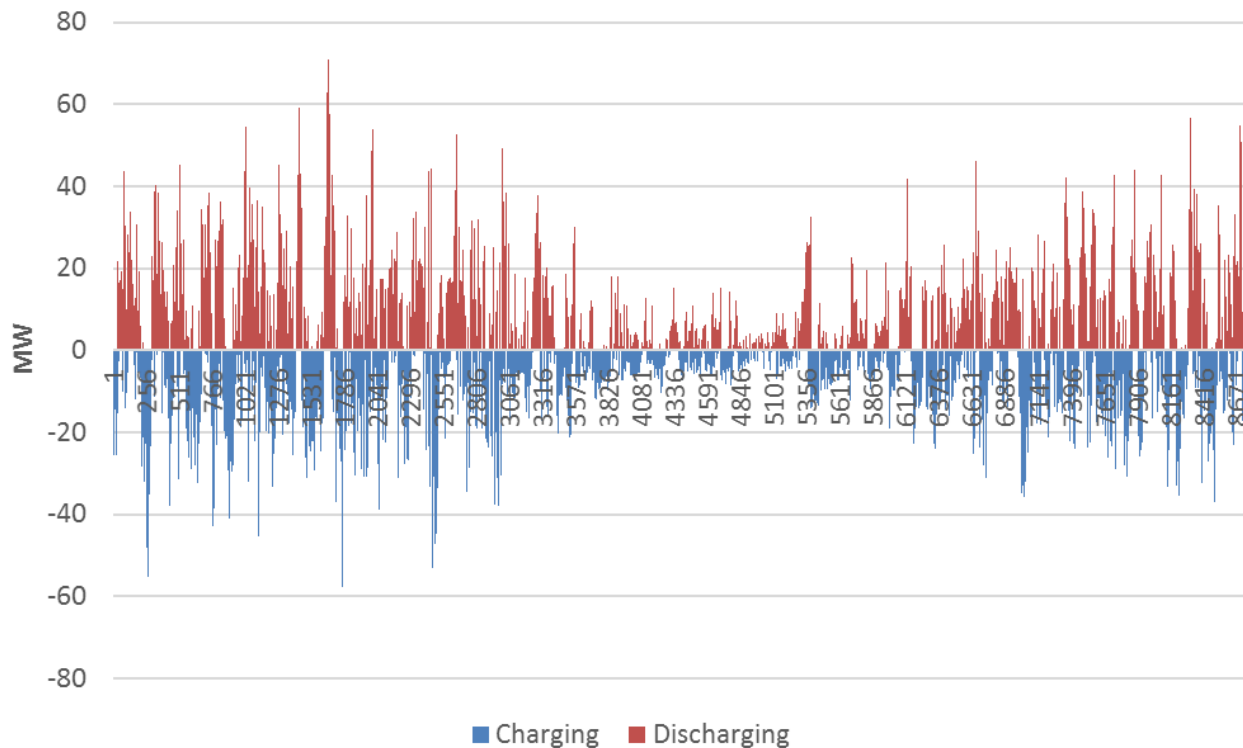
- More than 4500 lamps (LED)!



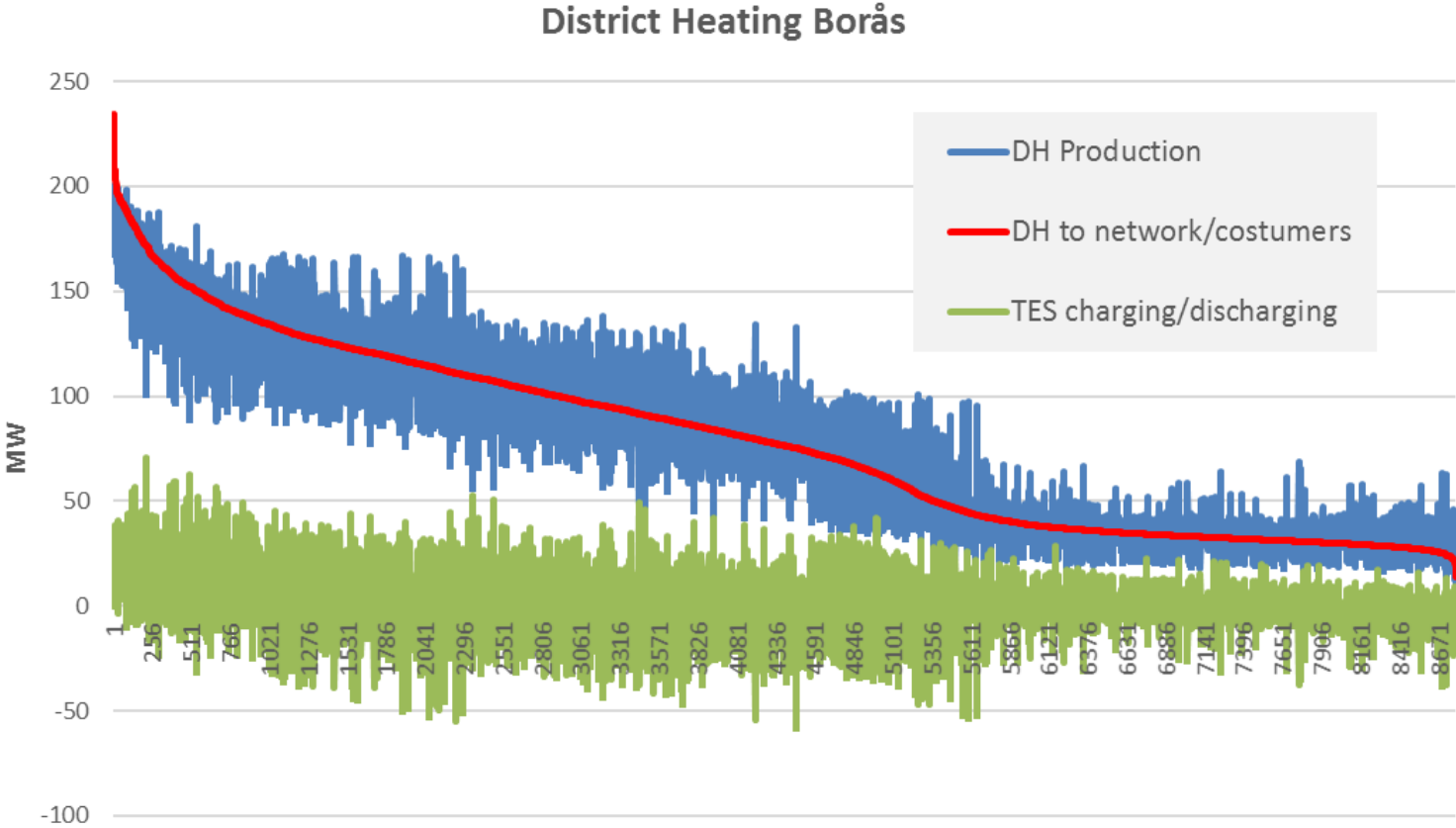


# The accumulator in operation

- The accumulator is use during all year on a hourly basis
- Large capacity, ~50 MW

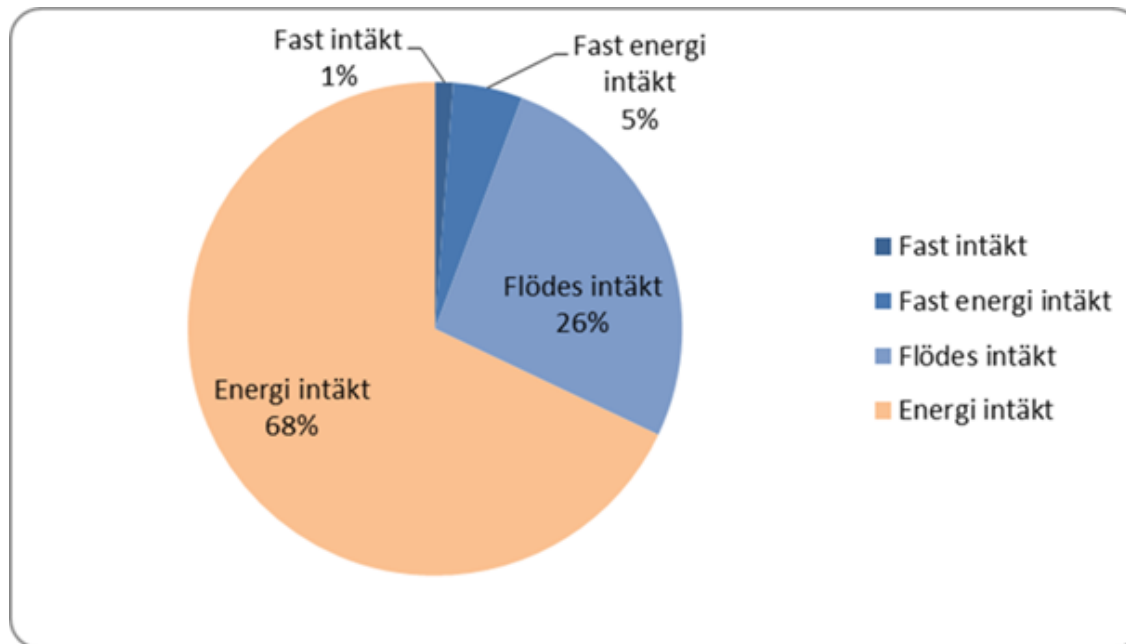


# Duration for DH and TES charging/discharging



# District Heating – Business model / Pricing

- ~1/3 fixed price (flow/flöde)
- ~2/3 energy price (energy/energi)





# DH - Pricing business costumers 2019

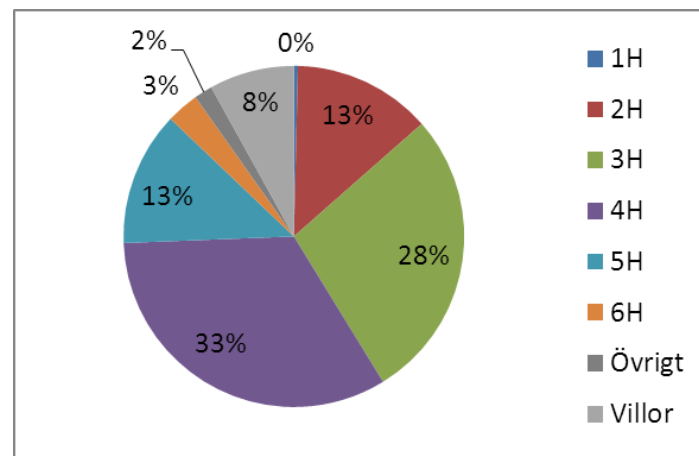
Total heating price = fixed + flow + energy

Energy price 495 SEK/MWh, ~50 EUR/MWh

## Total price for district heating:

~750 SEK/MWh exkl. VAT

~75 EUR/MWh exkl. VAT



Prisgrupp	Fast pris	Fast energipris	Flödespris*
1	430 kr/år	249 x Wn kr/år	-
2	510 kr/år	247 x Wn kr/år	-
3	400 kr/år	-	36 210 x Q kr/år
4	8 140 kr/år	-	34 320 x Q kr/år
5	86 520 kr/år	-	28 590 x Q kr/år
6	235 850 kr/år	-	25 470 x Q kr/år

Prisgrupp 1 Wn = 0 - 40 MWh/år

Prisgrupp 2 Wn = 40 - 150 MWh/år

Prisgrupp 3 Wn = 150 - 600 MWh/år

Prisgrupp 4 Wn = 600 - 2 000 MWh/år

Prisgrupp 5 Wn = 2 000 - 7000 MWh/år

Prisgrupp 6 Wn = >7 000 MWh/år

# DH - Pricing villas/private costumers 2019

- Four different offers

→ The higher investment, the lower fixed/energy price

## ***Investment / fixed cost / energy price***

Typ av kostnad	Paket 1	Paket 2	Paket 3	Paket 4
Inv. kostnad	0 kr	47 000 kr	92 000 kr	145 000 kr
Fast kostnad	839 kr/mån	395 kr/mån	253 kr/mån	0 kr/mån
Energipris	78,4 öre/kWh	76,4 öre/kWh	63,4 öre/kWh	52,4 öre/kWh



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