

Ringsted's New Heat Pump Plant

WEBINAR

March 2nd 2021

Classified as Business



Introduction of Ringsted District Company

We are a District Heating Company, who deliver heat - equivalent to 7,000 one family houses.



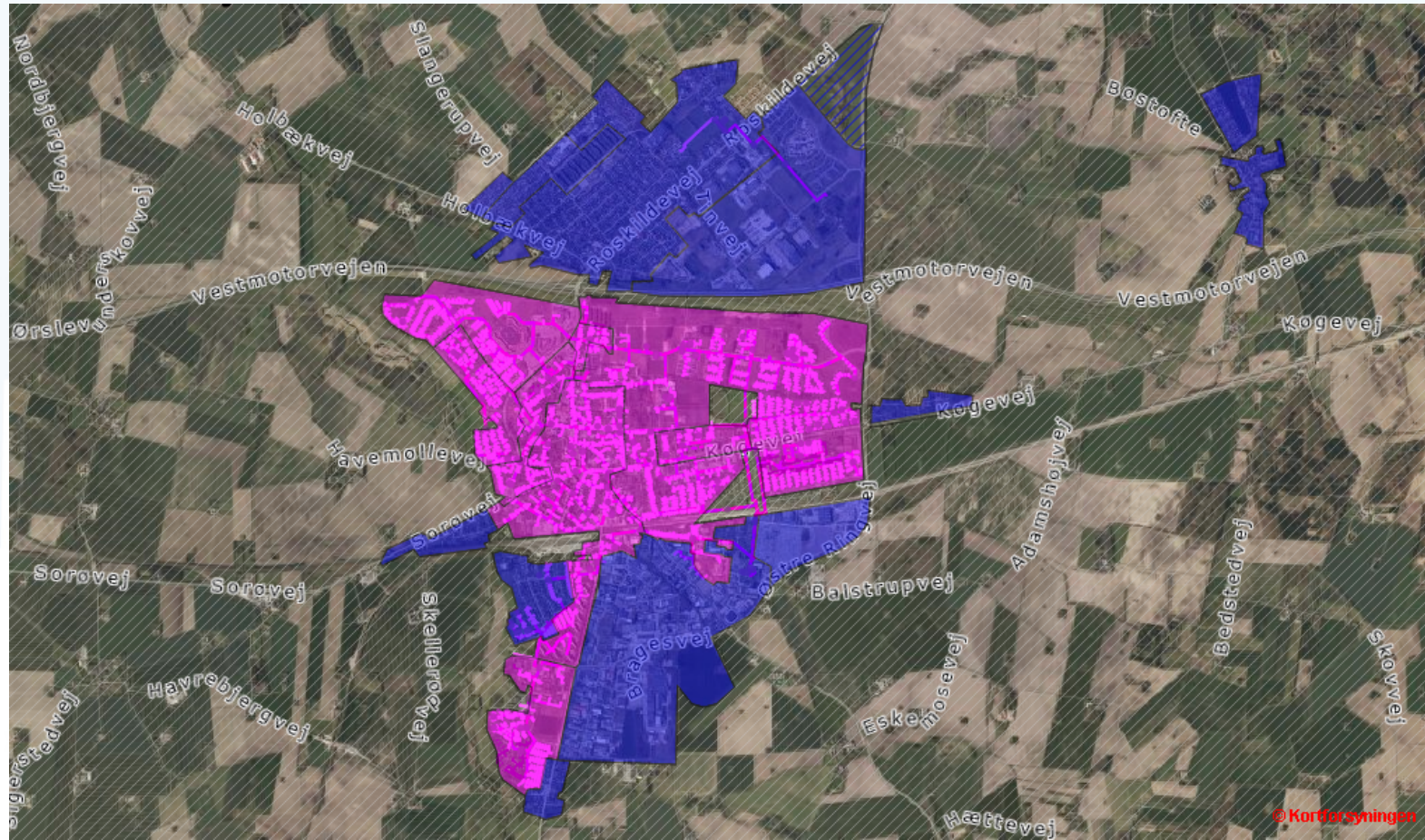
One family house
Block of flats
Shopping Center
Schools
Sports Center
Offices

March 2nd 2021

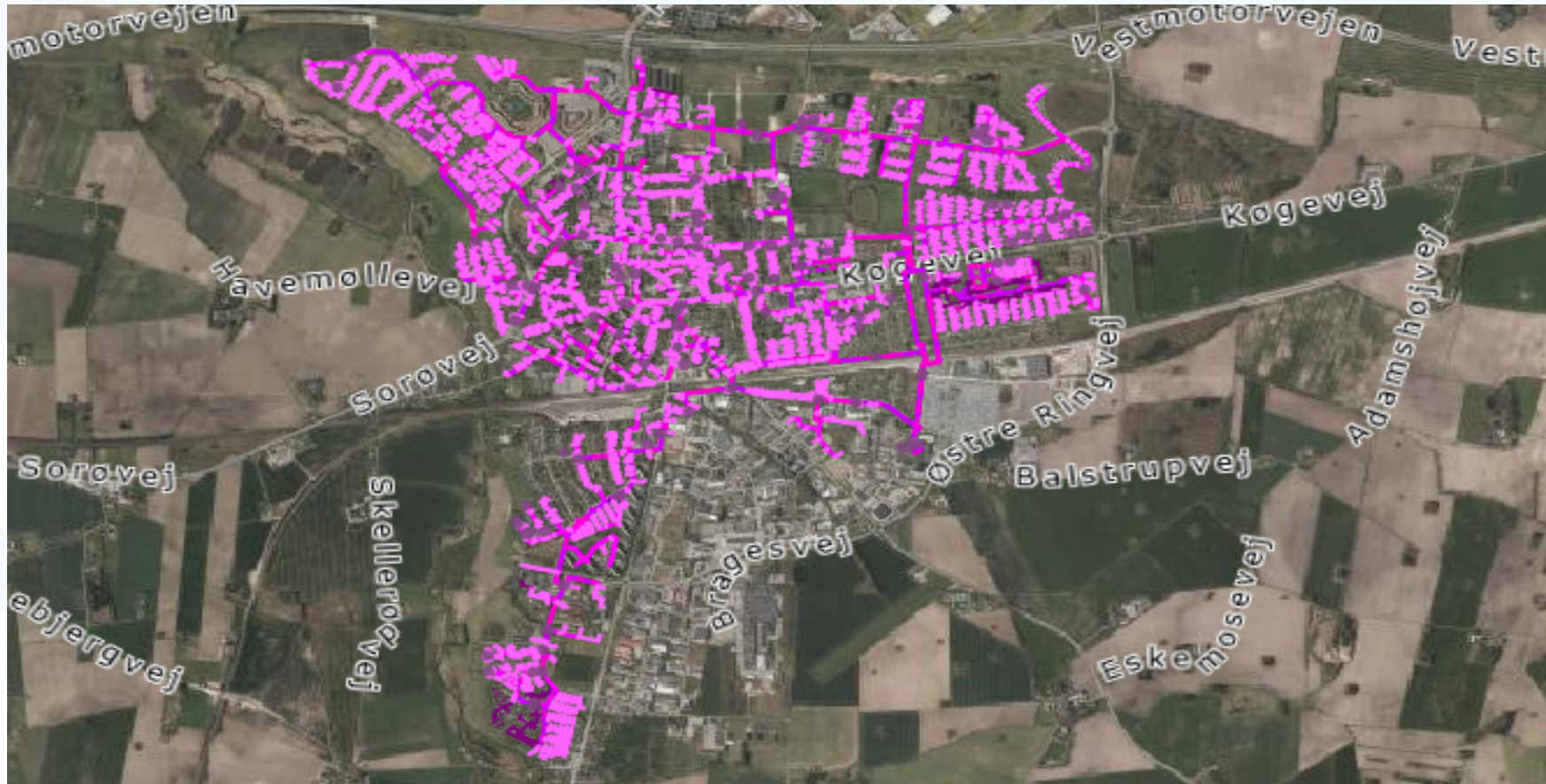
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District heating in the center of city. Individual oil or gas boiler in the surrounding



To supply the central city we use 124 km district heating network



Stock company with out dividend

- We are a public company where all stocks are owned by the municipality.
- The municipality may not take dividend out of company.
- When the company make profit one year - we must pay back to the consumers next year or reserve the money for new investment.

Company goals

- Safe heat without interruption in the heat supply (only few planned short - time interruptions happened in single streets)
- Heat supply which is competitive with other kind of heat (as eg. individual heat pumps)
- Supply with low impact to surrounding environment (filter bags 1 - 4 mg dust/m³ and 97 % desulphering on exhaust gas from straw fired plant + oxidation catalyst on the gas driven CHP)
- We have promised the municipality - that 95 % of our heat production was CO₂ free in 2020

All goals we have met for many years – also the goal for 2020

Our production facilities

In the last 4 decades we have moved from 100 % fossil to less than 5 % fossil – in 4 steps

- 1983 From Oil to Natural gas and the first 2 straw fired boilers 8 MWt
- 1997 From heat only boilers to own combined heat and power plant (CHP) on Natural Gas - 11 MWe and 13 MWt surplus heat
- 2009 2 new straw fired boilers (17 MWt)
- 2020 3 electric driven heat pumps (10 MWt) with 2 screw compressors and 3 Danfoss Turbocor

The last 3 steps we did each for an investment = 1.350 Euro pro district heating consumer

When build new plants - we are always buying the best new available technology and we do our own maintenance - so the last 3 plants are still “fit for fight” as new plants.

1. CHP to the right, the heat accumulator in the middle, the new evaporator in the back yard and the straw fired plant to the left.
2. Straw fired plant with the scrubber to the left.
3. Brand new evaporator to our new heat pump (january 2021)

1.



2.



3.



The combined heat and power plant (11 Mwe + 13 MWt) from 1997 – is today a very reliable stand by plant and support the national power grid. National power grid pay us for delivery 0 % to 100 % capacity in 15 minutes - when something unexpected happens or great fluctuations take place in the national power grid. In 2020 we were active in 700 h and the surplus heat covered about 6 % of our heat demand.



The straw fired plant with 2 boilers have until 2020 covered about 75 % of our heat demand. In the future we expect to cover only 45 % from the straw boilers. The other 30 % straw will be used in others new straw fired boilers in other locations - together with new heat pumps and in a biogas plant. We now install a scrubber at the fluegas - so we have a heat efficiency at 103 % and remove 97% of the SO₂ in the fluegas.



The new scrubber at the fluegas. By using the new Danfoss Turbocor heat pump - we increase the heat efficiency from 93 to 103 % and remove 97% of the SO₂ in the fluegas.



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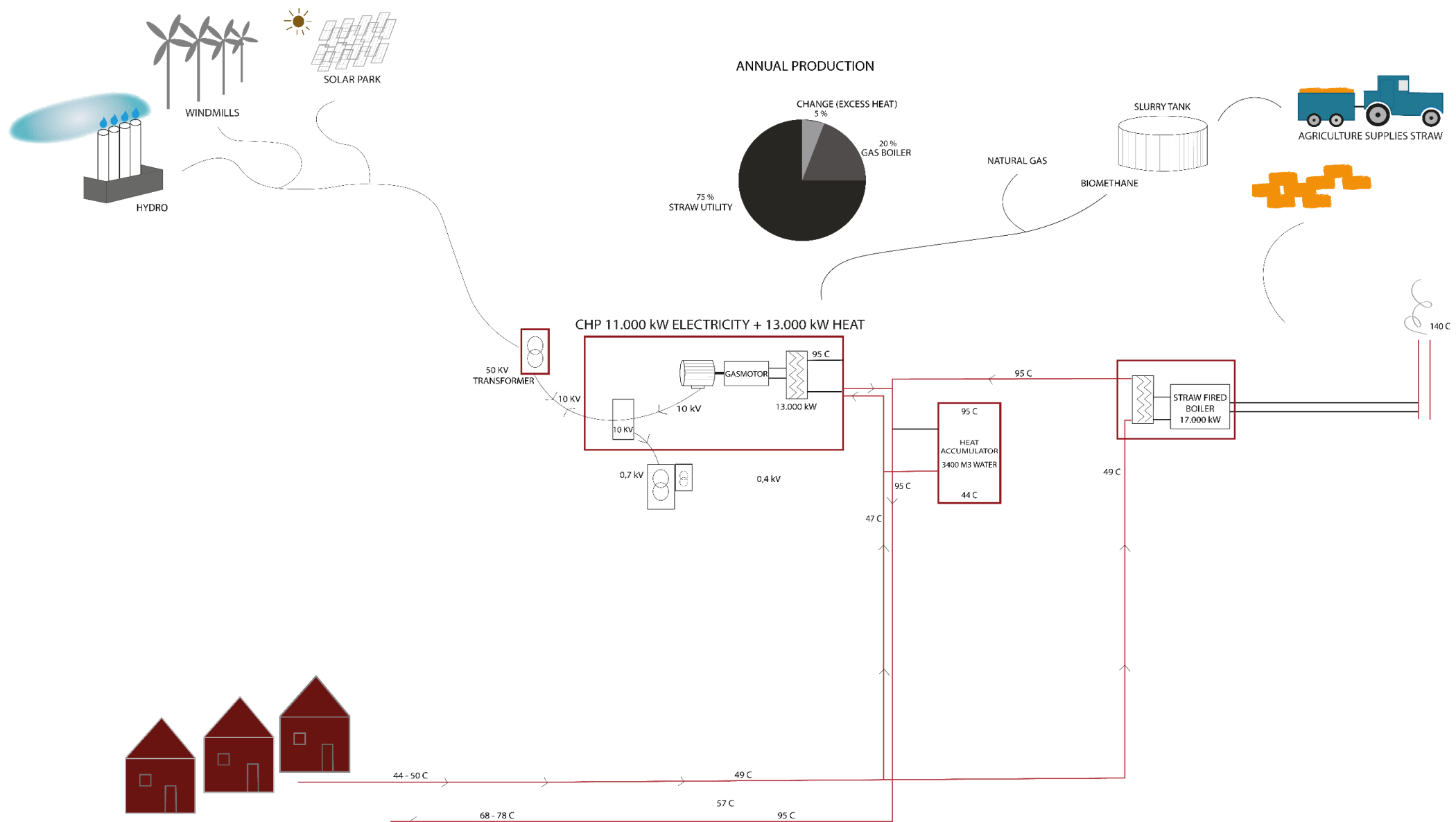
Ringsted Forsyning

UBDH

Danfoss



The former plant with only Combined Heat and Power Plant (CHP) and straw fired boilers



ANNUAL PRODUCTION

- 45 % STRAW UTILITY
- 44 % HEAT PUMP
- 6 % GAS BOILER
- 5 % CHANGE (EXCESS HEAT)

HP 1 - out door air

HP 2 - surplus heat from scrubber

CHP 11.000 kW ELECTRICITY + 13.000 kW HEAT

HEAT PUMP (HP) 1 - 8.000 kW

SCRUBBER - 1.700 kW

STRAW FIRED BOILER 17.000 kW

HEAT ACCUMULATOR 3400 M3 WATER

HP2 1000 kW

SLURRY TANK

AGRICULTURE SUPPLIES STRAW

BIOMETHANE

NATURAL GAS

50 kV TRANSFORMER

10 kV

0,7 kV

0,4 kV

95 C

44 C

72 C

75 C

28 C

57 C

58 C

49 C

51 C

35 C

26 C

49 C

57 C

44 - 50 C

68 - 78 C

57 C

95 C

58 C

47 C

30 C

5.739 kW AIR 0 C

-4 C

49 C

53 C

57 C

8.000 kW

1.075 kW EL

1.144 kW EL

Hz

Hz

Hz

13.000 kW

95 C

10 kV

10 kV

GAS MOTOR

WINDMILLS

SOLAR PARK

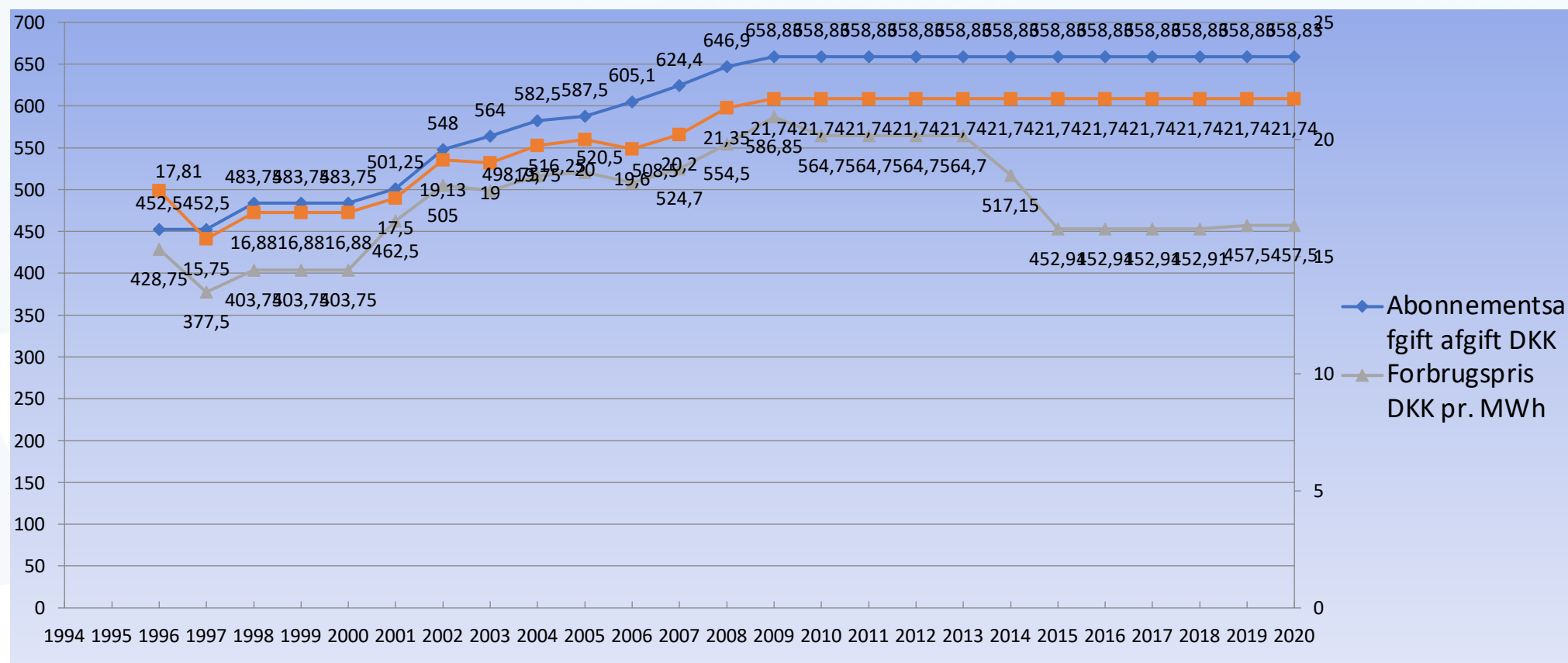
HYDRO

HP 2 - surplus heat from scrubber

How much you can increase the heat capacity and COP?

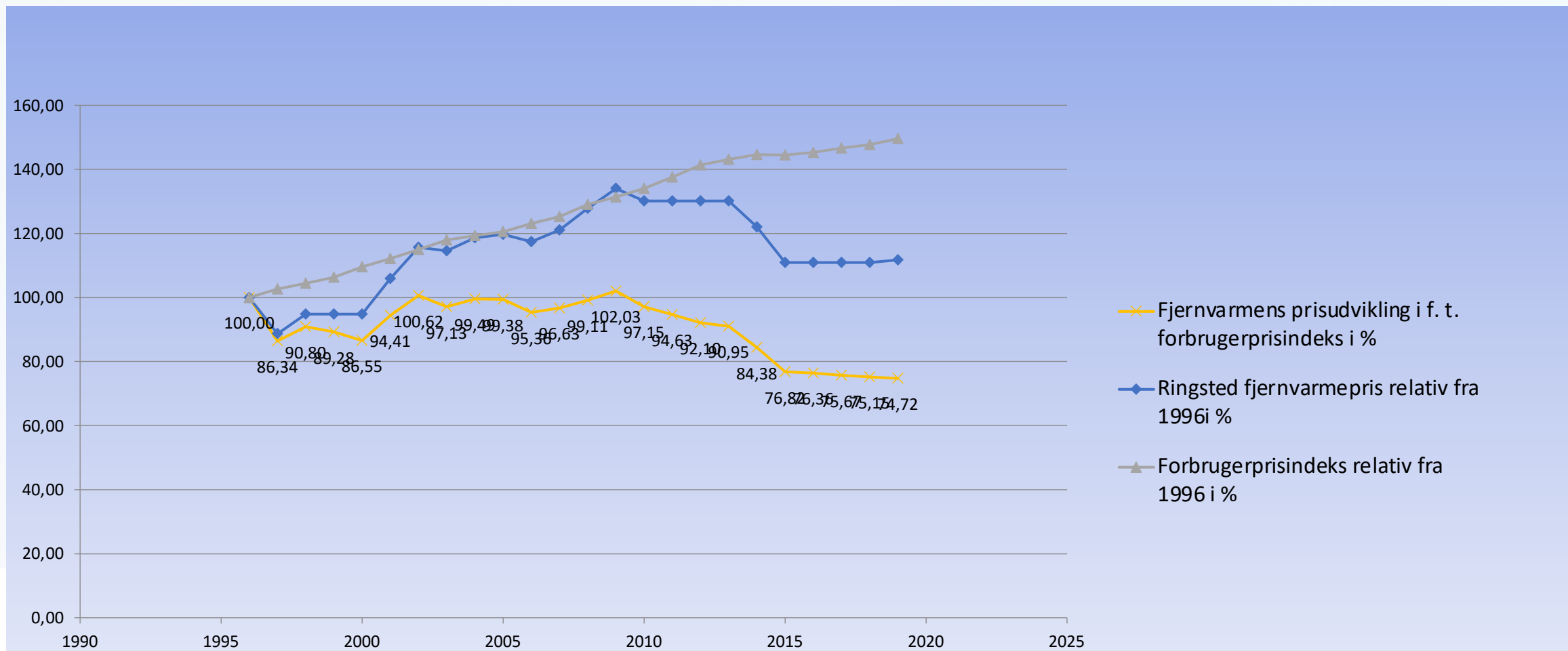
Ringsted Heatpump system 2020			
1 Outdoor temperatur	-5° C	0° C	12° C
2 Forward temperatur from HP*	60° C	55° C	60° C
3	kW	kW	kW
4 Heat capacity Heat Pump 01 (on outdoor air)	6.829	7.958	9.500
Heat capacity Heat Pump 02 (low temp. 51° C > 28° C surplus heat from scrubber at straw boileres)	962	962	962
Heat capacity - scrubber at straw boilers (75° C > 51° C surplus heat by heat exchange with out HP) Only possible by using the abov Heat Pump on lower temp at scrubber)	850	850	850
7 Heat capacity Heat Pump 03 (wast heat from Heat Pump 01)	310	310	310
8 Total heat capacity	8.951	10.080	11.622
Increasing the heat capacity by optimizing with Turbocor	31%	27%	22%
9 Power consumption Heat Pump 01	2.262	2.219	2.317
10 Power consumption Heat Pump 02	136	136	136
11 Power consumption Heat Pump 03	50	50	50
12 Power consumption scrubber	22	22	22
13 Total power consumption	2.448	2.405	2.503
14			
15 COP HP 01	3,0	3,6	4,1
16 COP HP 02	7,1	7,1	7,1
17 COP scrubber	38,6	38,6	38,6
18 COP HP03	6,2	6,2	6,2
19 Total COP for energy systeme established 2020	3,7	4,2	4,6
20 Increasing the COP by optimizing with Turbocor	21%	17%	13%

Stable or falling heat price in Ringsted the last 12 years



Heat price related to other prices in the last 25 years

Develop of other consumer goods, develop of district heating price in Ringsted, relative develop in DH price in Ringsted



Thank you.
Ringsted District Heating

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