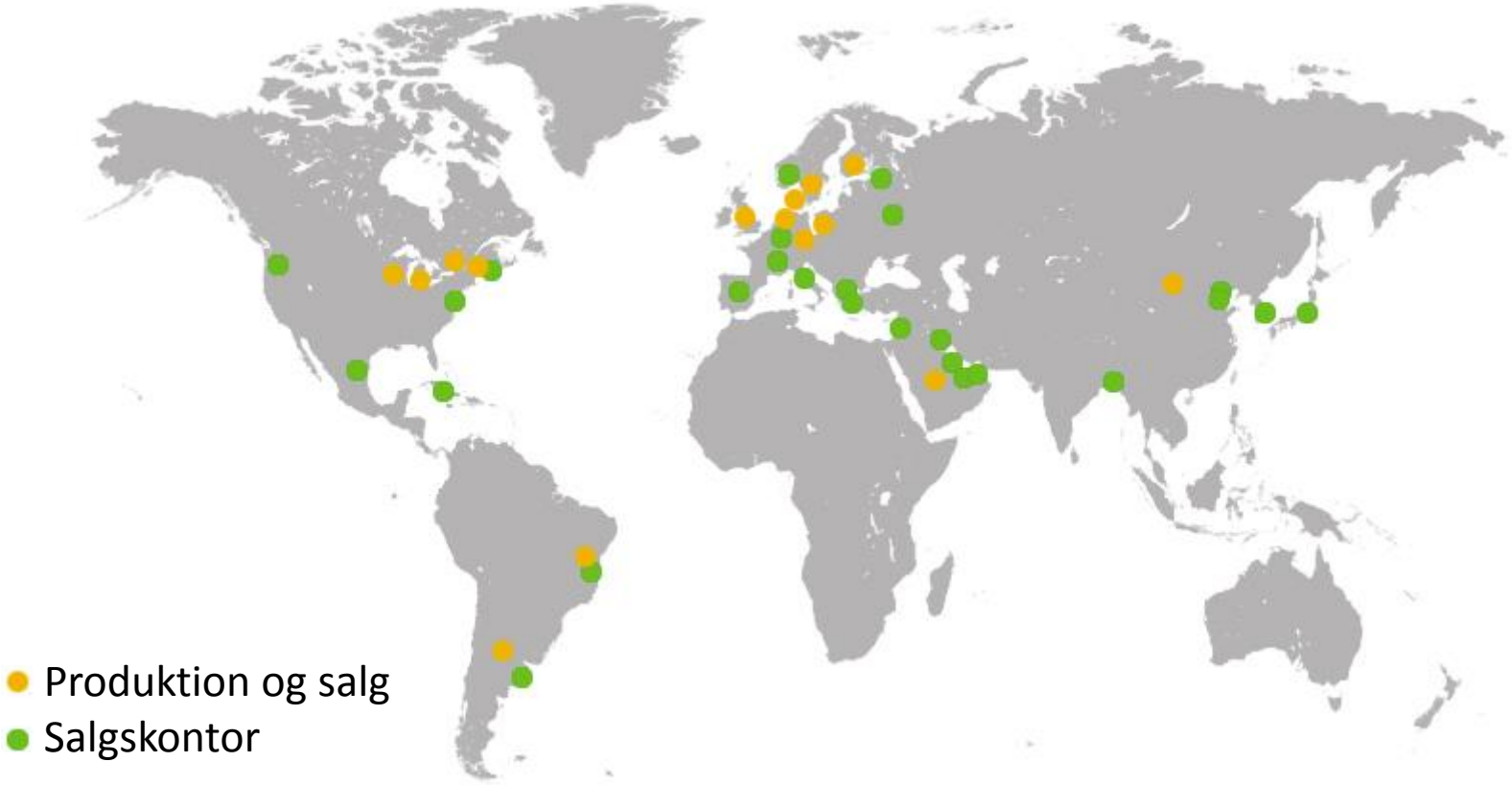
TI 4.- og 6. april 2017 Energieffektivitet i Industrien

POEM

Arla Foods i verden



Arla Foods i Danmark

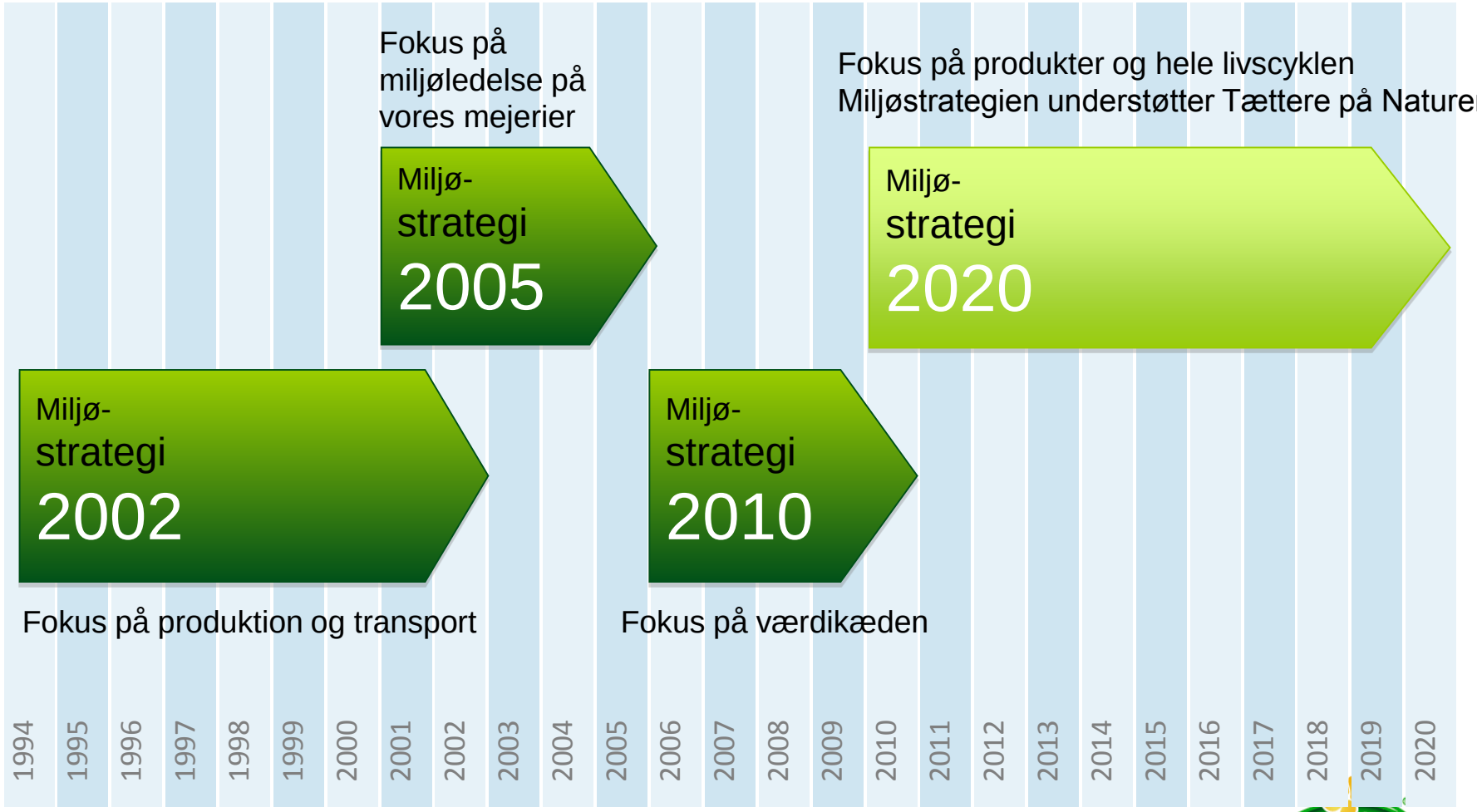
- Ost
- Friskmælk
- Smør
- Ingredients
- Pulver
- Distribution
- Kontor

Climate Change: Target

We want to reduce our CO2 emissions by 25% before 2020

In primary agriculture we will work with our co-operative members, research institutions and industry organisations to achieve as high a reduction in cattle farms as possible.

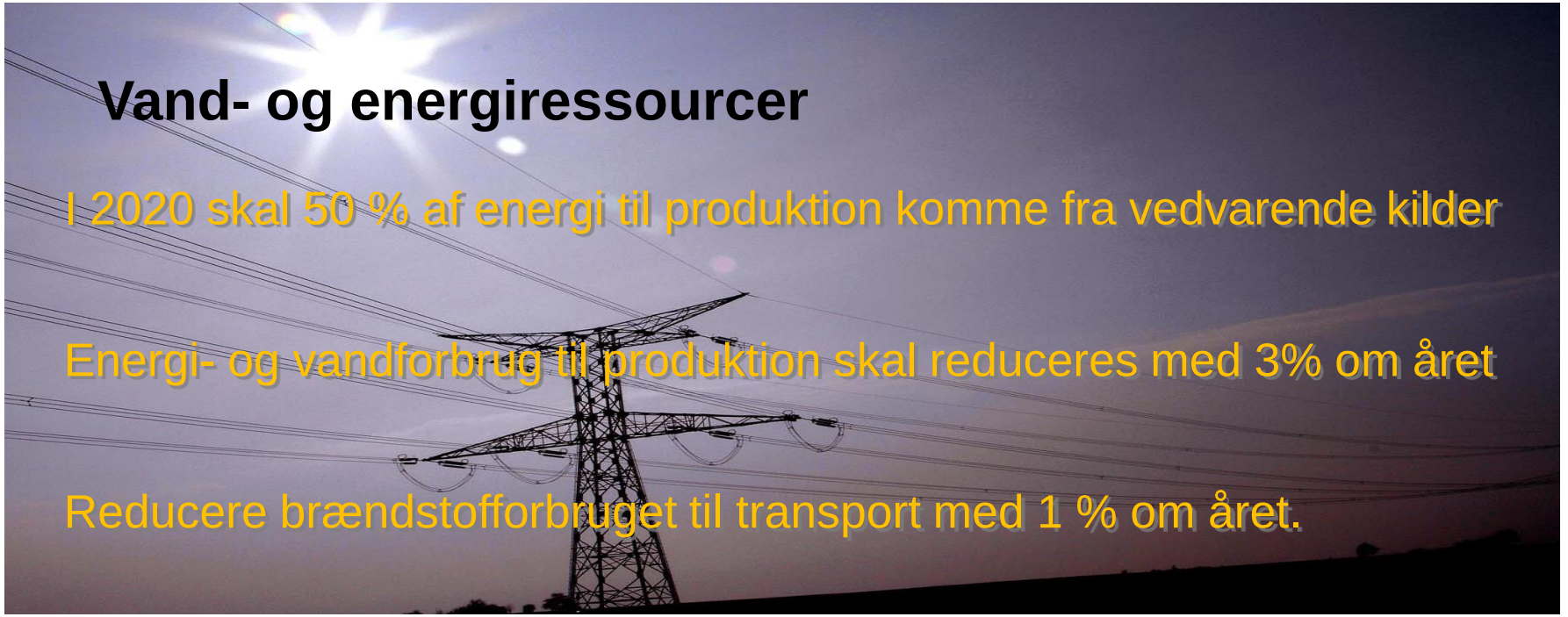
Fra produktion til produkt



Klimamålsætning

Vi ønsker at reducere CO2-udledning med 25 % inden 2020

25% Produktion- Transport – Emballage CO2



Vand- og energiressourcer

I 2020 skal 50 % af energi til produktion komme fra vedvarende kilder

Energi- og vandforbrug til produktion skal reduceres med 3% om året

Reducere brændstofforbruget til transport med 1 % om året.

Miljøstrategi 2020

Primære fokusområder

Bæredygtigt landbrug

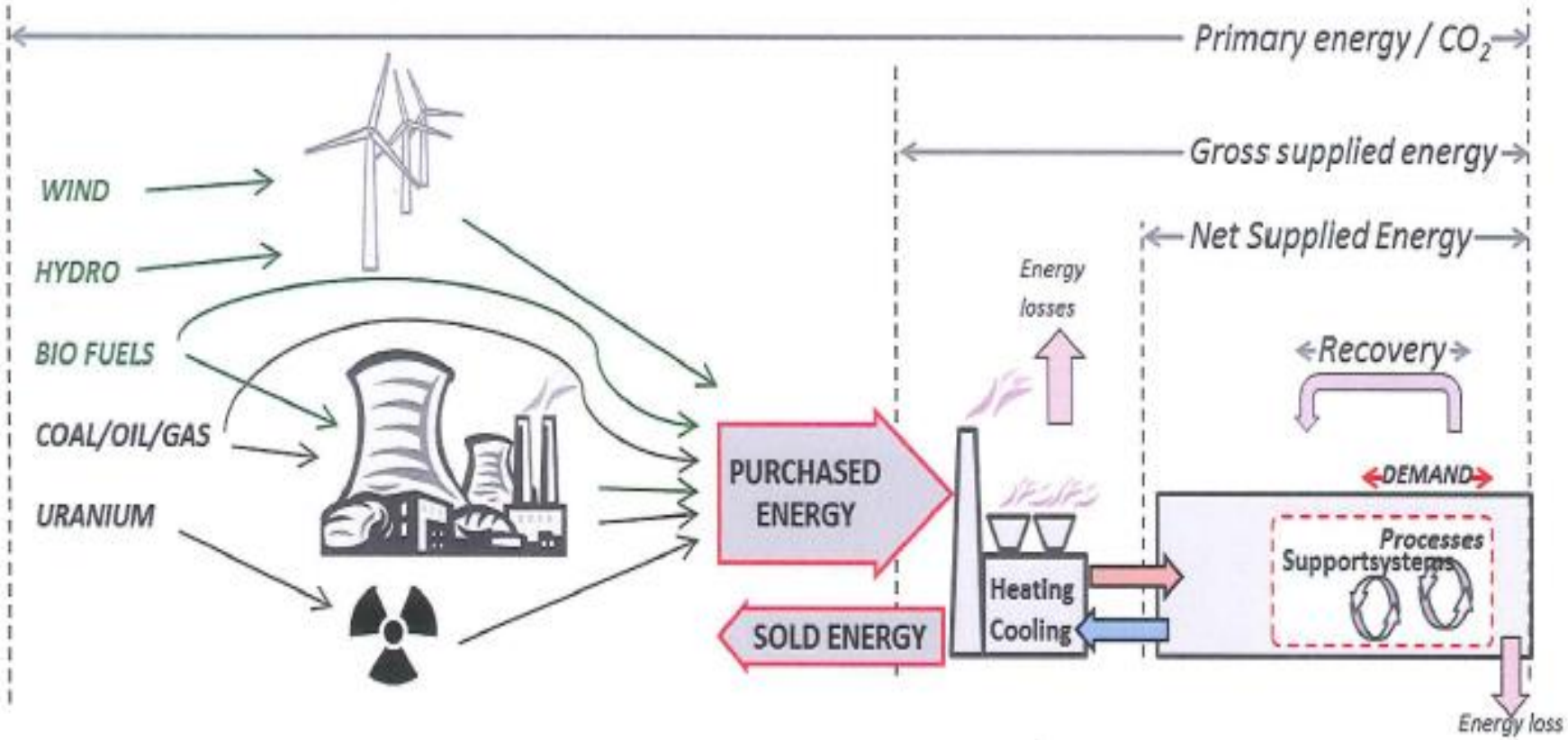
Udledning af drivhusgasser

Vand og energi

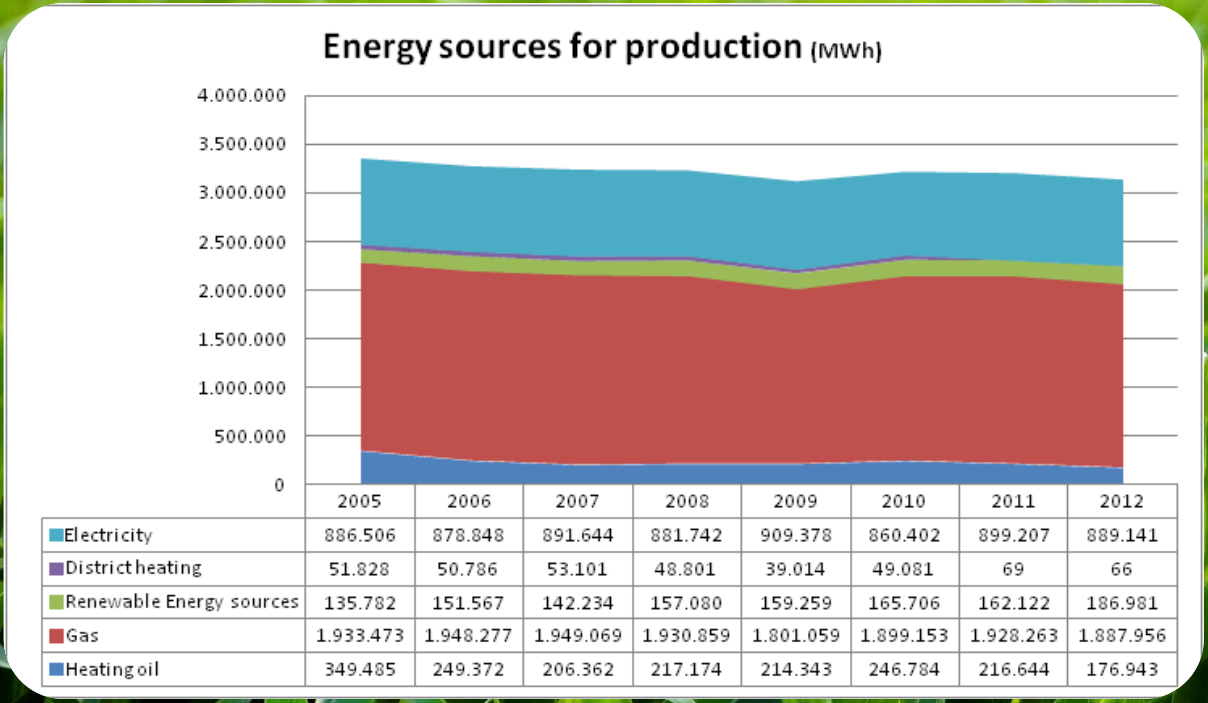
Affald

Politisk situation

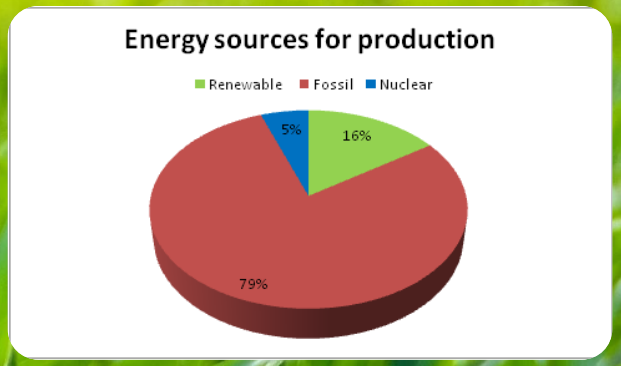
- Mange gode energipolitiske tiltag.
- Energiafgifter.
- Værdi af energibesparelser.
- Tilskud til biogas
- VE til proces.
- Passer perfekt ind i Arla Foods miljømålsætning.

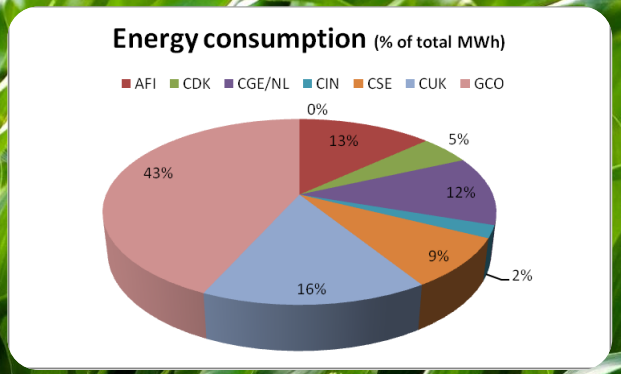

Primary energy / CO_2
Gross supplied energy
Net Supplied Energy
WIND
HYDRO
BIO FUELS
COAL/OIL/GAS
URANIUM
Energy losses
Recovery
PURCHASED ENERGY
SOLD ENERGY
Heating
Cooling
DEMAND
Processes
Supportsystems
Energy loss

Energy Sources 2012

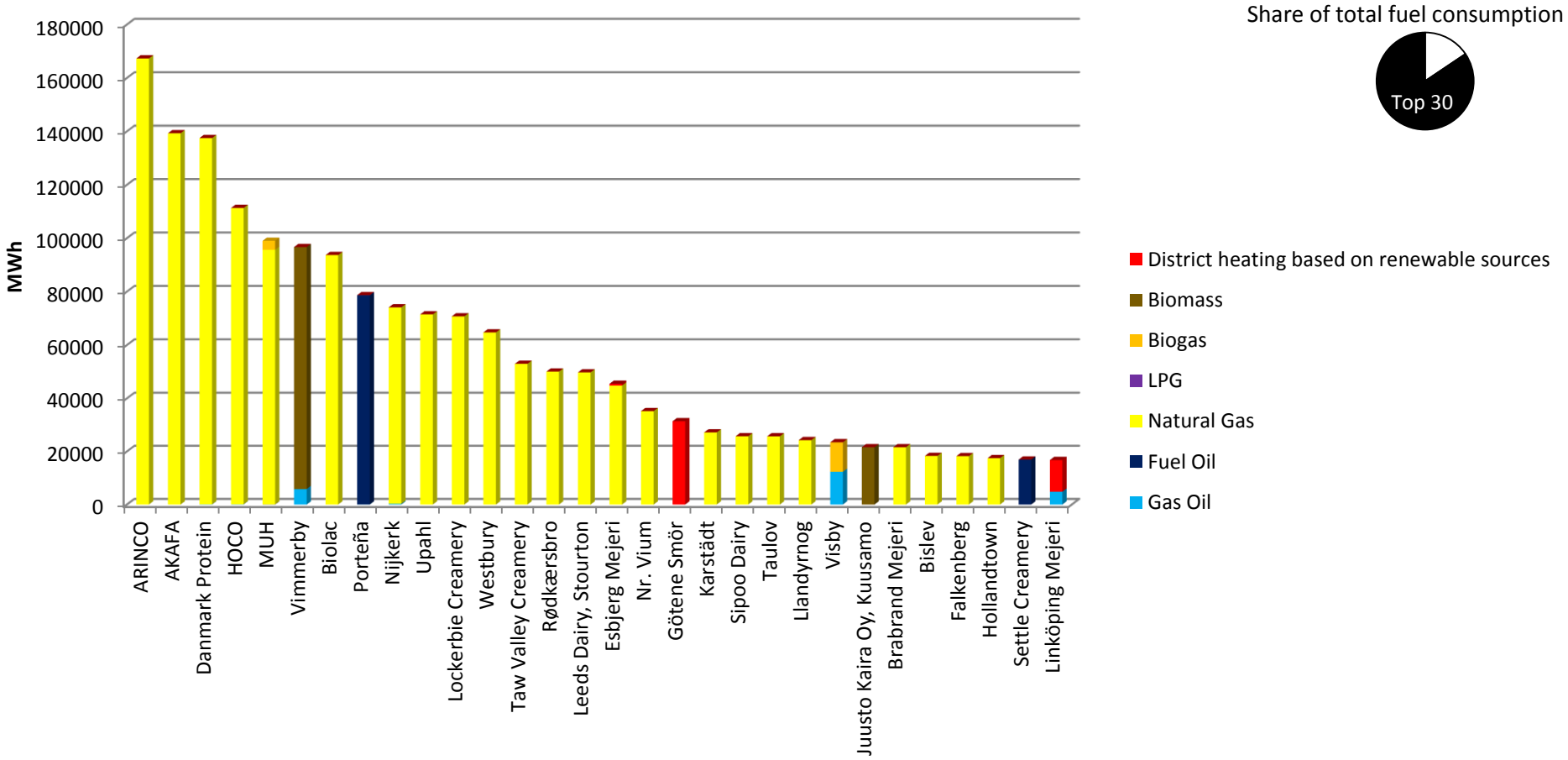


	2005	2006	2007	2008	2009	2010	2011	2012
Electricity	886.506	878.848	891.644	881.742	909.378	860.402	899.207	889.141
District heating	51.828	50.786	53.101	48.801	39.014	49.081	69	66
Renewable Energy sources	135.782	151.567	142.234	157.080	159.259	165.706	162.122	186.981
Gas	1.933.473	1.948.277	1.949.069	1.930.859	1.801.059	1.899.153	1.928.263	1.887.956
Heating oil	349.485	249.372	206.362	217.174	214.343	246.784	216.644	176.943

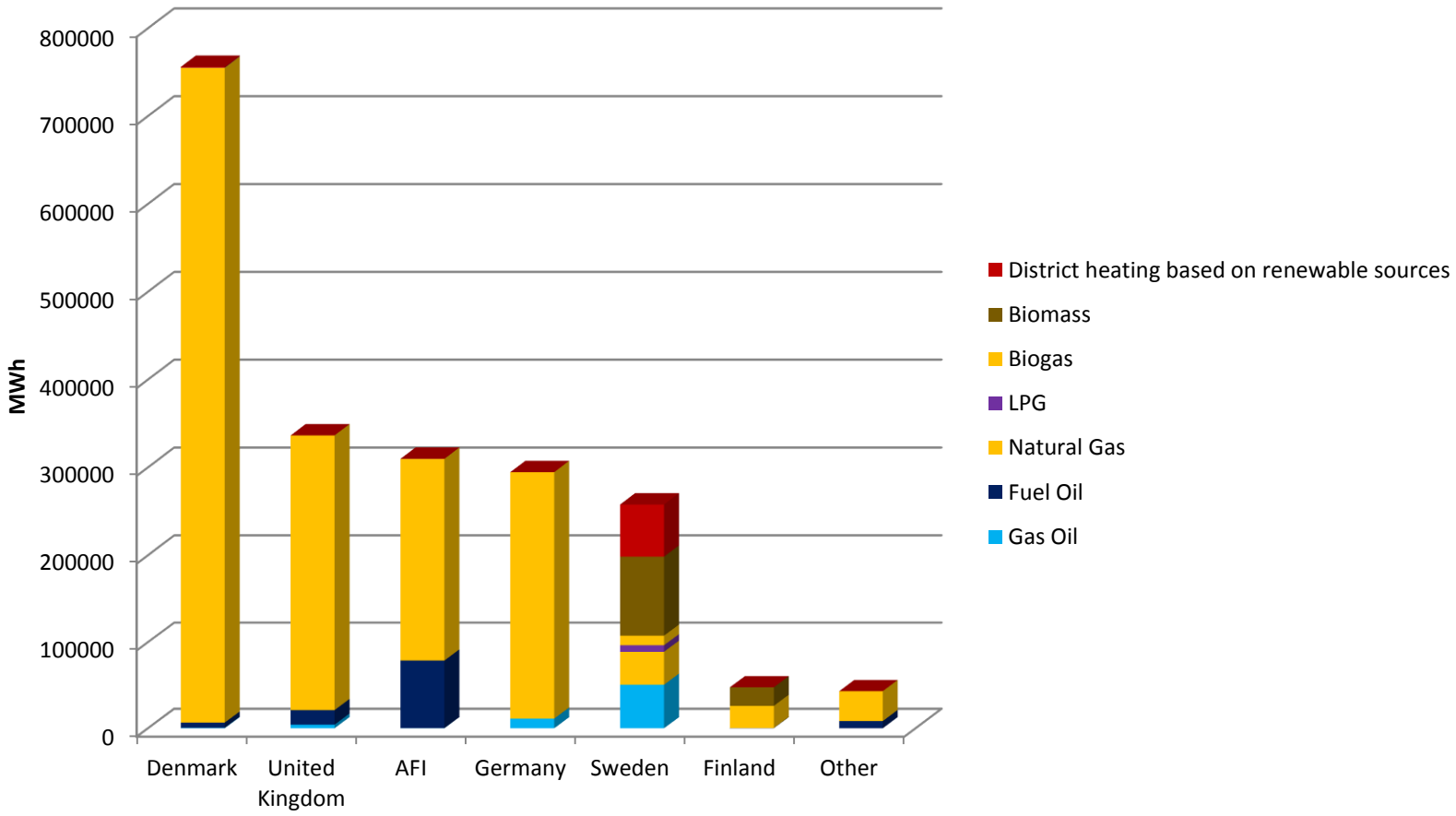




Fuel consumption details top 30

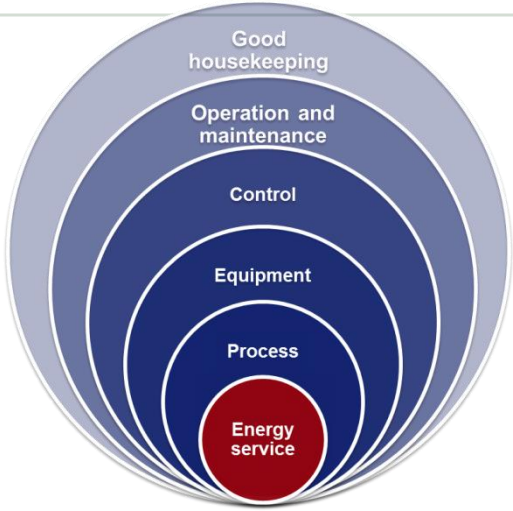


Fuel consumption details



Energy

- Phase 1: Energy mapping
- Phase 2: Energy savings and investments



Phase 1:
Energy mapping - 6 steps maximum 6 weeks

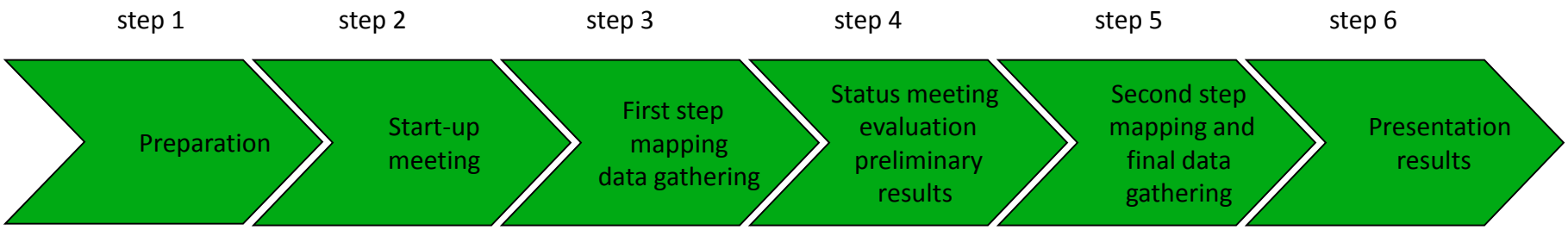
Project steps

- Preparation
- Start-up meeting
- First step mapping and data gathering
- Status meeting and evaluation of preliminary results
- Second step mapping and final data gathering
- Presentation of results

Time frame

The project can be conducted over a period from two/three weeks to six weeks depending on involvement from production site and data availability.

Energy mapping procedure

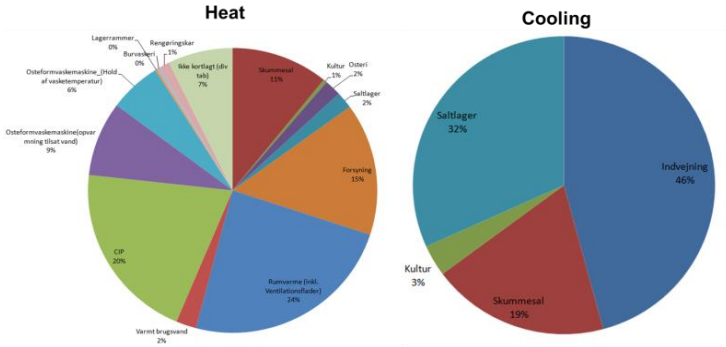


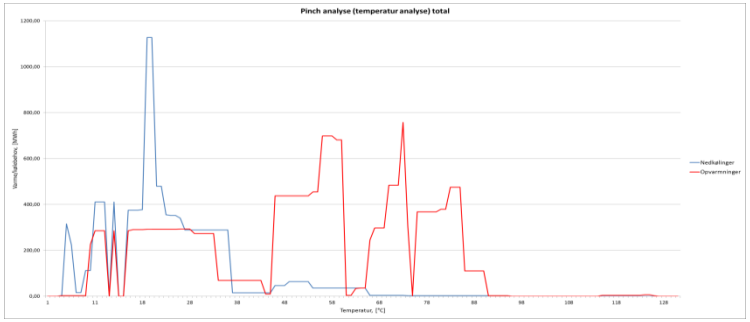
Involvement					
Site: Project manager	Project manager Site manager Production manager Energy experts	Project manager Energy experts	Project manager Site manager Production manager Energy experts	Project manager Energy experts	Project manager Site manager Production manager Energy experts
Global QEHS: Energy manager	Energy manager		Energy manager		Energy manager
Ext.consultants: Energy consultant	Energy consultant	Energy consultant	Energy consultant	Energy consultant	Energy consultant

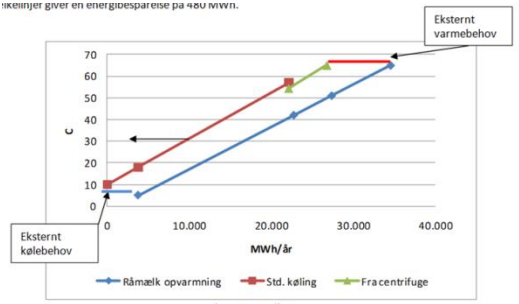
Energy mapping – results

Project results

- Total overview of energy consumption
  - what goes where and why
- Pie chart
- Pinch analysis
- Screeninglist
  - Savings idea, quantity and priority





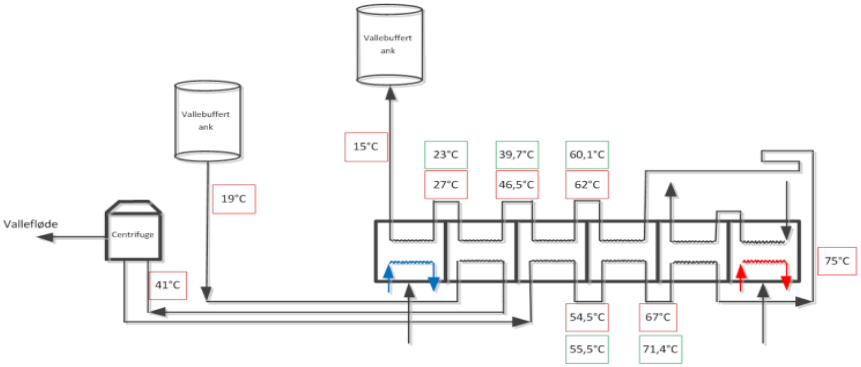


Figur 49 QT-diagram

Phase 2: Energy Savings and Investments

Phase 2 activities

- Heat recovery/"Energy water" analysis and optimisation
- Heat exchanger optimisation
- Utility optimisation
  - Refrigeration and cooling systems
  - Steam and hot water systems
  - HVAC systems



- All other activities listed and prioritised on the screening list
- Evaluating investment and payback
- Getting energy savings subsidy from the government

Delta-T jagt

ΔT'er:
Pasteurisering af valle/permeat: ΔT ≤ 4 °C
Pasteurisering af ostemælk/skummetmælk: ΔT ≤ 5 °C
Pasteurisering af fløde: ΔT ≤ 10 °C
Pasteurisering af vand: ΔT ≤ 3 °C

Flow:
Der forudsættes, at de pasteurs, som skal optimeres i første omgang,
alle er hvor flowet gennem apparatet på årsbasis er større end 10.000 tons.

Område [-]	Produkt [-]	ΔT_erfaring [°C]	ΔT_målt [°C]	Flow [ton/år]	Målt [-]	Beskrivelse [-]	Potentiale_flow [-]	Potentiale_temp [-]
Mælkemodtagelse	Permeat	4	11,5	25.944	Ja	Pasteurisering af mælkepermeat	Ja	Ja
Mælkebehandling	Skummetmælk	5	10	2.385	Nej	Pasteurisering af skummetmælk til kultur	Nej	Ja
	Ostemælk	5	3,9	152.250	Ja	Pasteurisering af ostemælk til osteri	Ja	Nej
	Ostemælk	5	7,4	33.788	Ja	Pasteurisering af ostemælk på MF/HTT linje	Ja	Ja
	Fløde	10	25,8	3.621	Ja	Højtemperatur pasteurisering i HTT	Nej	Ja
	Fløde	10	9,6	12.854	Ja	Pasteurisering af fløde til udvejning	Ja	Nej
	Grænsemix	10	2,5	638	Ja	Pasteurisering af grænsemix	Nej	Nej
Vallebehandling	Valle	4	2,5	243.478	Ja	Pasteurisering af råvalle	Ja	Nej
	RO-vand	3	7,4	82.772	Ja	Pasteurisering af RO-vand	Ja	Ja
	UF-valle	4	6,5	46.991	Ja	Pasteurisering af UF-valle	Ja	Ja
Køling	Kølevand	3	7,5	148.607	Ja	Pasteurisering af kølevand i osteri	Ja	Ja

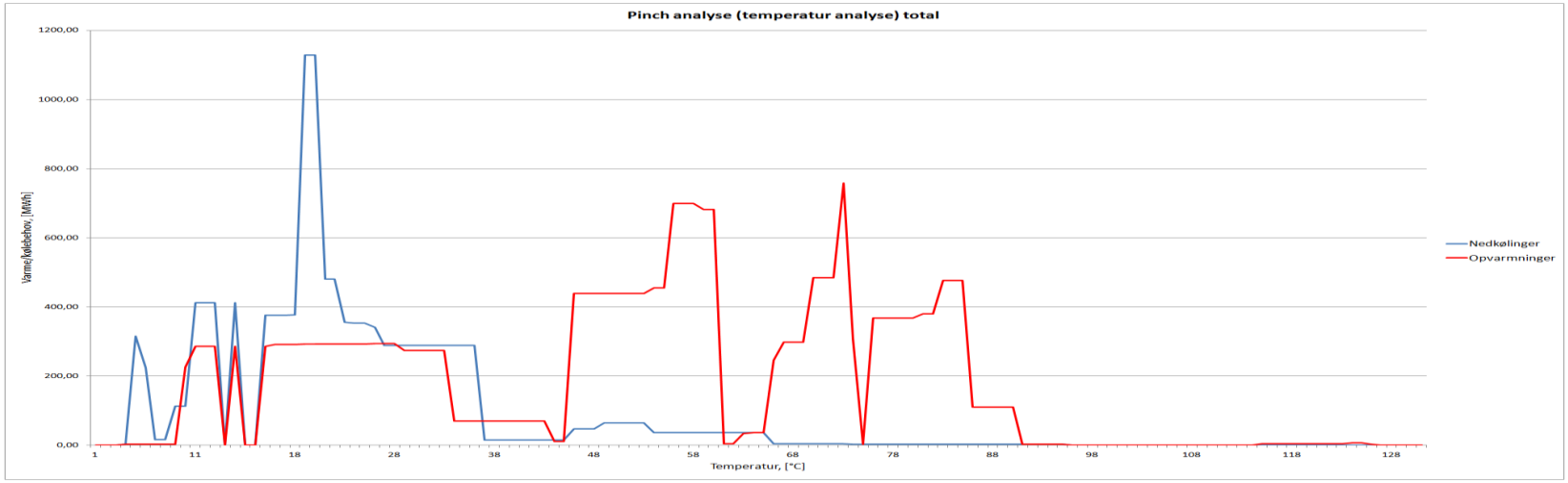
Varme strømme

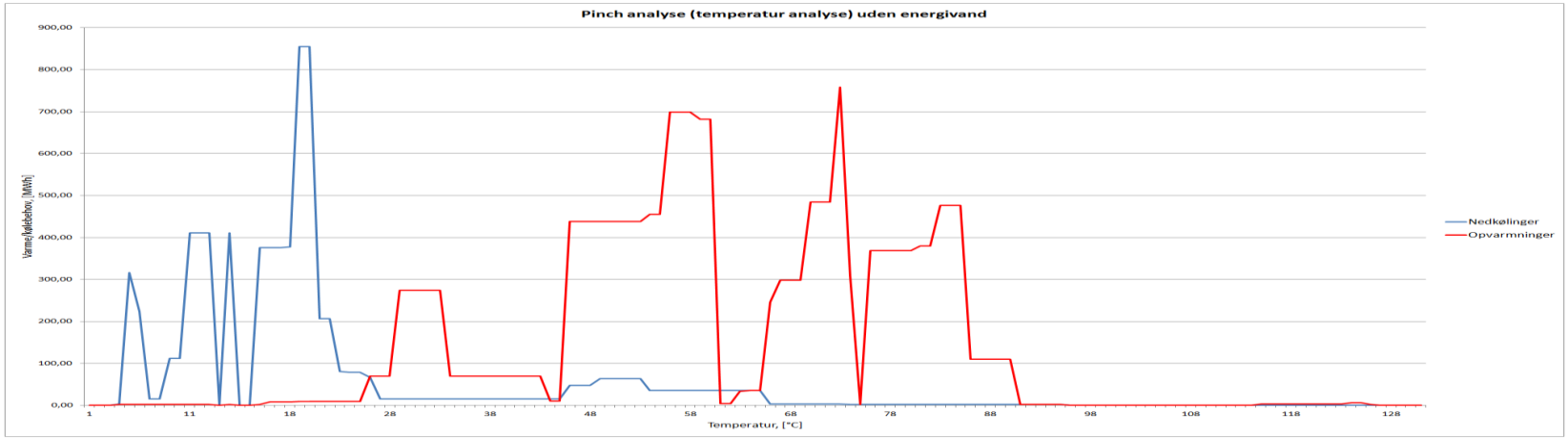
Strømnummer	Temperaturer	Niveau	Niveau	Niveau	Niveau	Niveau	Kølekilde	
-	°C	130-85	84-60	60-30	29-20	19-5	I, [MWh]	E, [MWh]
35	5					1.193	1.193	
36	51-18			432				432
37	120-70	2.070						2.070
38	18-7					141	141	
39	55-50			1.131			1.131	
40	18-10					2.221	2.221	
41	120-70	1.655						1.655
42	51-7			453			453	
43	51-46			911			911	
44	15-10					1.096	1.096	
45	95-45	491						491
46	45-5			389			389	
47	39-10			1.483			1.483	
48	19-10					1.747	1.747	
49	11-5					1.142	1.142	
50	39-36			207			207	
51	11-4					352	352	
52	11-4					352	352	
53	45-10			408			408	
54	89-7	167					167	
55	33-28			4.224			4.224	4.224
56	28-10				7.555		7.555	
57	18-8					907	907	
							26.079	8.872

Kolde strømme

Strømnummer	Temperaturer	Niveau	Niveau	Niveau	Niveau	Niveau	Varmekilde		
-	°C	5,0 - 19,0	20 -29	30 - 60	60 - 84	75 - 130	H, [MWh]	D, [MWh]	E, [MWh]
1	77-80				1.193		1.193		
2	51-65			3.854			3.854		
3	85-93					123	123		
4	57-120					2.821		2.821	
5	51-65			3.083			3.083		
6	85-93					99	99		
7	57-120					2.322		2.322	
8	15-94	786					786		
9	94-95					10	10		
10	10-15	49							49
11	10-26	6.567							6.567
12	26-34		3.285				3.285		
13	68-74				2.424		2.424		
14	34-35			307			307		
15	46-62			3.035			3.035		
16	71-75				813		813		
17	71-75				703		703		
18	10-26	920							920
19	26-34		452				452		
20	68-74				338		338		
21	35-40			345			345		
22	53-62				439		439		
23	71-75				370		370		
24	67-75				94		94		
25	82-90					18	18		
26	67-75				4.076		4.076		
27	70-80				1.757		1.757		
28	63-71				730		730		
29	65-75				3		3		
30	80-90					12	12		
31	65-75				105		105		
32	15-35	1.746							1.746
33	35-48			1.135					1.135
34	48-65			1.484			1.484		
35	10-84	690						690	
							29.938	5.833	10.417

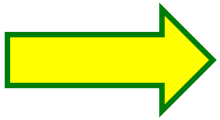
Arla Pinch


Pinch analyse (temperatur analyse) total
Varme/kølebehov, [MWh]
1200,00
1000,00
800,00
600,00
400,00
200,00
0,00
1
11
18
28
38
48
58
68
78
88
98
108
118
128
Temperatur, [°C]
Nedkølinger
Opvarmninger


Pinch analyse (temperatur analyse) uden energivand
Varme/kølebehov, [MWh]
900,00
800,00
700,00
600,00
500,00
400,00
300,00
200,00
100,00
0,00
1
11
18
28
38
48
58
68
78
88
98
108
118
128
Temperatur, [°C]
Nedkølinger
Opvarmninger

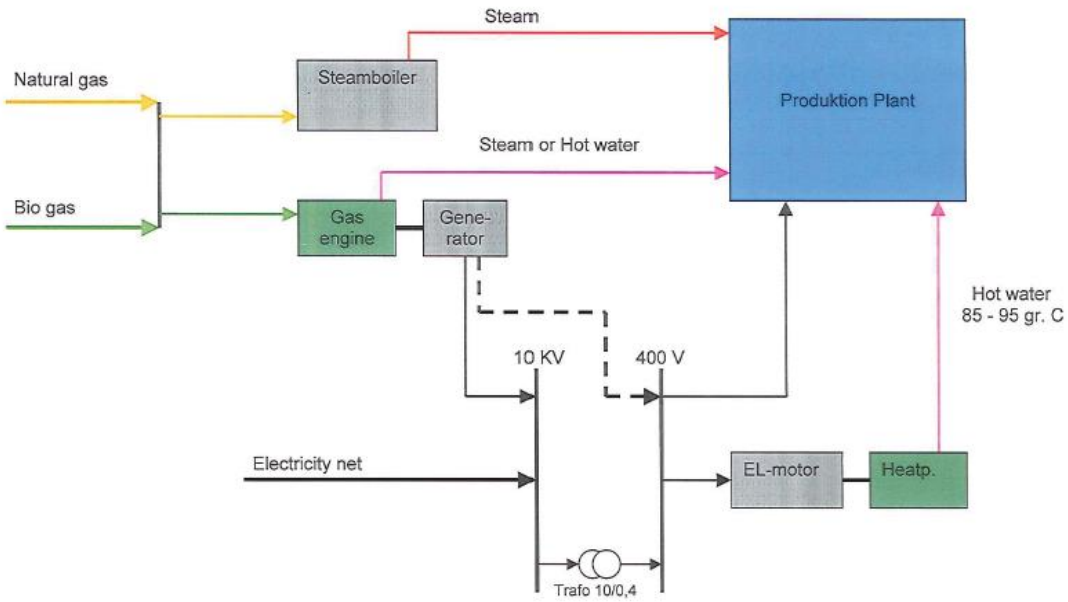
Type of biomass and it's conversion

Waste from house holds
Straw
Wood chip
Waste from forest
Wood pellets
Manure
Agricultural waste
Energy crop



Ethanol
Bio-diesel
Bio-oil
Thermal – Steam
Bio-gas
Gasification (gas from wood)

Princip of CHP and Heatpump

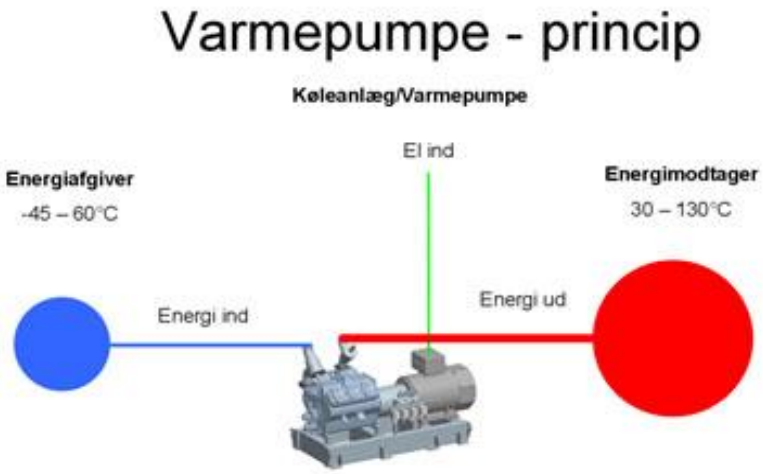


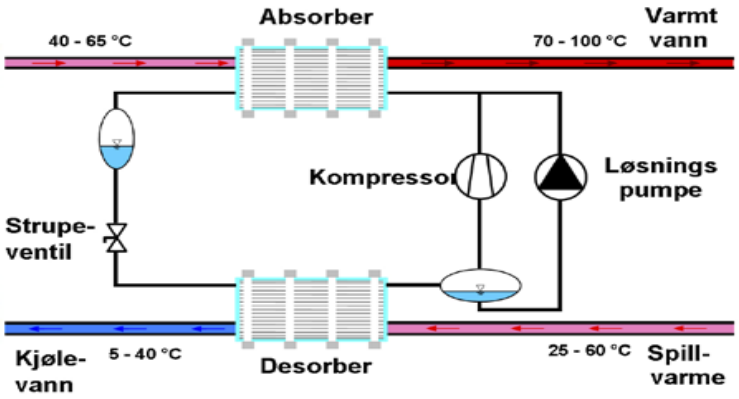
Power generation with gas-engine – CHP.
Heatpump for producing hot water.

Power generation
gas-engine – CHP.

Princip heatpump

ENERGY Masterplan





Heat pumps are usually operated by an electric motor, and the energy is converted to an equivalent amount of energy + engine power at a higher temperature.
Amount of energy can typically be 4 times the electric motor energy consumption. (COP 4)

COP = Coefficient of Performance

Forberedelse til varmepumpe.

1) Energioptimering.
2) Procesoptimering.
3) Kortlægning af køleopgave.
4) Afsætning af varme.
5) Vurdering af samtidighed og evt. akkumulering.
6) Døgn-pinch for køle - og varme behov.

Herefter kan varmepumpe anlæg dimensioneres.

Estimated Fuel GCO DK 2020