Study Tour to Denmark and Sweden, May 2013
In the framework of
"Engaging Citizens in Sustainable Energy to improve environment and local Economy"
ECSE Project in 2012-14.

Strategic Energy Planning, Climate Planning in Solrod Municipality

By
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More about the Project:

http://www.inforse.org/europe/ECSE.htm

http://inforse.org/europe/ECSE_RU.htm

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Climate Actions at Local Level - Solrød Municipality

Meeting with Delegation from Belarus • ECSE Project • The 21th of May, 2013

Climate Actions at Local Level

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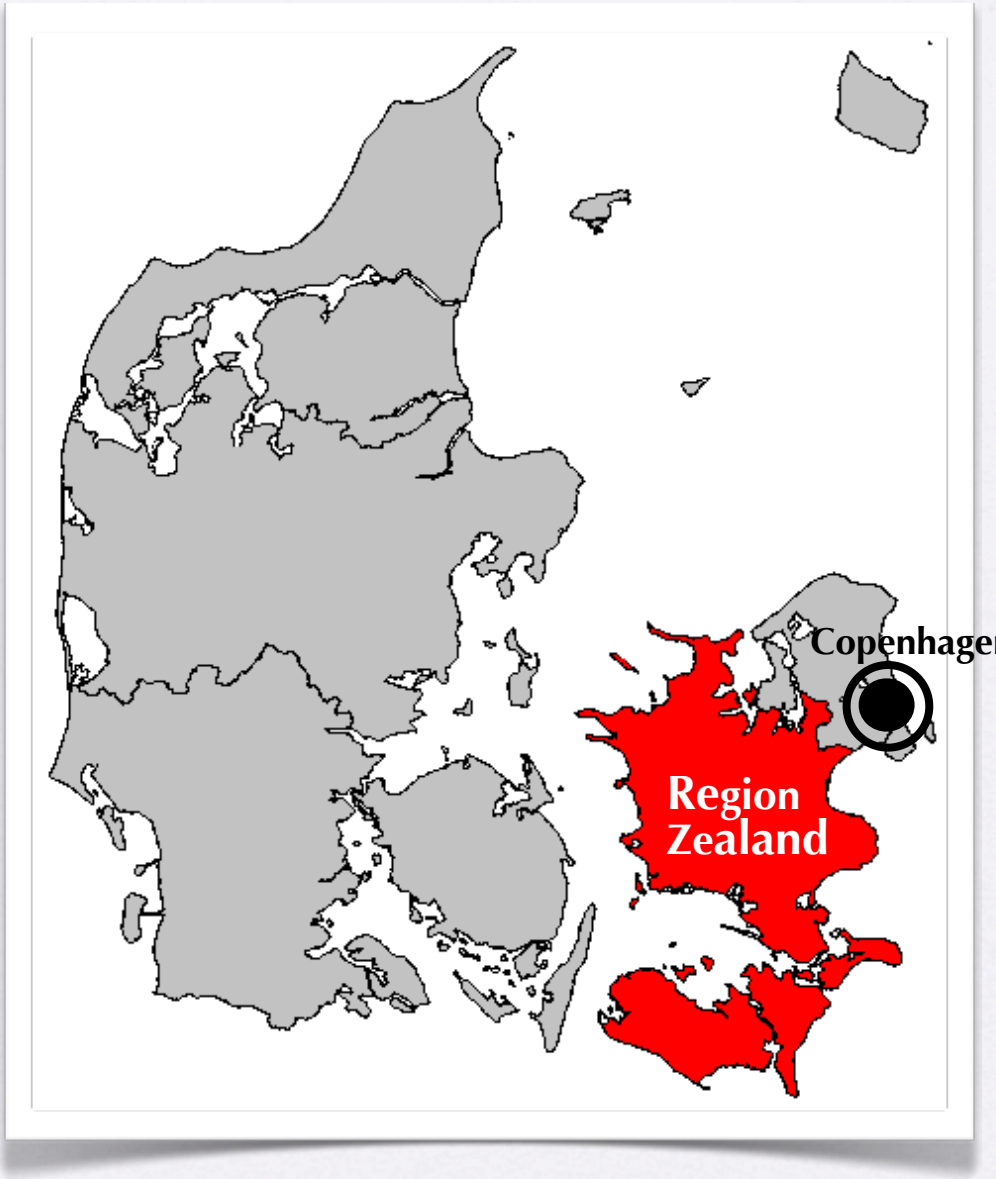
Agenda

Region Zealand

Experience of Region Zealand

Topic:

- Background
  - Greenhouse gasses
  - Policies
  - Planning activities
- Solrød Municipality
  - Planning activities
  - principles
  - example biogas
  - example onshore windmills
  - example solar heating
  - example small district heating on straw

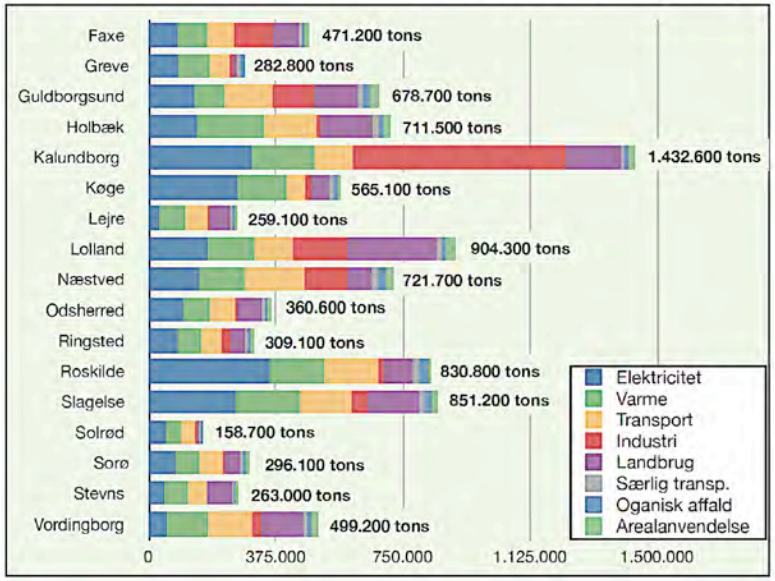


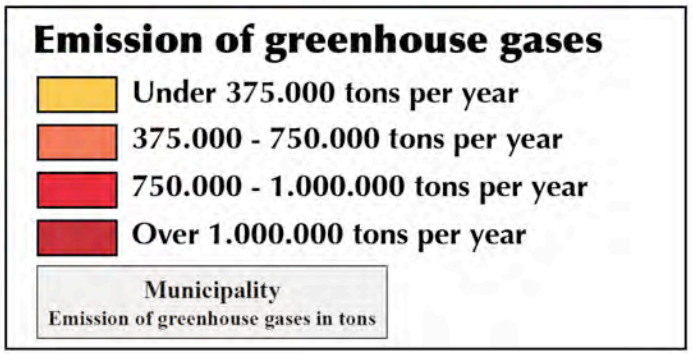
Background

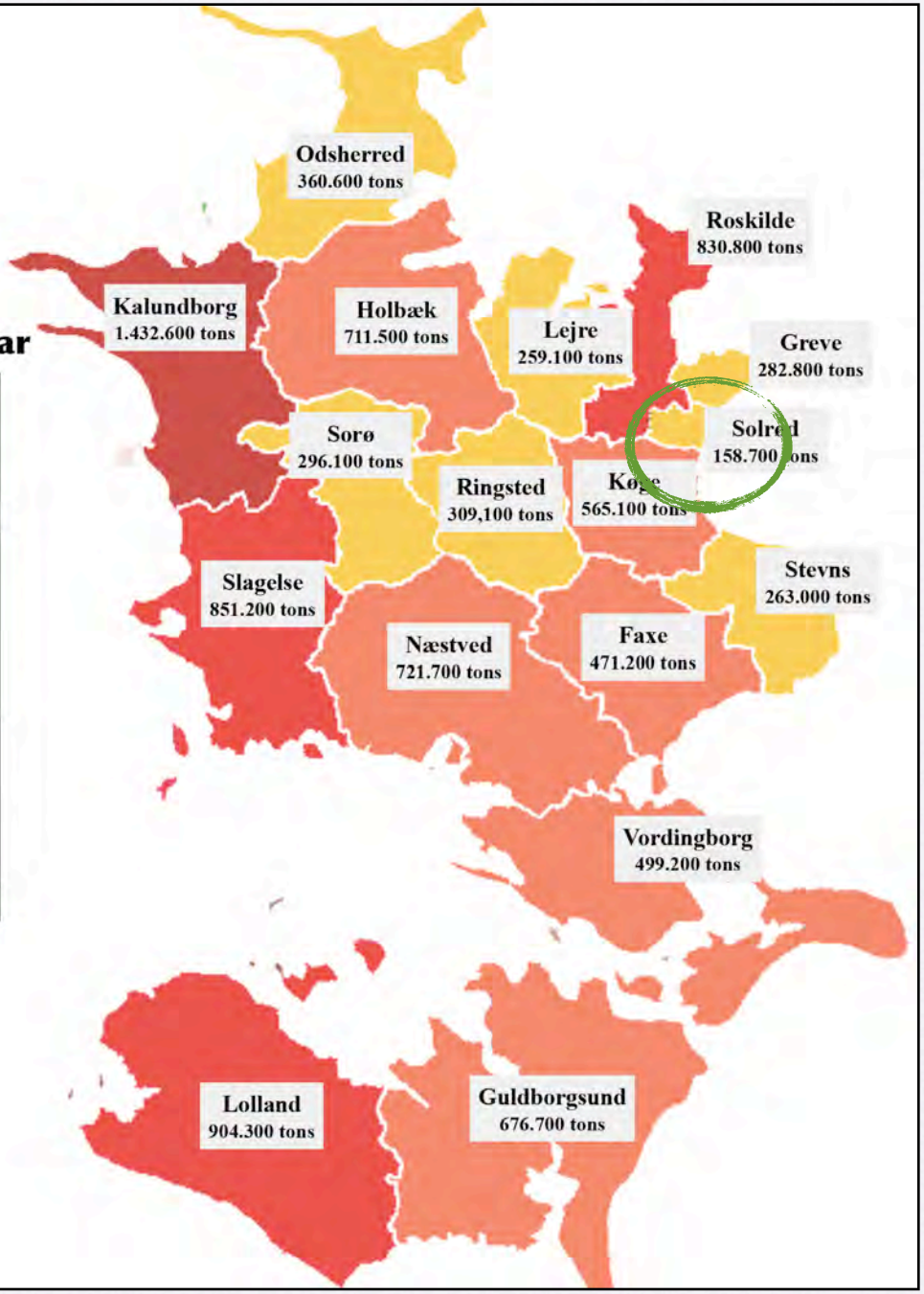
Region Zealand

Greenhouse gases in the region

Total emissions: : 9.595.400 tons per year

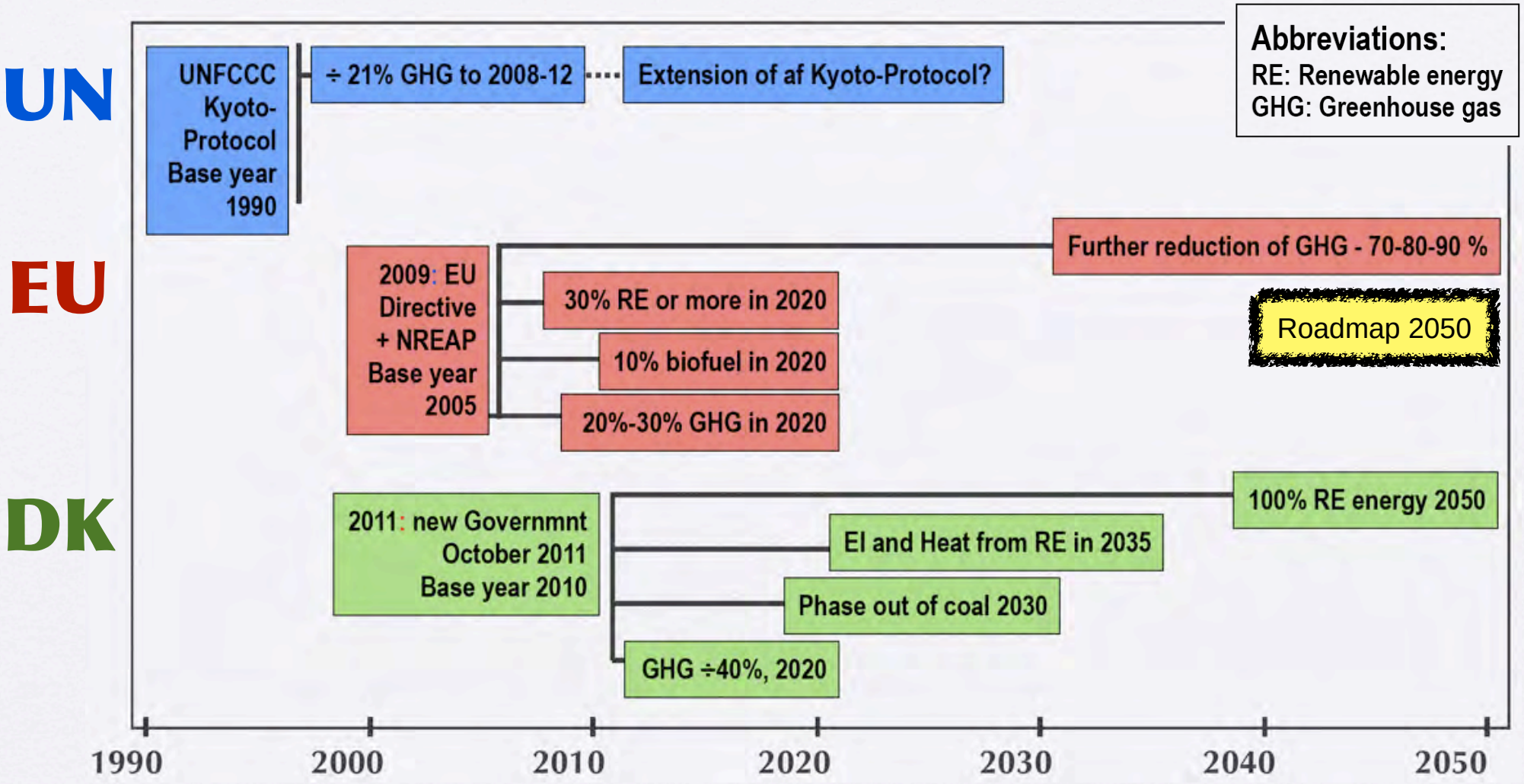






Background

Renewable energy: Supporting policies & action plans

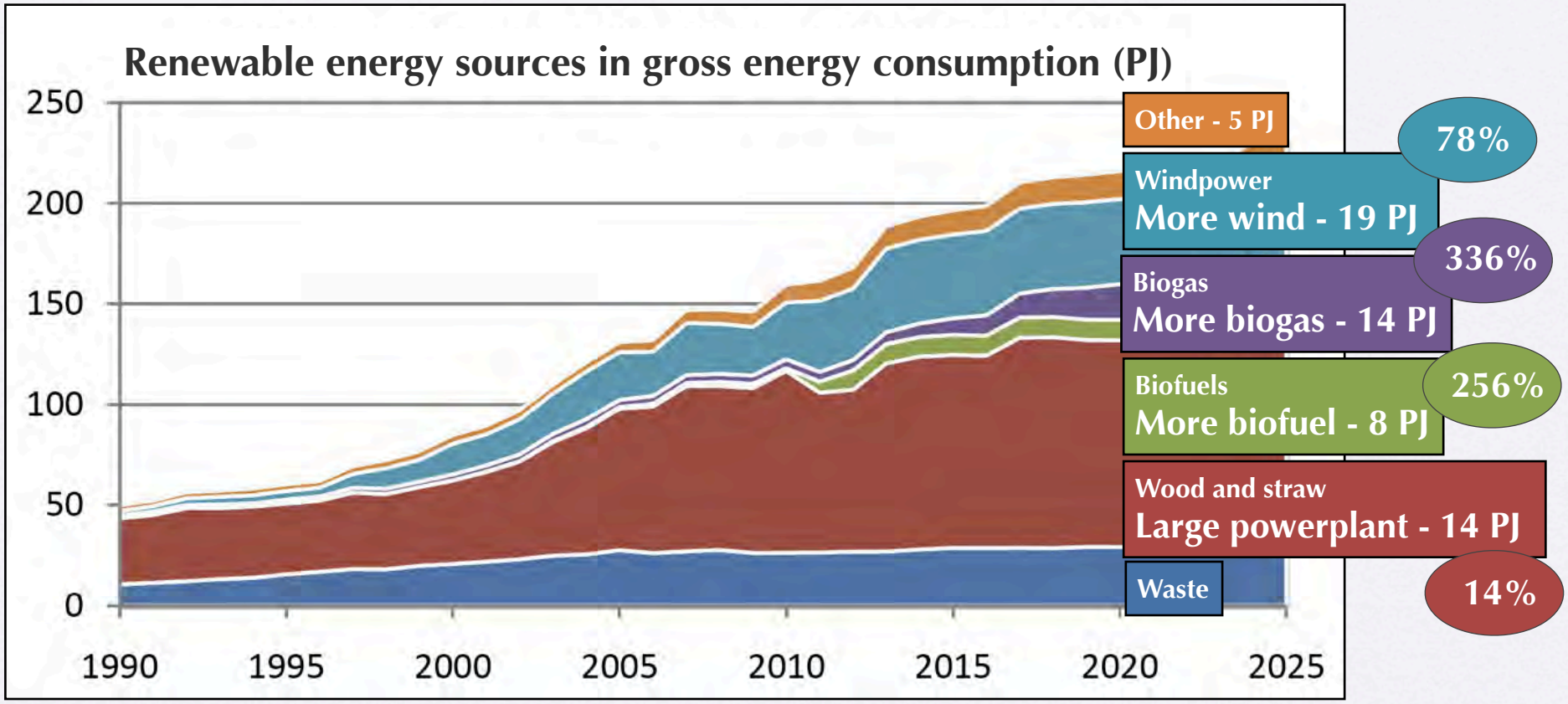


Background

Priorities and expected development

Energy Agency projections to the year 2025 (54% electricity based on RE in 2020)

Priorities up to 2020



Sources: Danmarks Energifremskrivning, april 2011, Energistyrelsen

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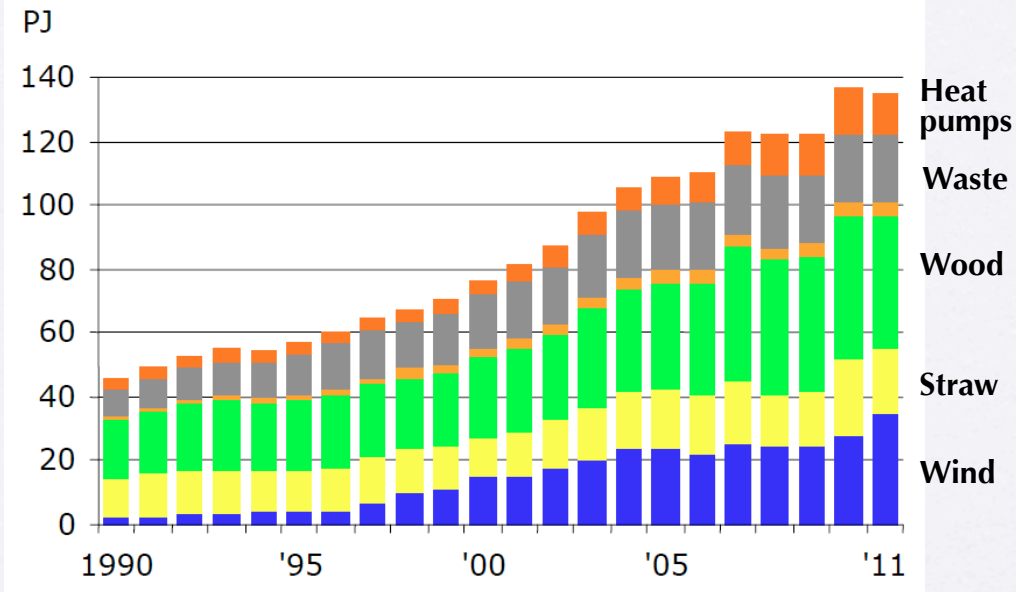
Background

Energy supply

- Change in energy sources
- Less oil, more natural gas
- More renewable energy
- Carbon reduction has been an issue since 1992
- More renewable towards 2020

Renewable energy - Denmark



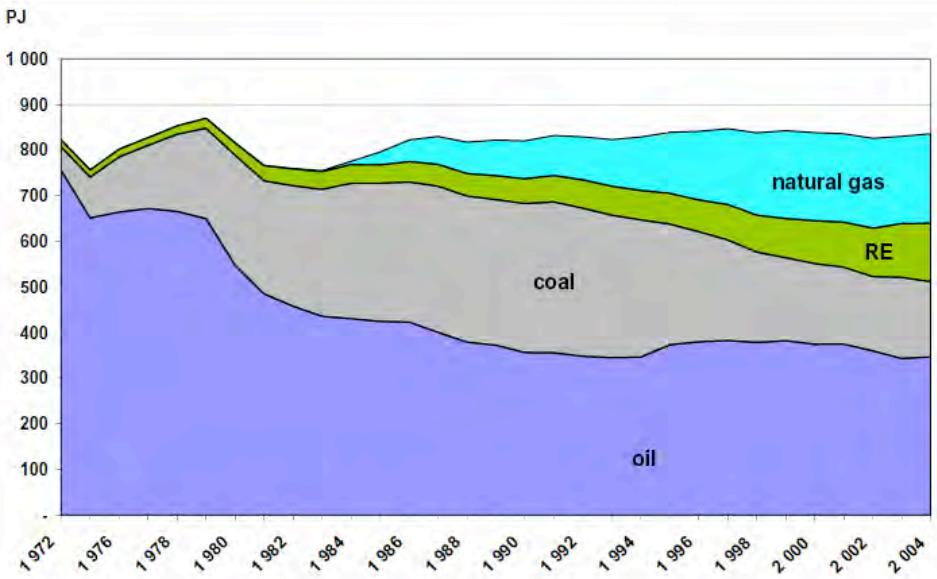
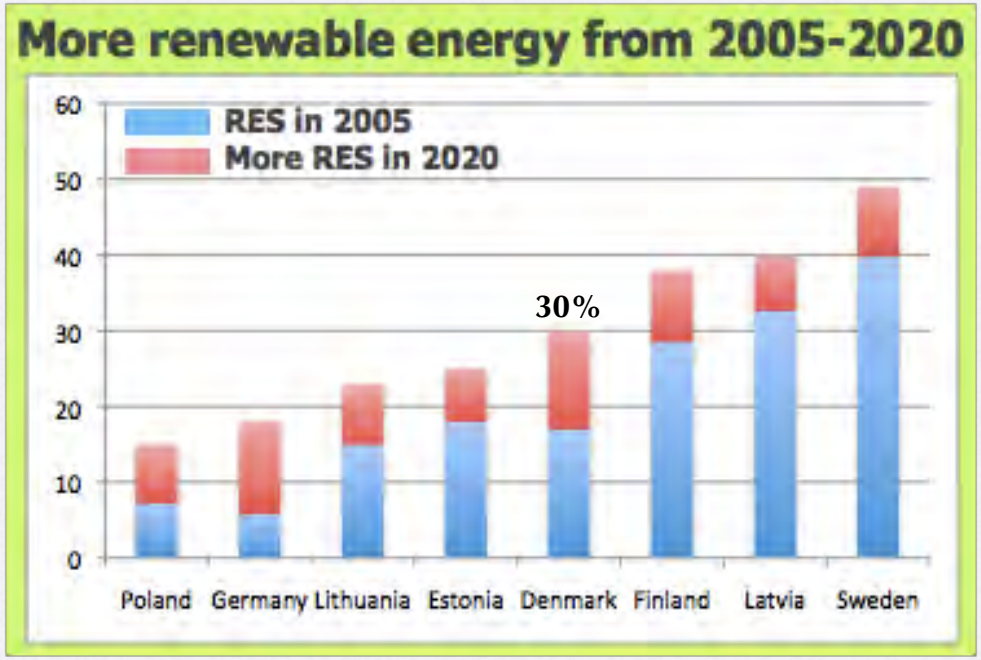


Figure 1: Trends in Danish gross energy consumption (1972-2004). Foreign air and sea carriage is not included.



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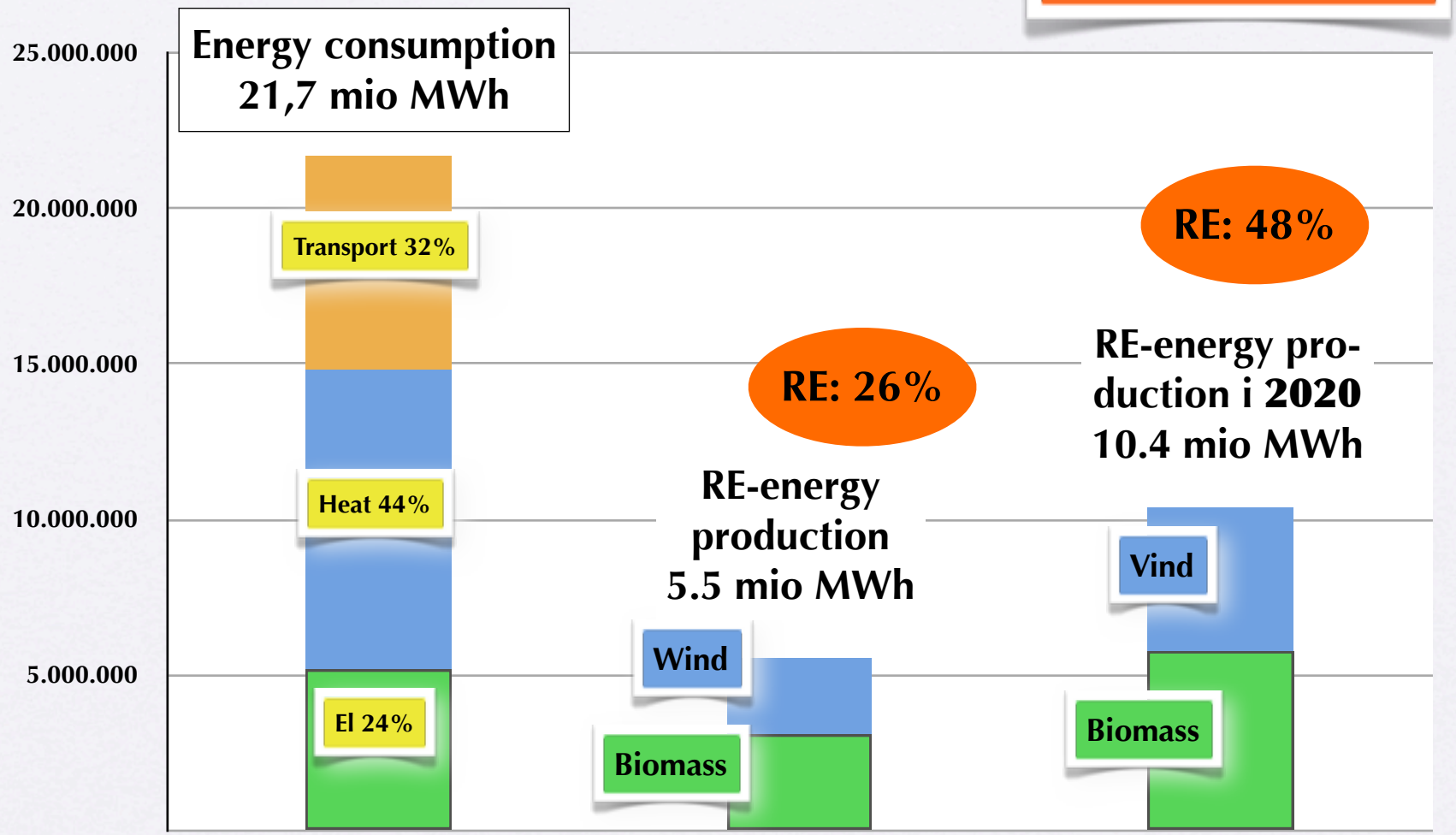
Background

Renewable energy in Zealand

Potential for expansion of biomass and wind power

MORE RES:
- wood 0.6 mio MWh
- straw: 1.1 mio MWh
- biogas: 1.0 mio MWh
- Wind: 2.2 mio MWh



Local action plan

Local Energy Action Plans

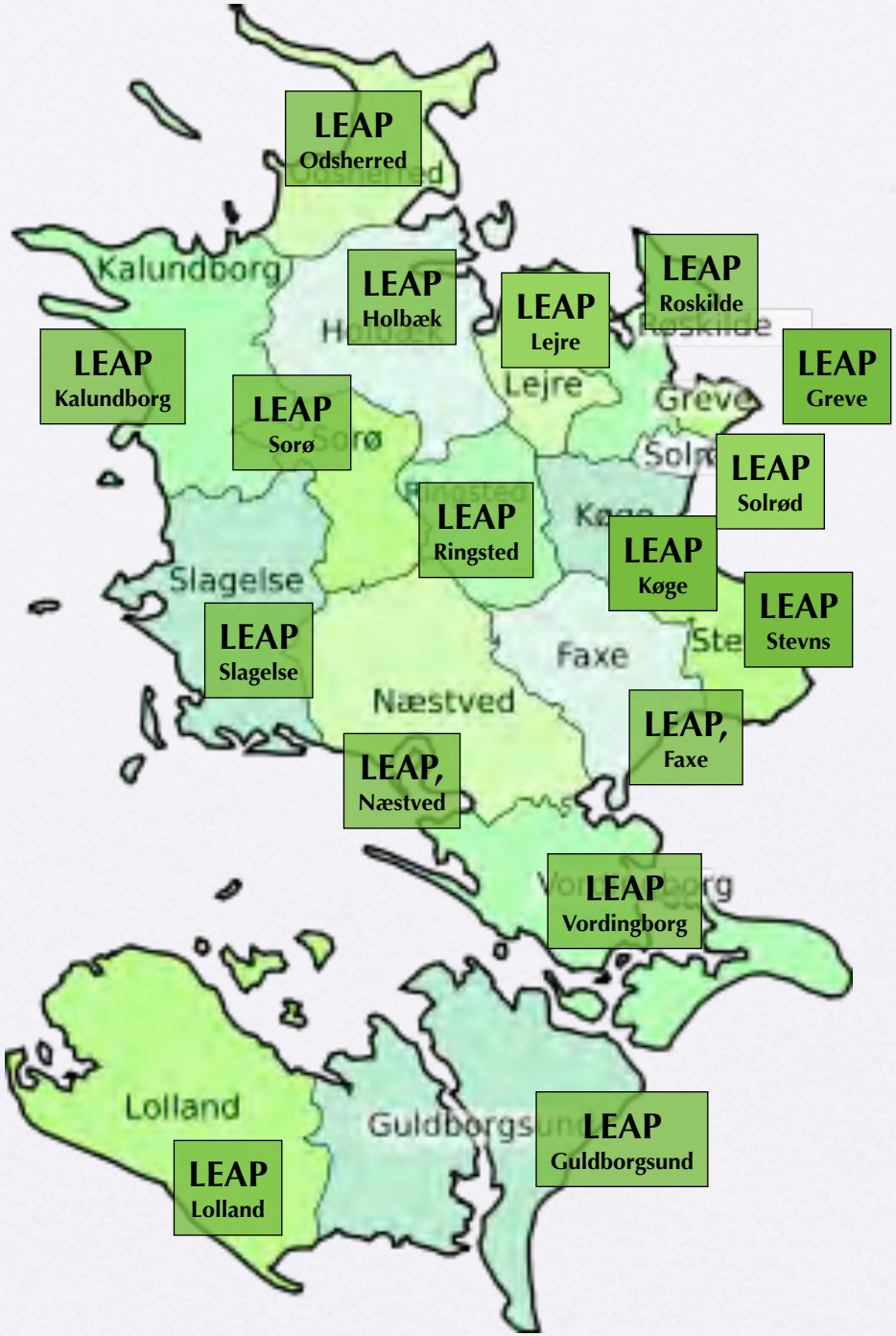
What are we doing?

- Local Climate plans
- Local energy action plans (LEAP)
- Sustainable energy action plans (SEAP)

-Energy-system-approach

Energy sources	Energy technologies	Enduse of energy
Change to RES-energy sources	Improved efficiency	Energy saving in the end use

Optimizing the three sub-systems of the energy systems



Local action plan

SEAP

Covenant of Mayors
Committed to local sustainable energy

COVENANT CAPACITY

The Covenant of Mayors is the mainstream European movement involving local and regional authorities, voluntarily committing to increasing energy efficiency and use of renewable energy sources on their territories. By their commitment, Covenant signatories aim **to meet and exceed the European Union 20% CO_2 reduction objective by 2020.**

Signatories

4,418 Cities and municipalities

Covering in all

169 mio inhabitants (35% of EU)

Local action plan

Potentials in Local Action Plan

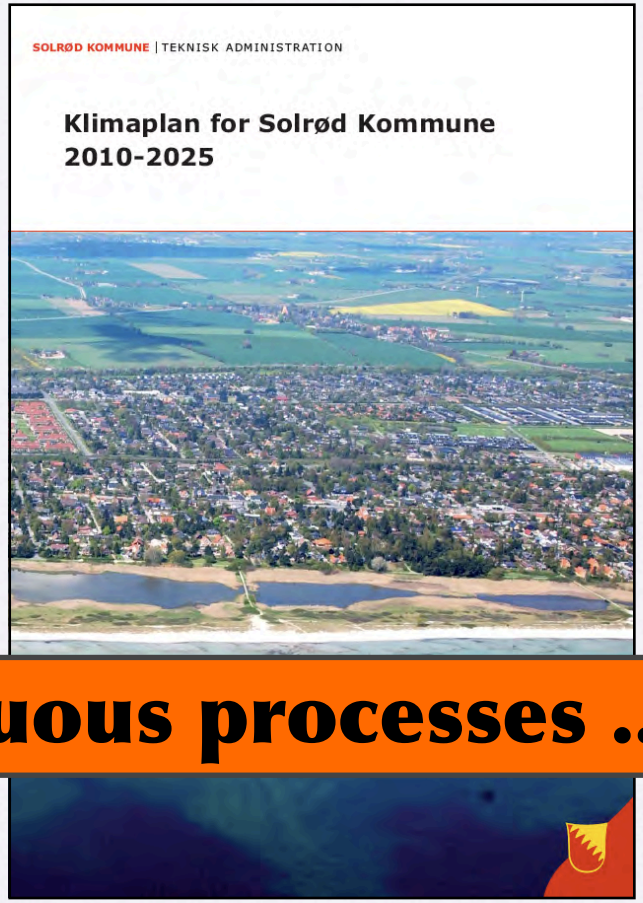
Solrød Municipality

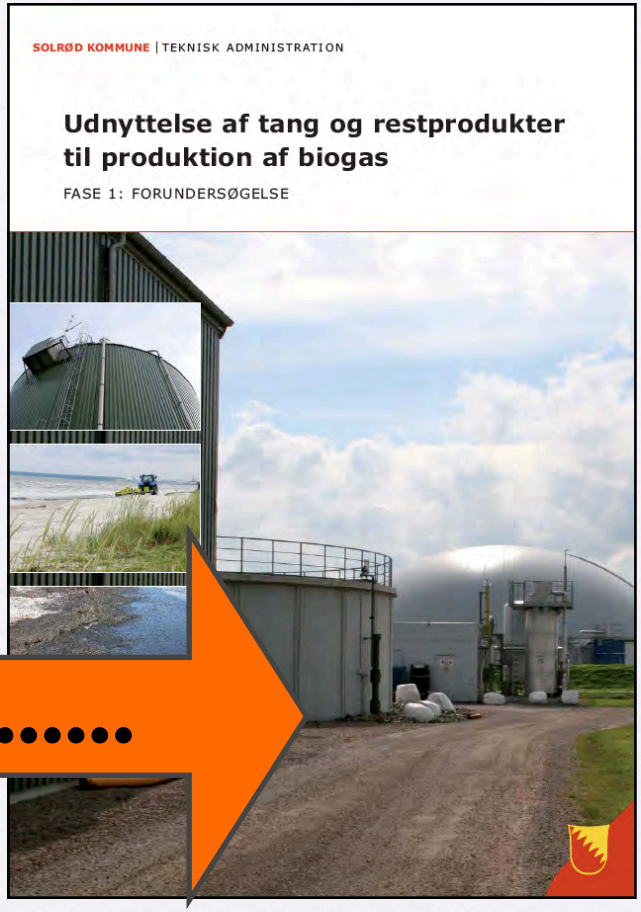
Solrød Municipality

Local action plan

Local energy leadership

From Heating plan — Climate action Plan / SEAP — To the biogas project





Continuous processes .....

Local action plan

Holistic or systemic approach:

Planning - Four important steps

Four steps:

- **Energy balance** to identify the amount and the origin of the greenhouse gasses
- **Projection** of the emission of the greenhouse gasses - to create a baseline
- **Identification of** opportunities **for** reduction of greenhouse gasses
- Establish an **climate action plan**

Local action plan

Energy balance

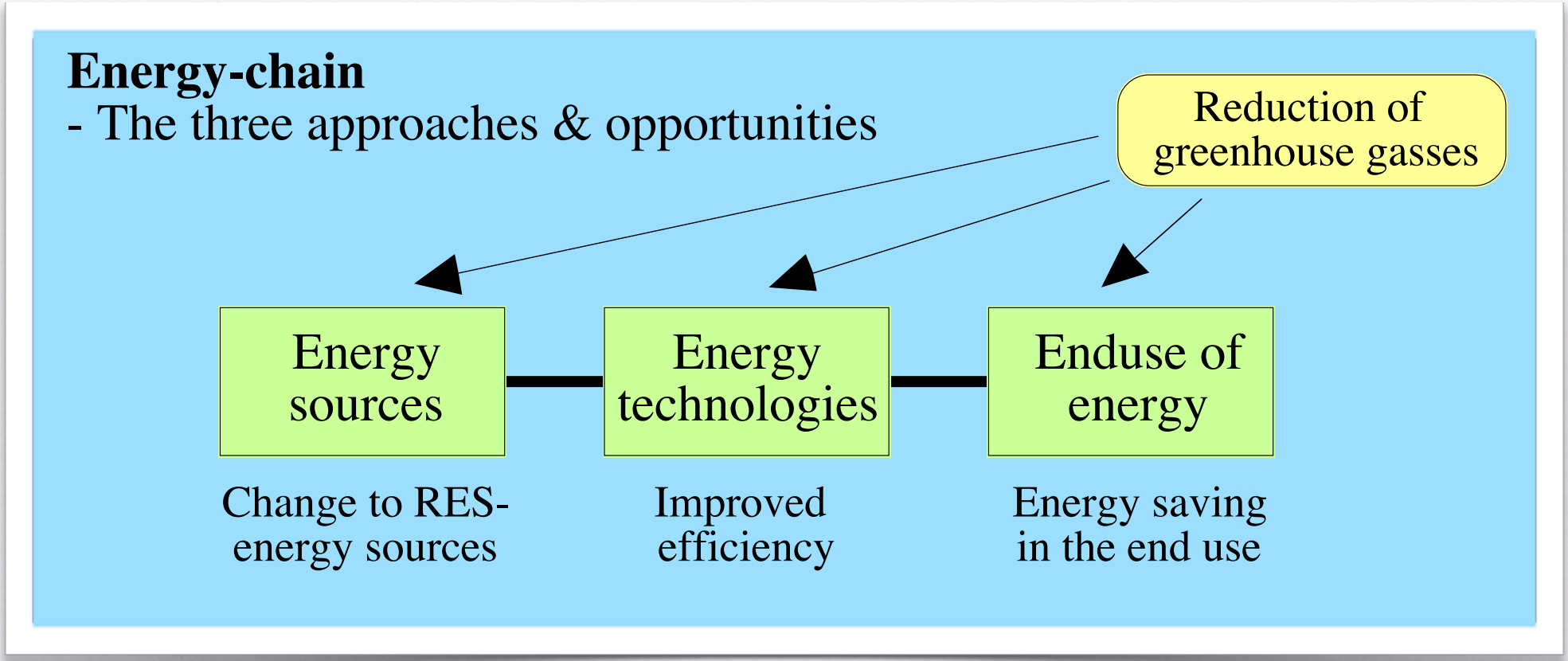
Energy balance = the whole pro-duction chain:

Three approaches:

(1) change of sources: RES

(2) more efficient and carbon efficient conversion

(3) savings in end-use



Solrød Climate action plan

Baseline

Energy system approach

Four areas:

(1) Individual energy consumption

Heating

Fuel-specific emission factors

(2) Collective heating

District heating - VEKS

Environmental declaration

(3) Electricity

The Zealand electricity system

Environmental declaration

(4) Transportation

Activities and modes of transport

Fuel-specific emission factors

	Drivhusgas i tons
VARME	
Samlet varmeforbrug (brutto):	-
-Fjernvarme	8.311
-Naturgas-KV	891
-Centralvarme/naturgas	15.565
-Centralvarme/oliefyr	10.940
-El-varme	5.819
-Varmepumper, m.v.	589
Samlet drivhusgas-emission - varme:	**42.116**
ELEKTRICITET	
Samlet el-forbrug:	
-Husholdninger	19.390
-Industri	5.539
-Landbrug	1.889
-Handel og service	11.392
-Offentlige anlæg, m.v.	8.787
Samlet drivhusgas-emission - elektricitet:	**46.997**
TRANSPORT	
Samlet transport angivet i 1.000 person.k	-
-Knallert, MC	233
-Personbiler	32.915
-Varebiler	4.194
-Lastbiler	931
-Offentlig transport	6.660
Samlet drivhusgas-emission - transport:	**44.934**
ANDRE SEKTORER	
-Landbrug (dannelse af lattergas, m. v.)	6.726
-Affald (methan-dannelse, m. v.)	4.889
-Optag/frigivelse af CO_2 (LULUCF)	-1.838
Ialt drivhusgas-emission	**143.823**

Solrød Climate action plan

Projection 2007-2025

Activity based projection:

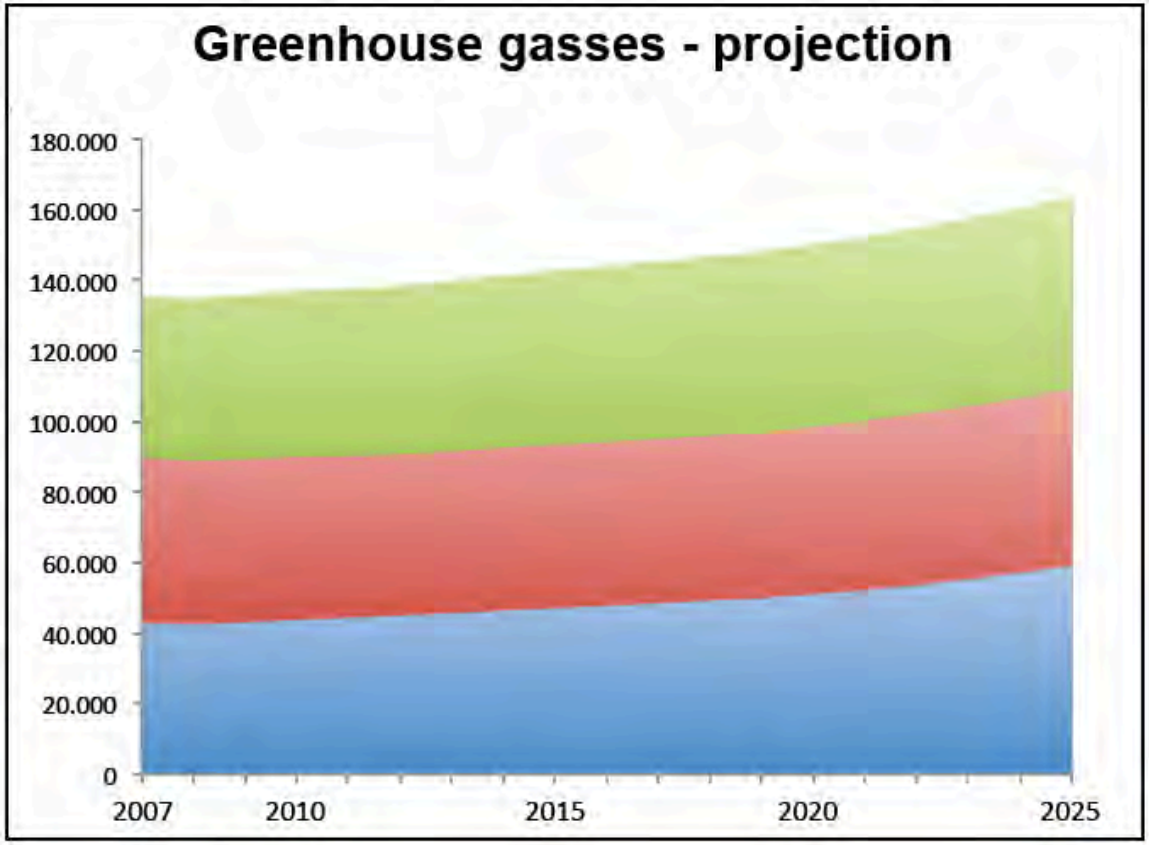
- Expected increase in heating (more houses), in electricity consumption and in transport

Growth rate from 2007-2025:

- heating: 38%
- electricity: 7%
- transport: 20%

Local based projection, modification of national projection taking local condition into account

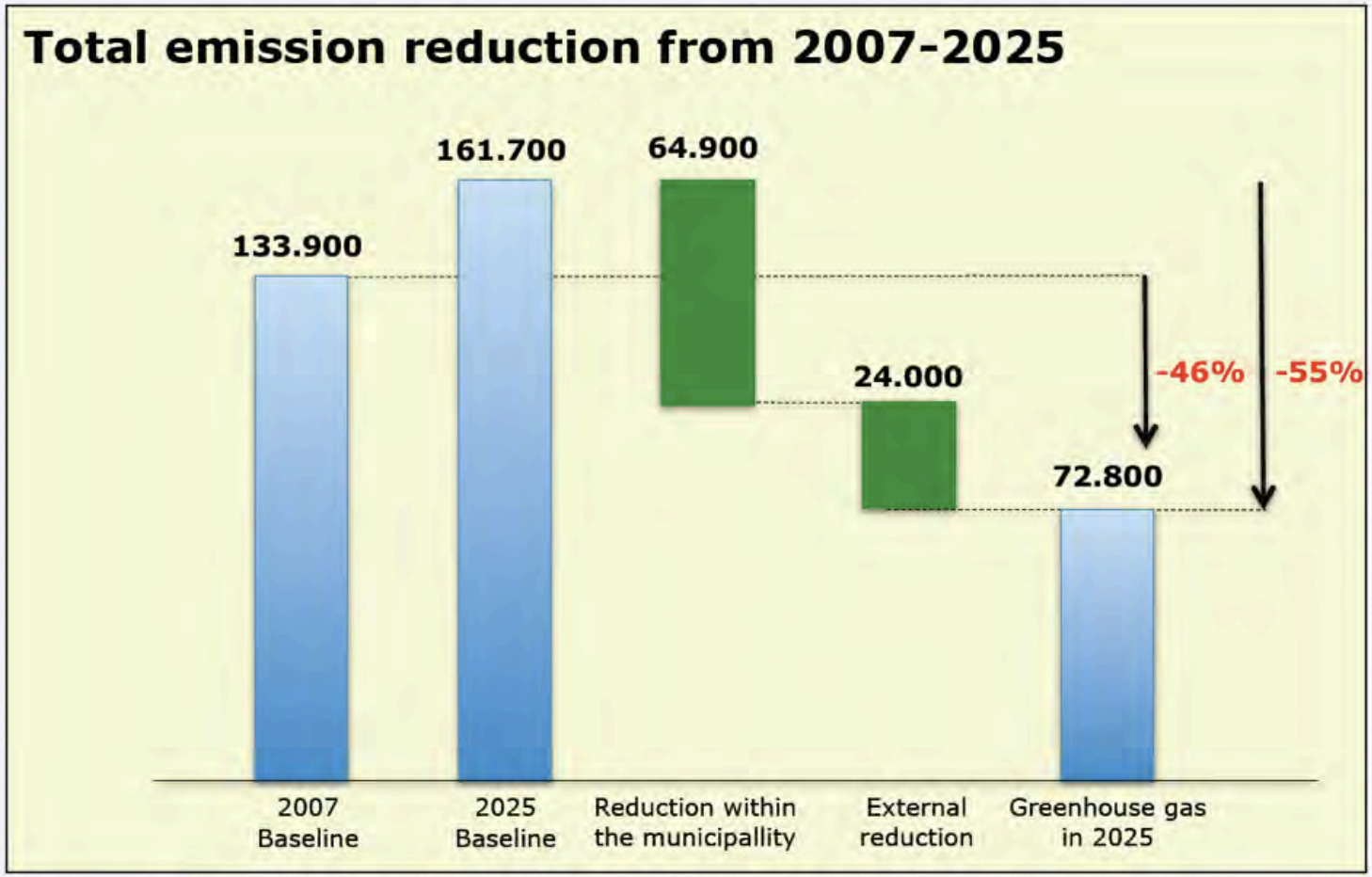
Detailed investigation of local opportunities



Solrød Climate action plan

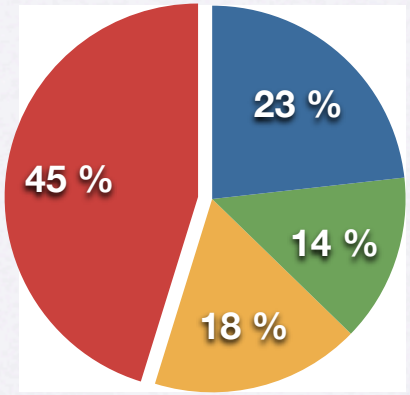
Opportunities for reduction - in general

Reduction of greenhouse gas emission



Reduction in:

- **heating - 23%**
- **electricity - 14%**
- **transport - 18%**

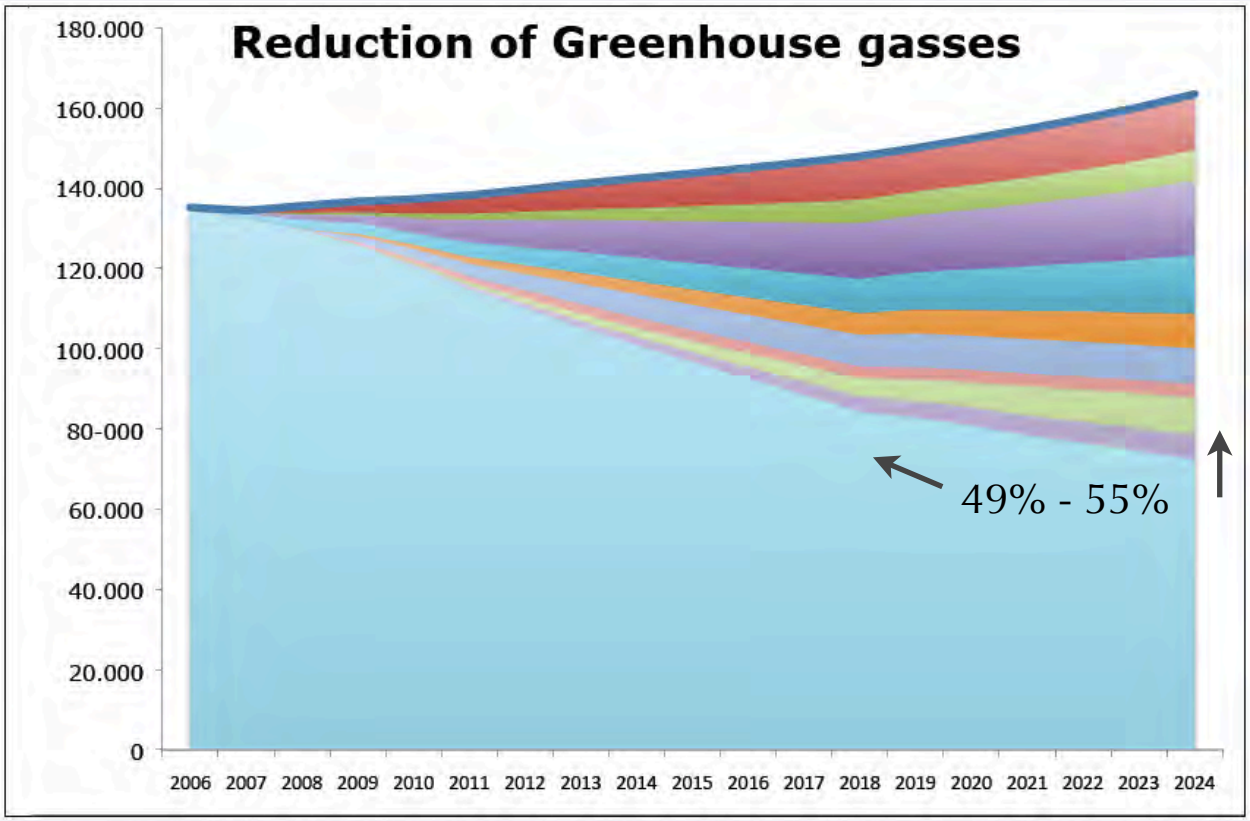


Solrød Climate action plan

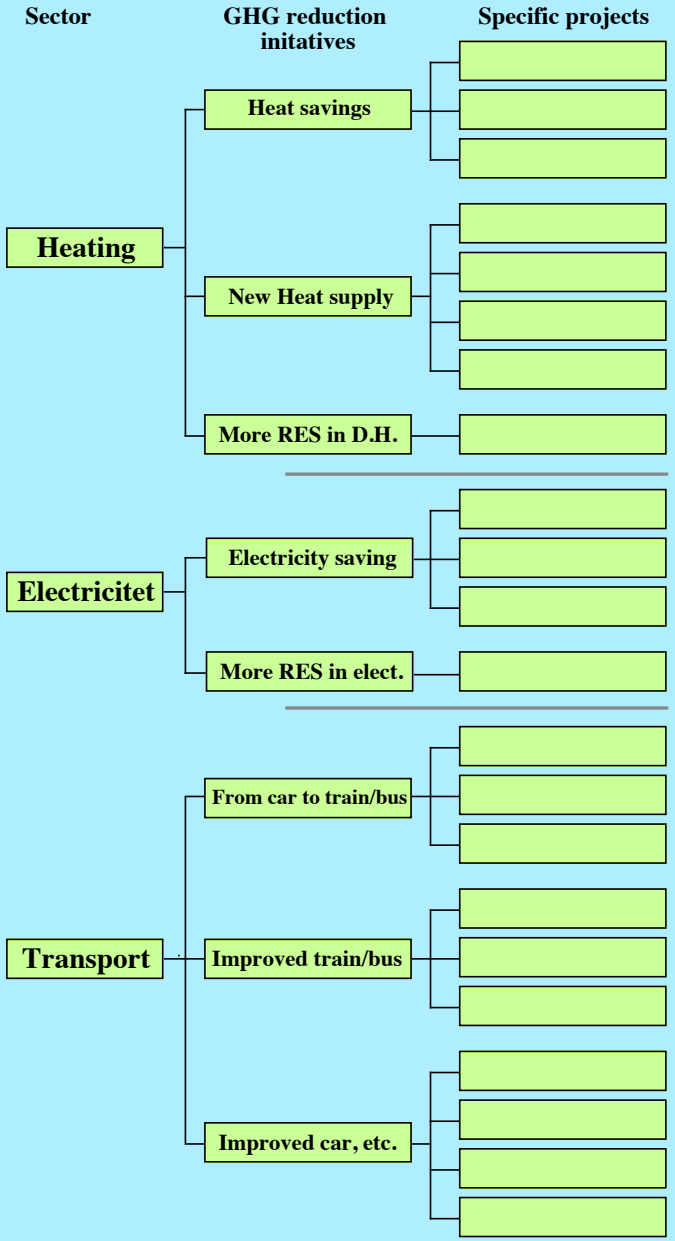
The climate action plan

Reduction in short (2014) and long term (2025)

- Heating
- Electricity
- Transport



The whole action plan



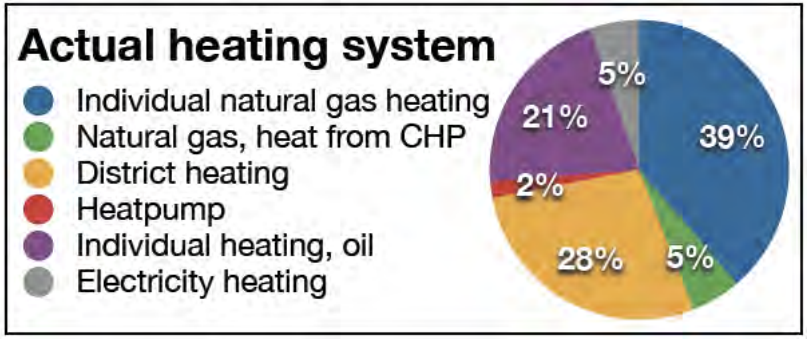
Solrød Climate action plan

Example - The heating sector

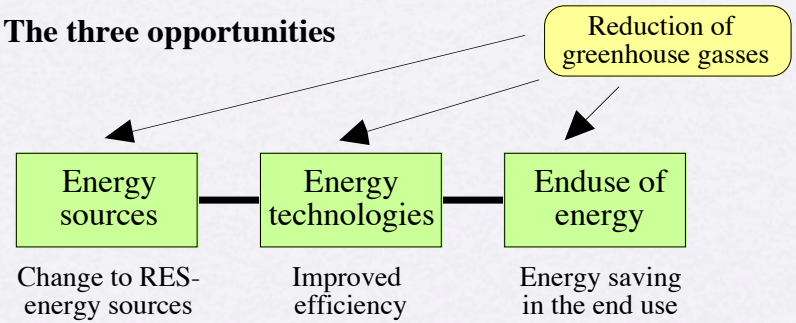
Actual situation

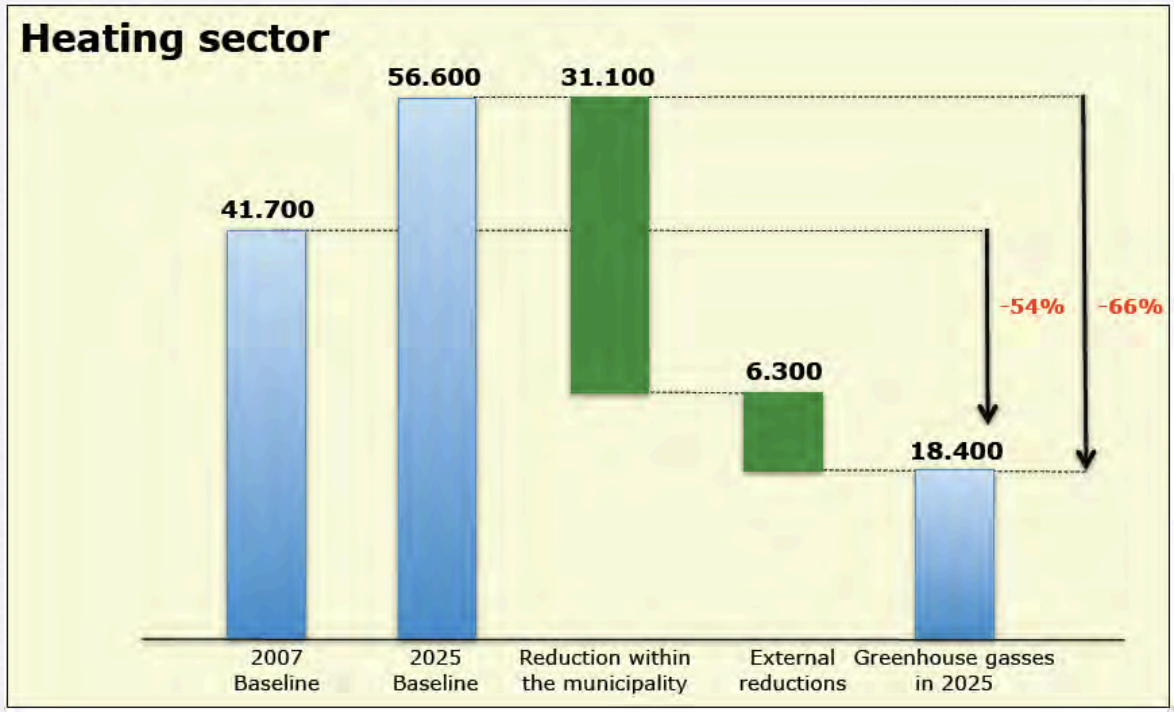
GHG reduction opportunities:

- 54%: from 41,700 tons to 18,400 tons
- 66%: from expected increase to 56,600 to 18,400 tons



The reduction is created in the whole energy chain

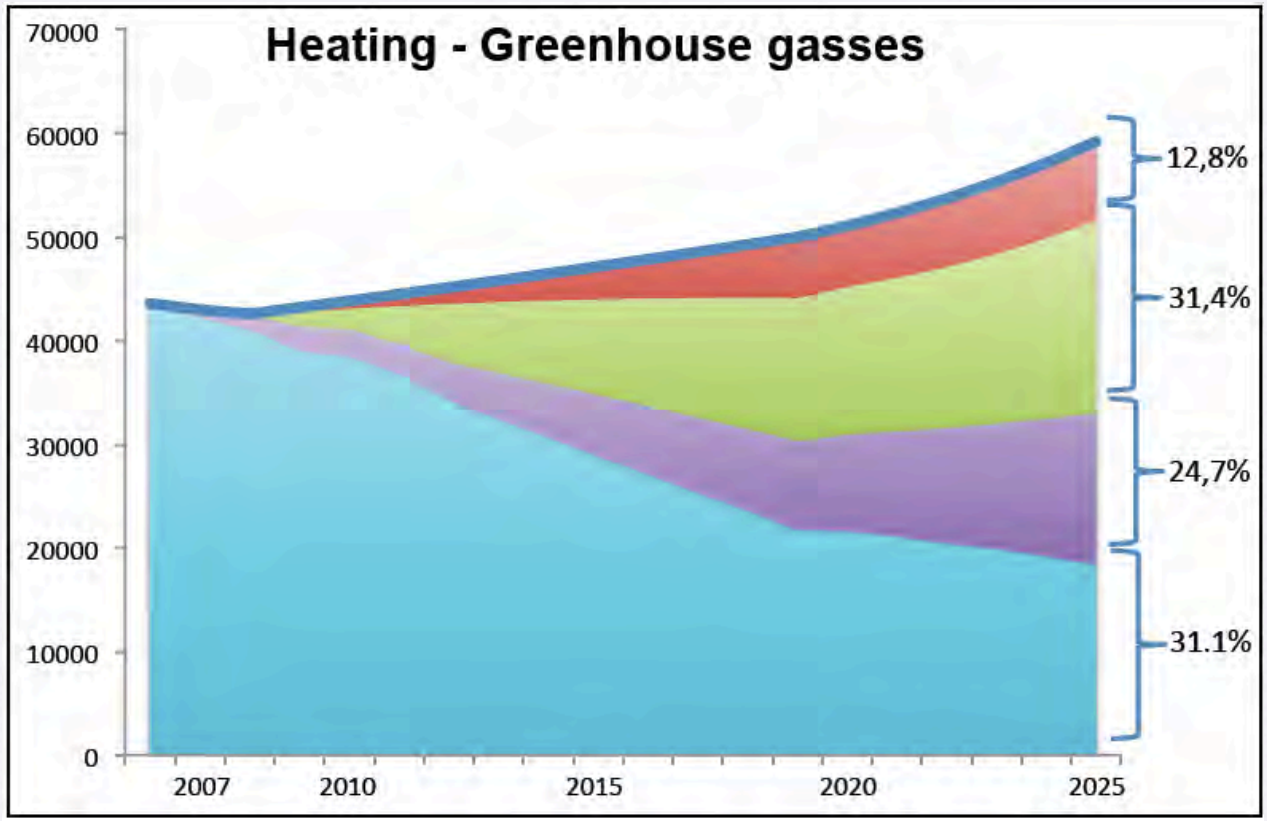


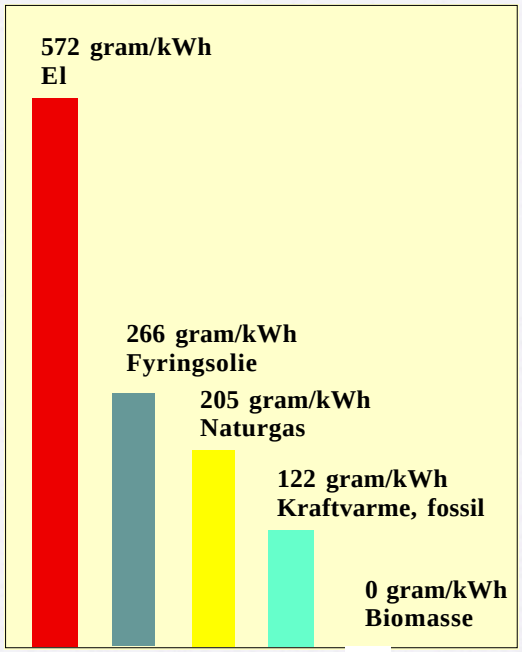


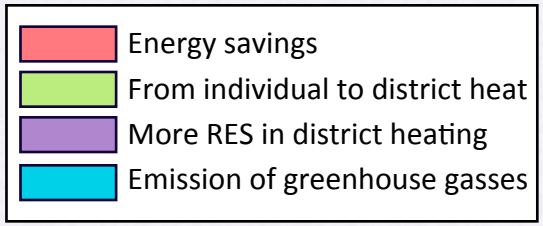
Solrød Climate action plan

Example - The heating sector

Reduction year by year - Evaluation from year to year - continuous reduction



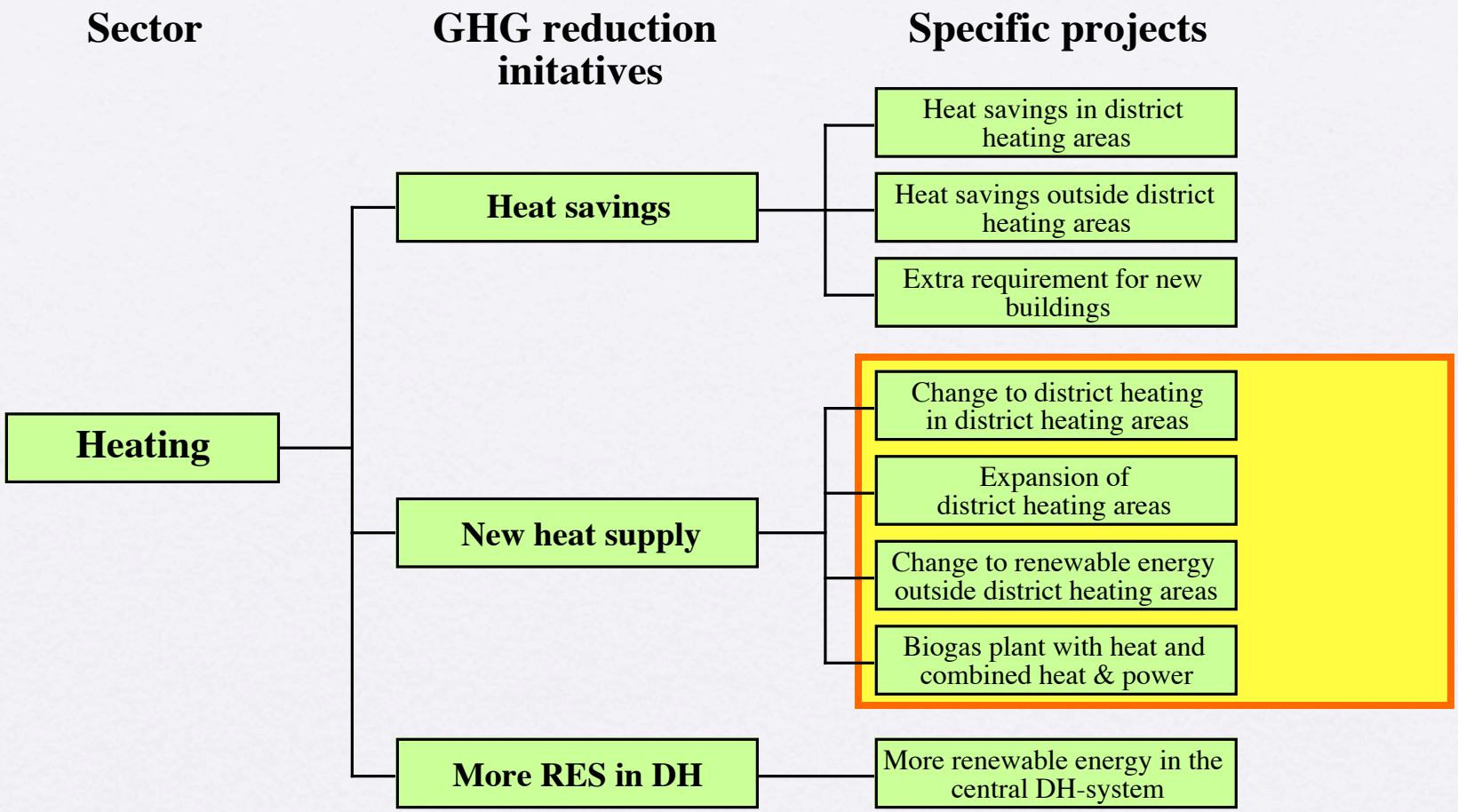




Solrød Climate action plan

The action plan - example - The heating sector

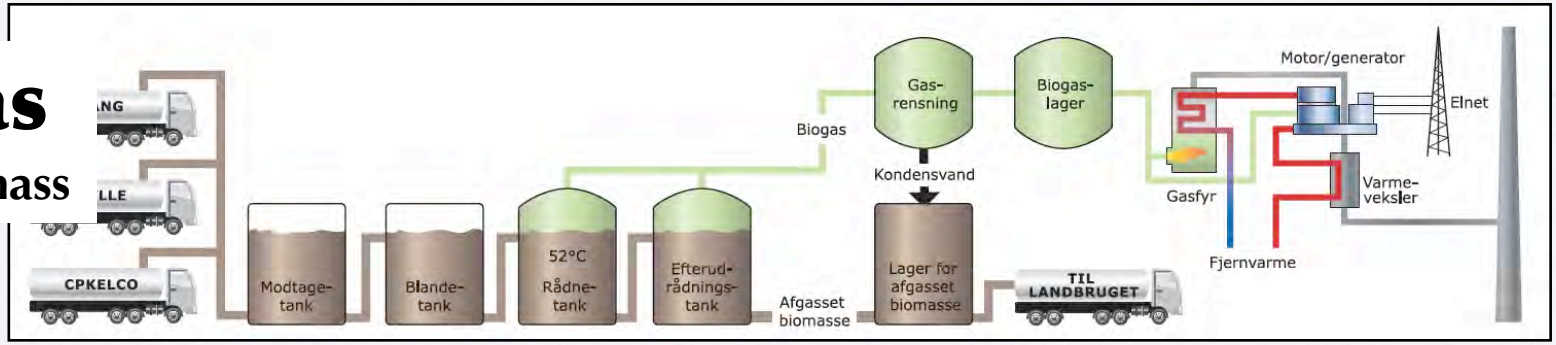
Short term reduction: from 41.700 tons to 34.000 tons
Long term reduction: from 41.700 tons to 19.200 tons

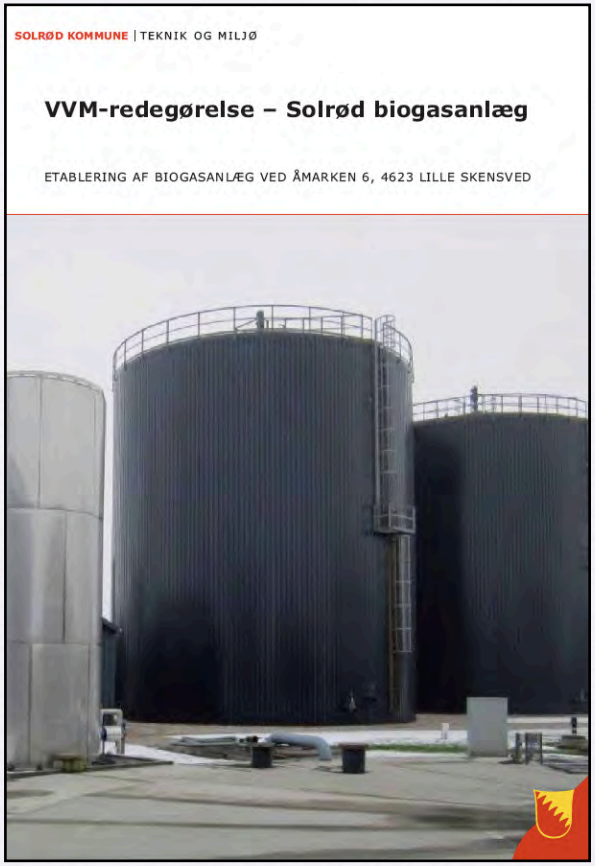


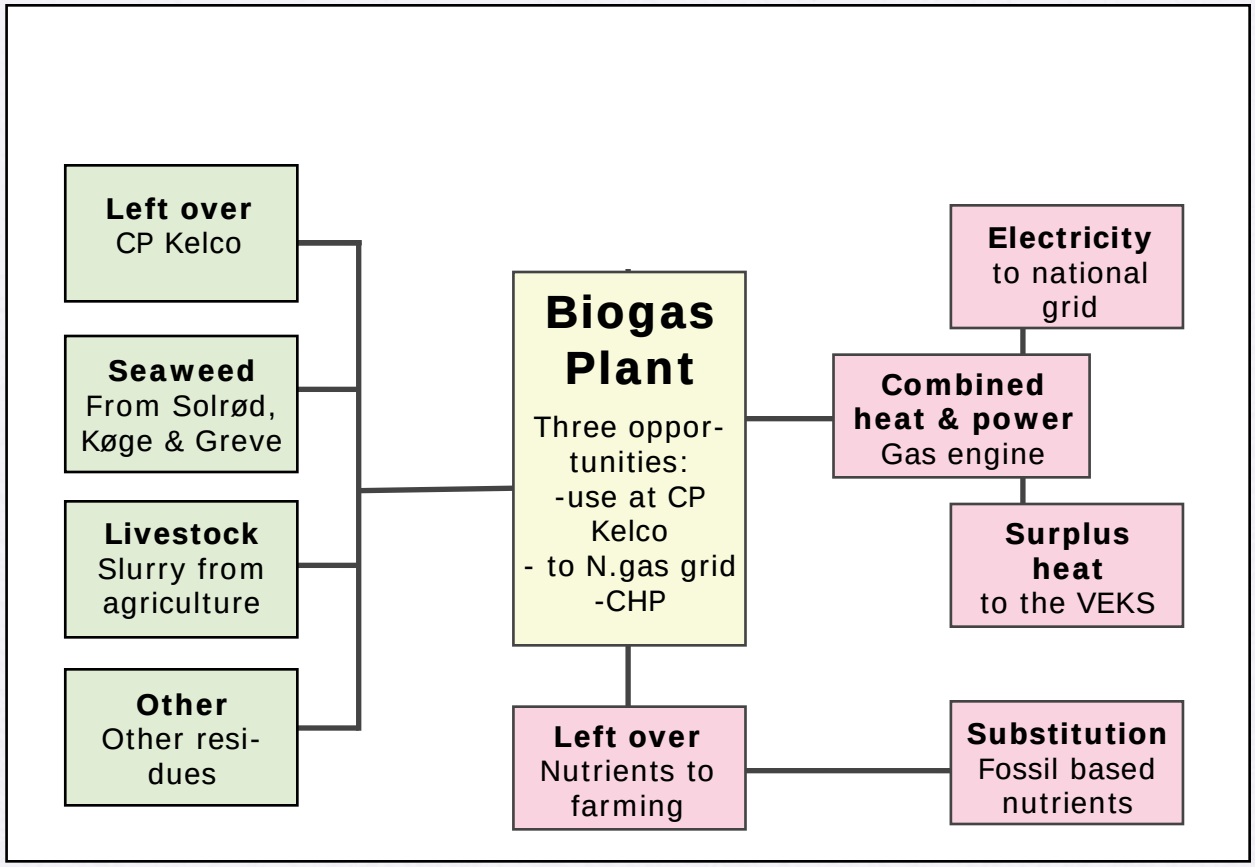
Solrød - Example 1 - biogas

The biogas

200.000 tons biomass





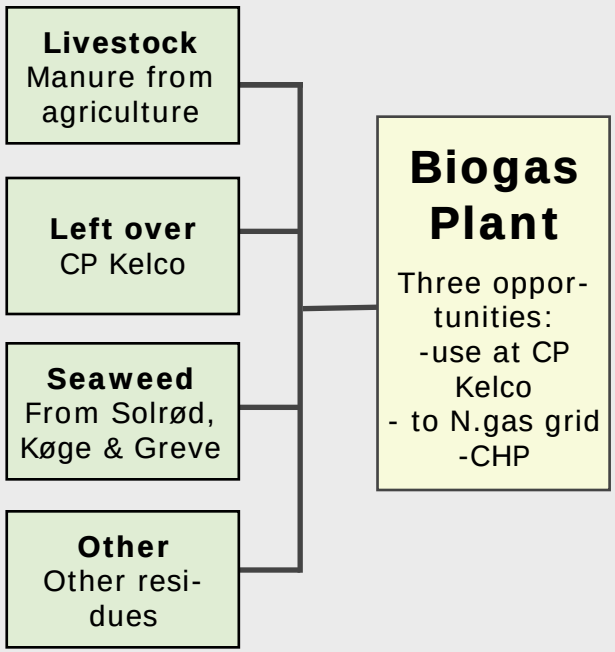


Solrød - Example 1 - biogas

The the supply chain to the plant

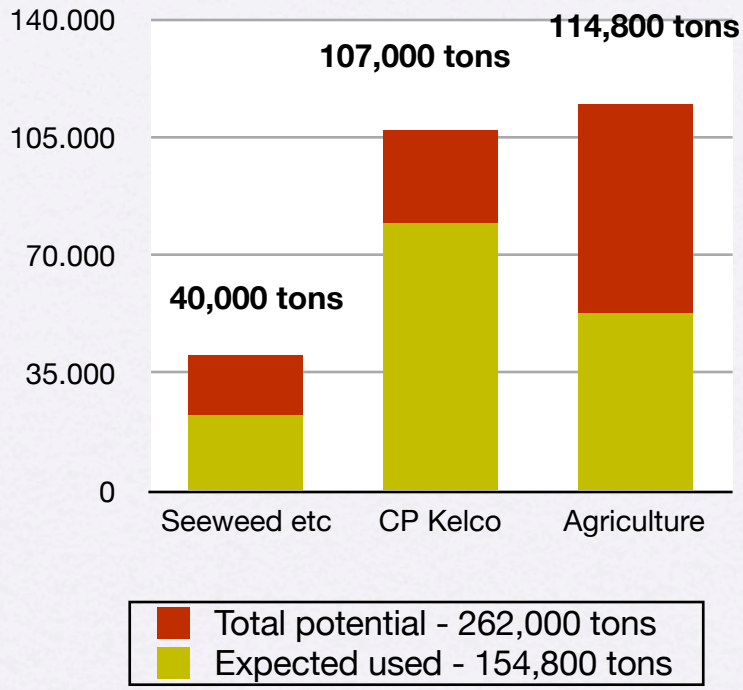
Three main sources

The supply chain



Ressource - potentials

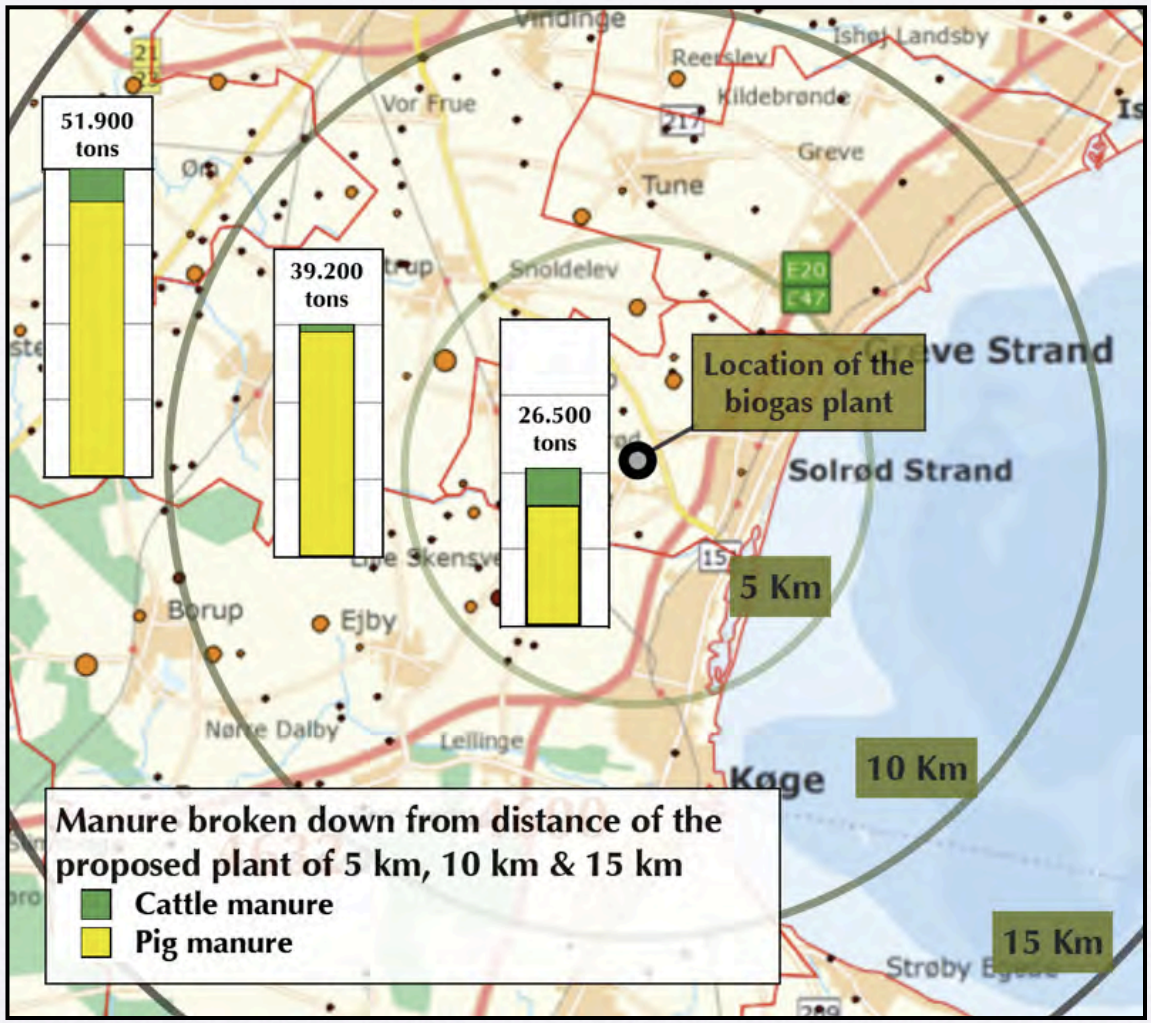
Yearly amount of biogas feedstock - expected use and total potential



Solrød - Example 1 - biogas

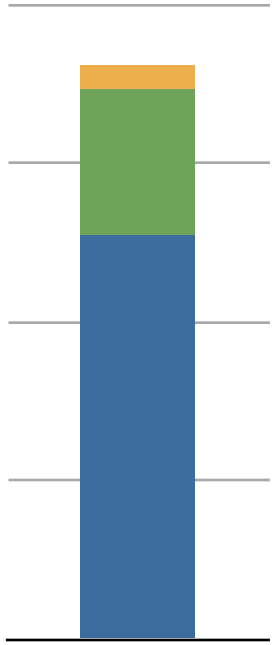
Manure from agriculture

Estimated amount



Estimated biogas production

Methane: 5.4 mio. m3
~ Biogas: 9.0 mio m3



Seaweed etc
Manure
CPKelco leftover

Solrød - Example 1 - biogas

Benefit from the biogas plant

Win-win situation

Renewable energy and .....

Local benefits form the biogas plant:

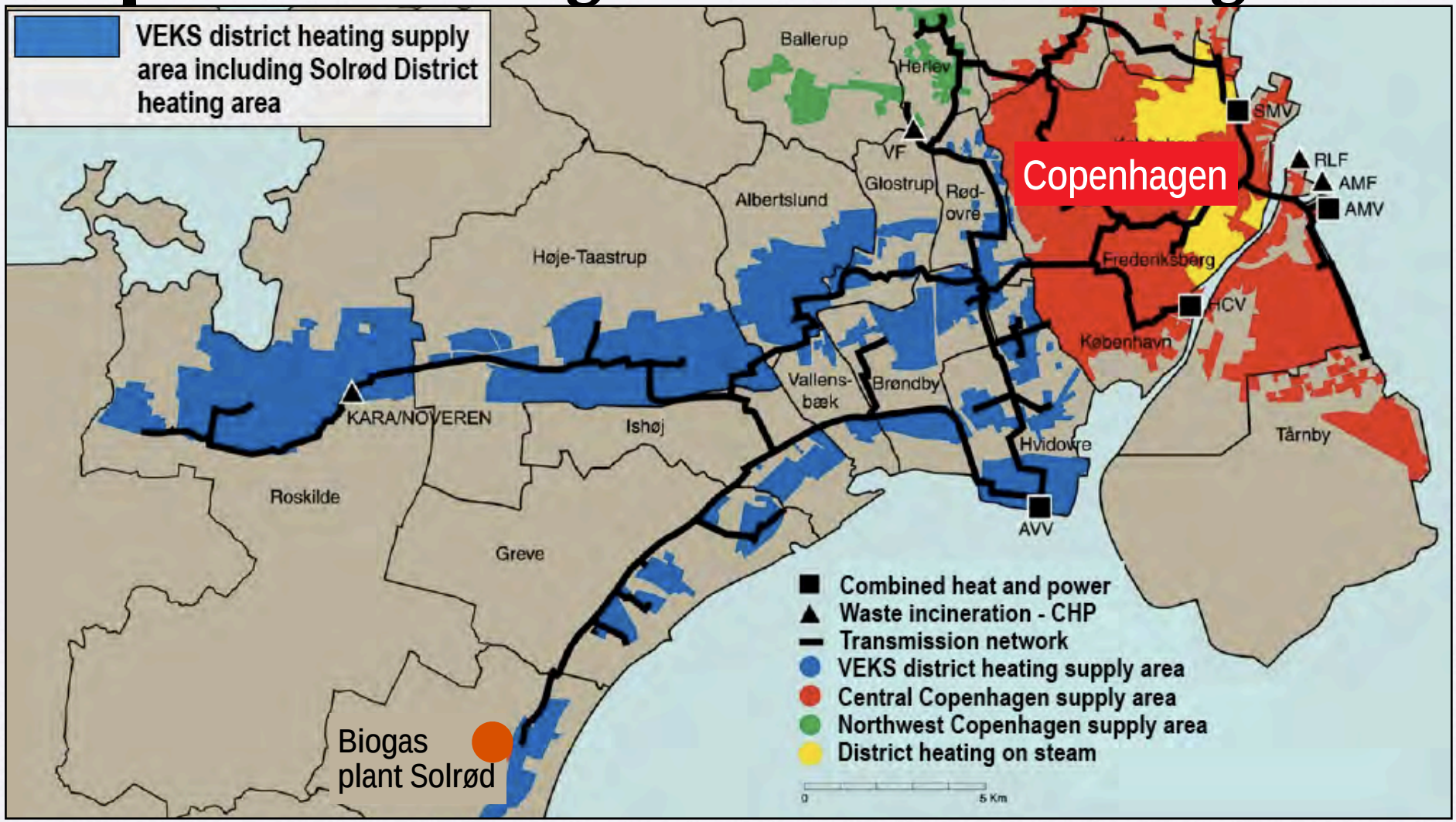
- Odors: Solve problems with odors from seaweed & algae by removing the seaweed and use it in a biogas plant
- Climate: Contribution to solve the climate problem: Using seaweed and organic waste from Kelco in a biogas plant will contribute to reduce the use of fossil fuels in the energy consumption in the area
- Nutrients: Contributing to solve problems with marine pollution. Removing the seaweed of the Køge Bay will diminish the load of nutrients, which today is a major problem of the aquatic environment
- Fertilizer: Contribute to useful nutrients. From the biogas plant comes in addition to biogas also some residues, which can be used for fertilizer designed to replace chemical fertilizer.

Company benefits form the biogas plant:

- Both Kelco and VEKS will benefit from use of more renewable energy, because of the restrictions caused by CO_2 allowances and energy taxation
- And both companies will of course also benefit from community reputation from their contribution to mitigate the greenhouse gasses

Solrød - Example 1 - biogas

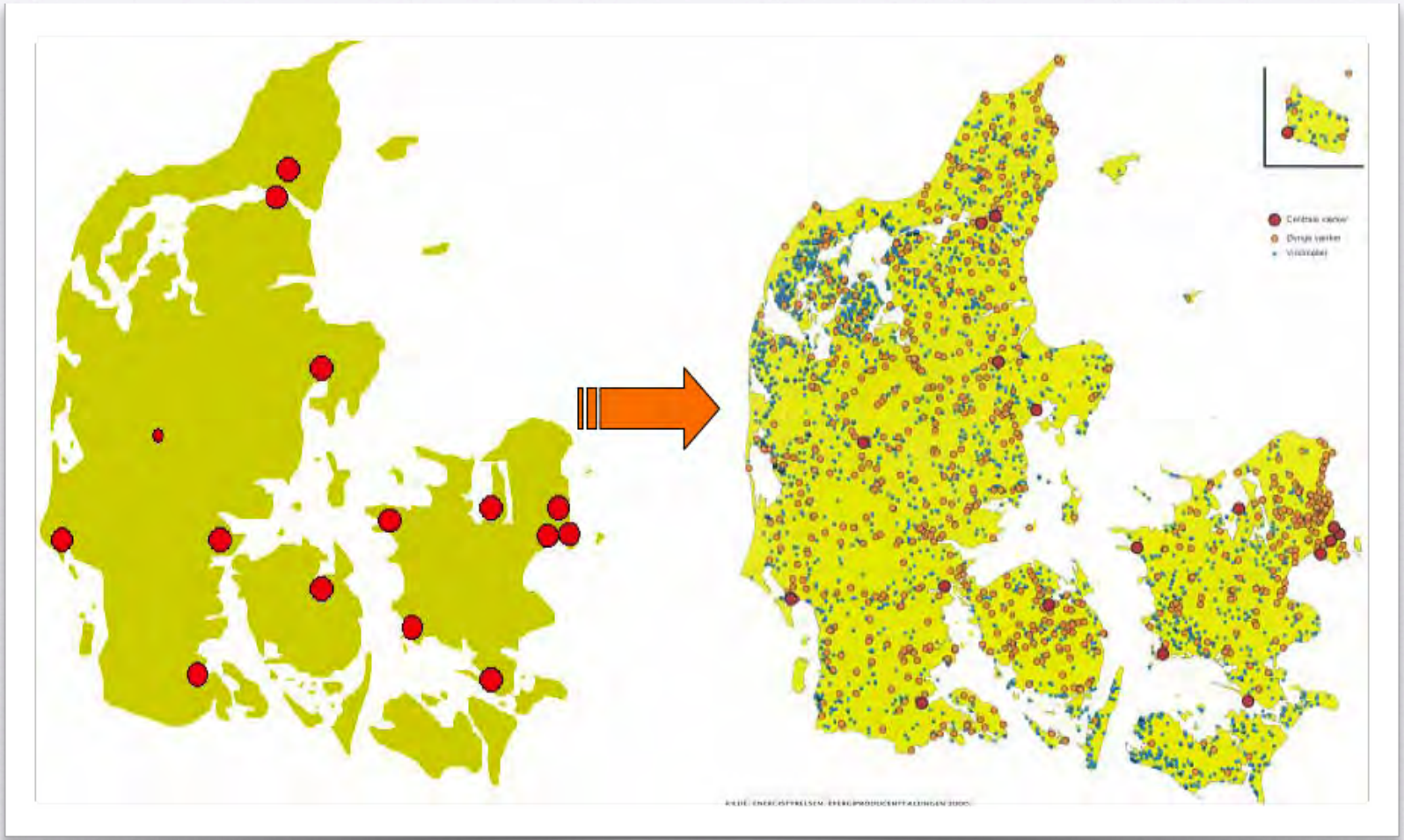
Surplus heat to regional district heating



Solrød - Example 2 - windpower

Energy supply - localized energy systems

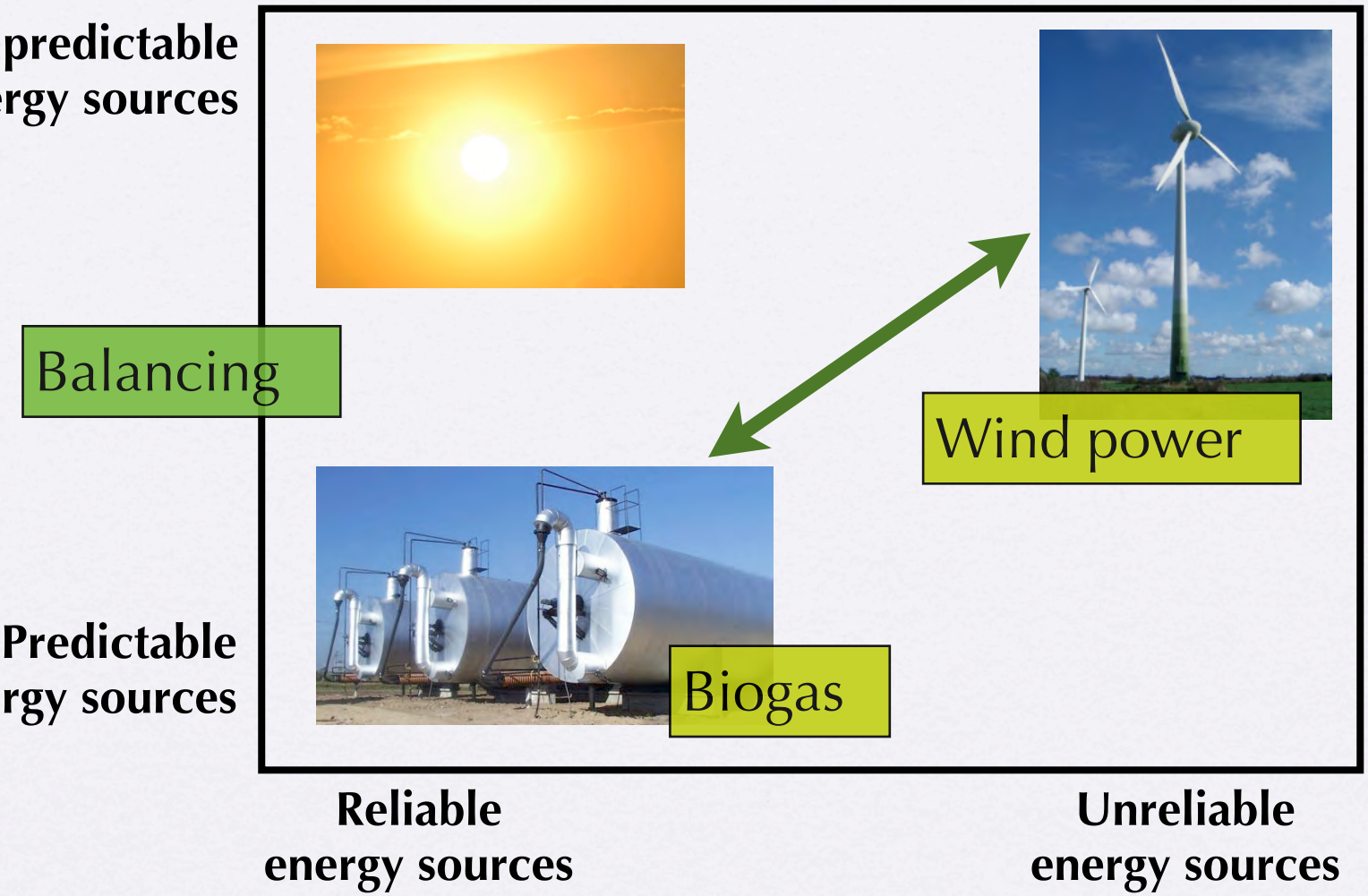
- Decentralized production structure from 1980s to today



Solrød - Example 2 - windpower

Energy system - Fluctuating sources

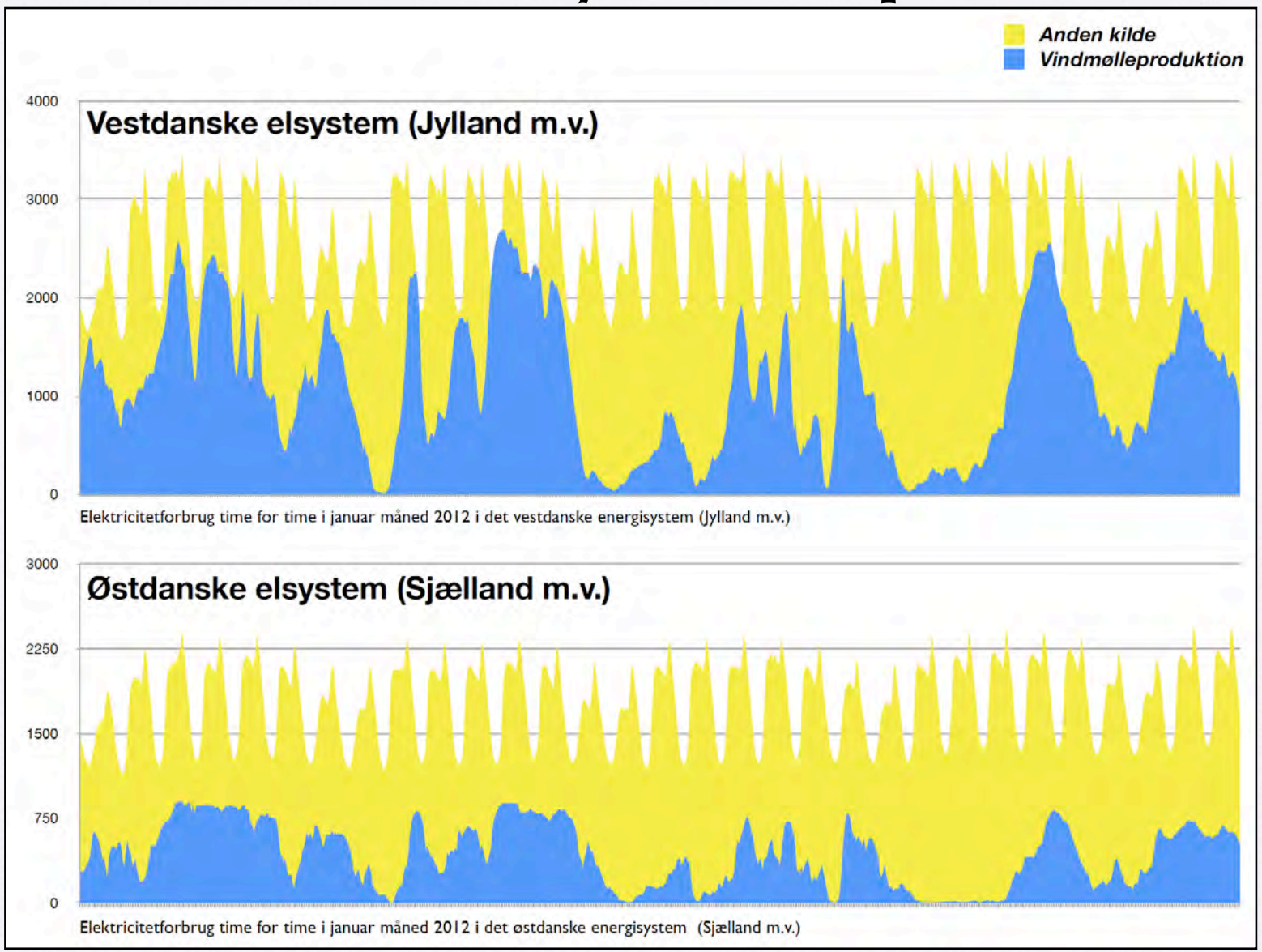
Development of an entirely new energy system in Region Zealand (Denmark)



Solrød - Example 2 - windpower

Windpower and electricity consumption

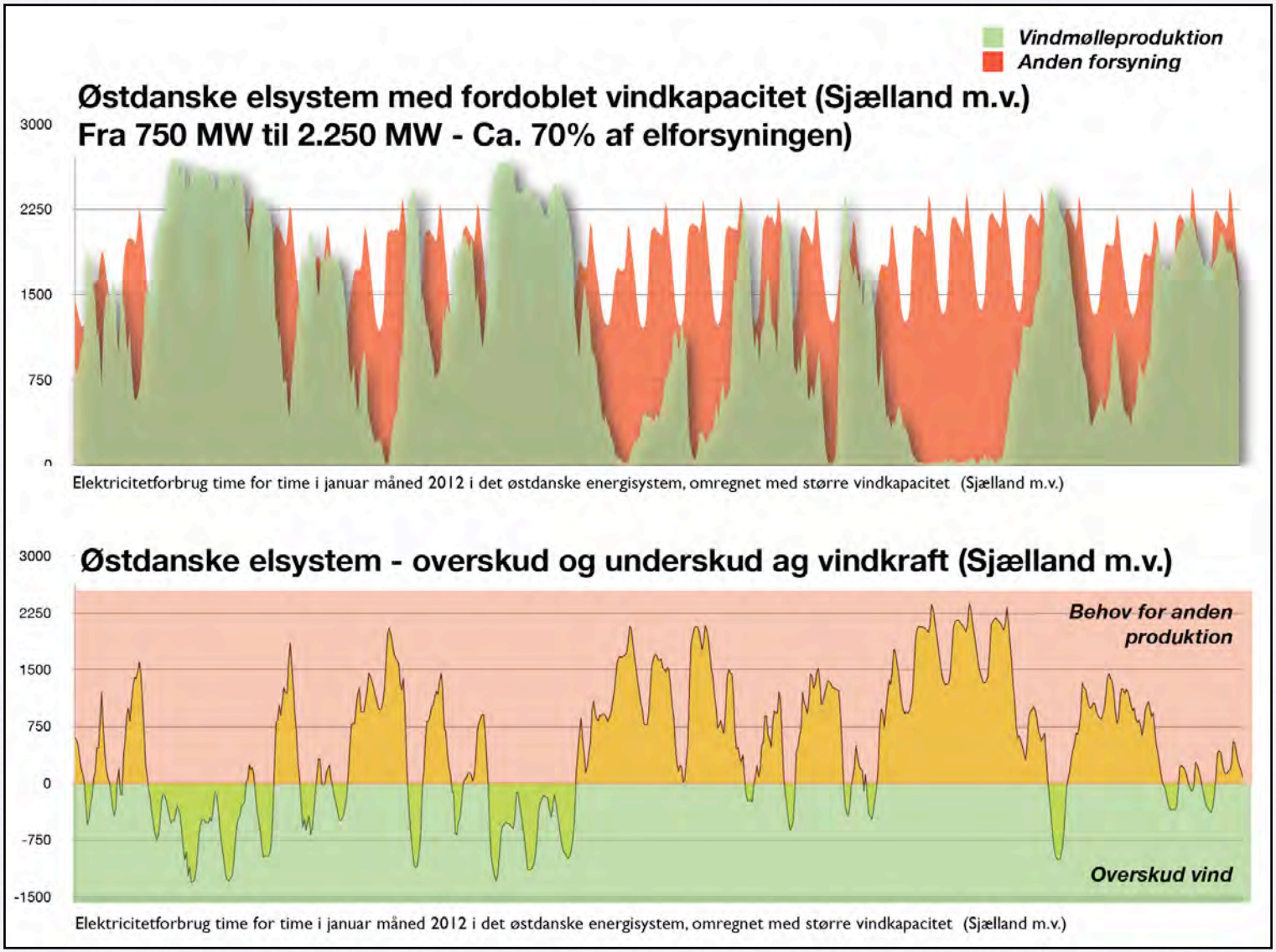
January 2012



Solrød - Example 2 - windpower

Windpower and electricity consumption 2020

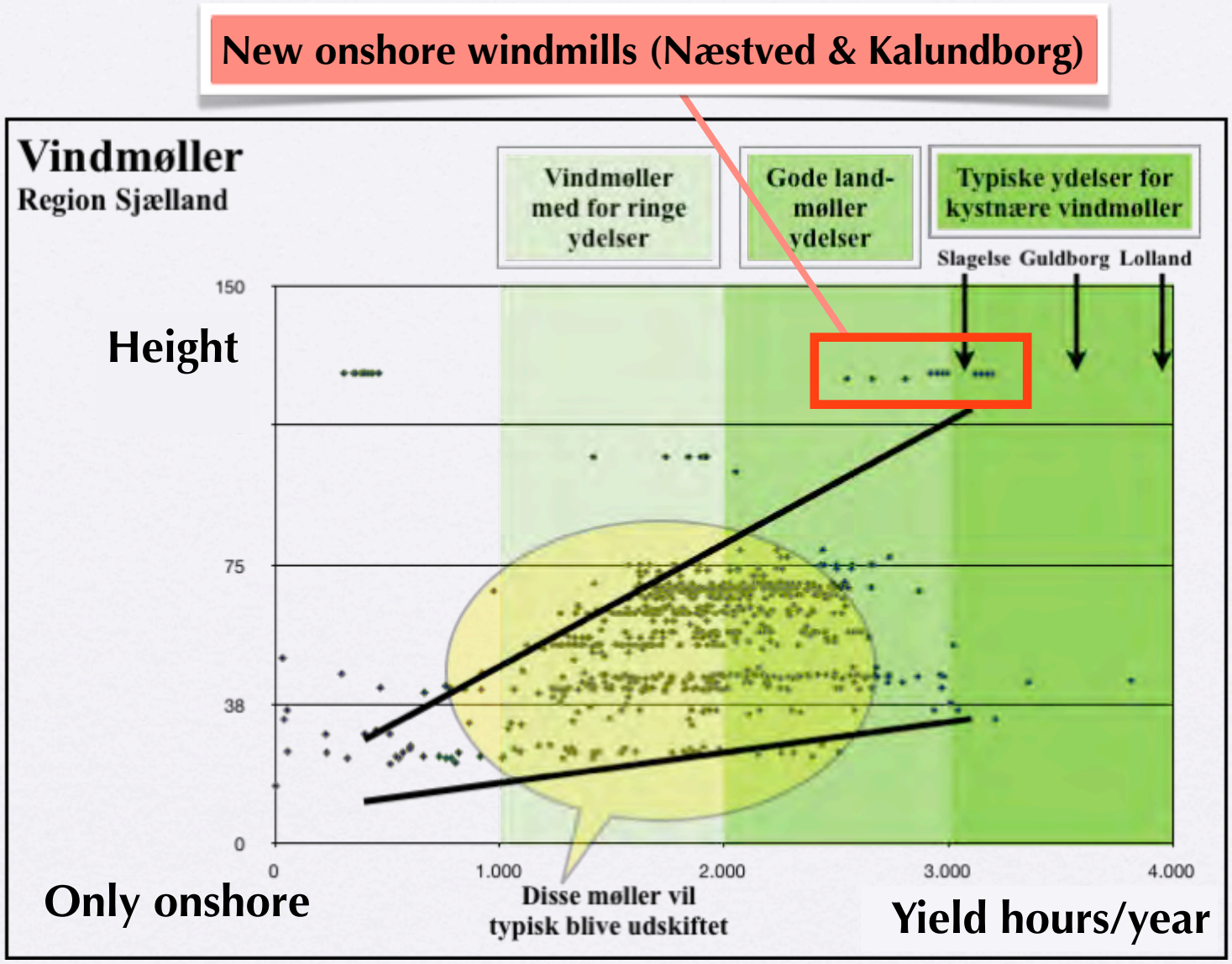
Estimated



Solrød - Example 2 - windpower

Windpower and electricity consumption 2020

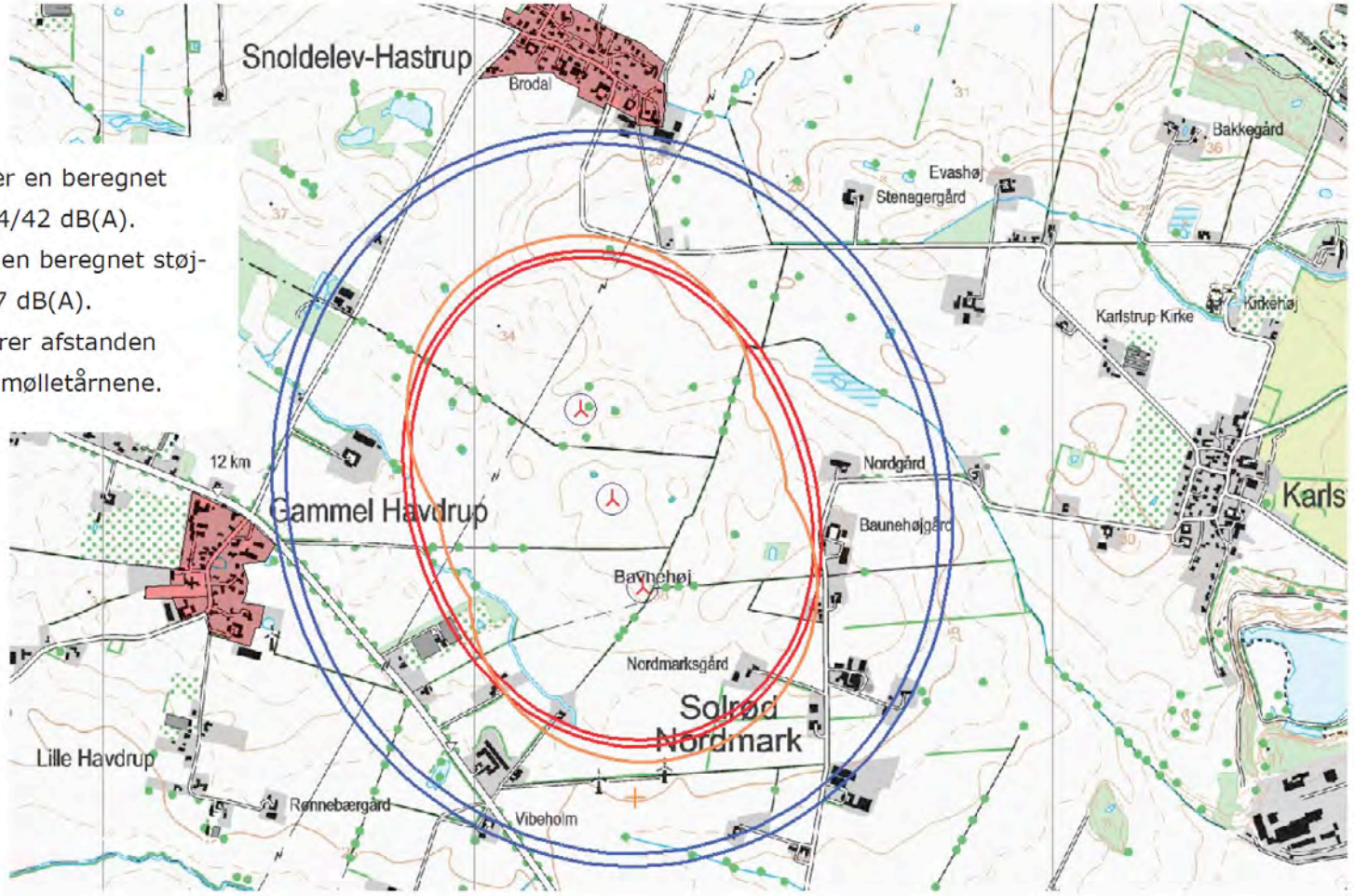
Estimated



Solrød - Example 2 - windpower

Planning of onshore windmills - Havdrup

Røde linjer markerer en beregnet støjbelastning på 44/42 dB(A).
Blå linjer markerer en beregnet støj-belastning på 39/37 dB(A).
Orange linje markerer afstanden 4 x totalhøjden fra mølletårnene.



Solrød - Example - Heating

Renewable energy for heating

Supply options:

Collective supply options

- Central CHP systems - biomass
- Decentralised CHP system - biomass, waste
- Distributed heat production - biomass CHP
- Neighbour heating plants - biomass/solar
- Geothermal - production facility and storage
- Biogas

Individual supply options:

- Biobiolers - wood pellets, wood chips, straw pellets, straw
- Biogas boiler - biogas distrubuted on the natural gas network , træflis, halmpiller, halm
- Heat Pumps - (soil / water, air / water, air / air)

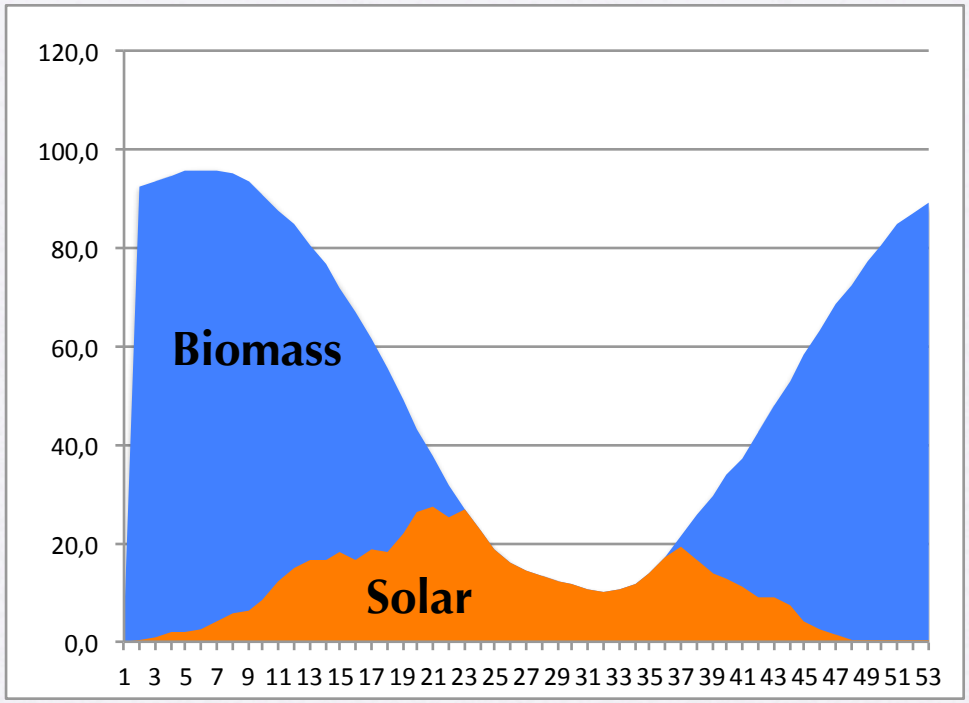
Ørnesædet, Havdrup

Solrød - Example 3 - solar heating

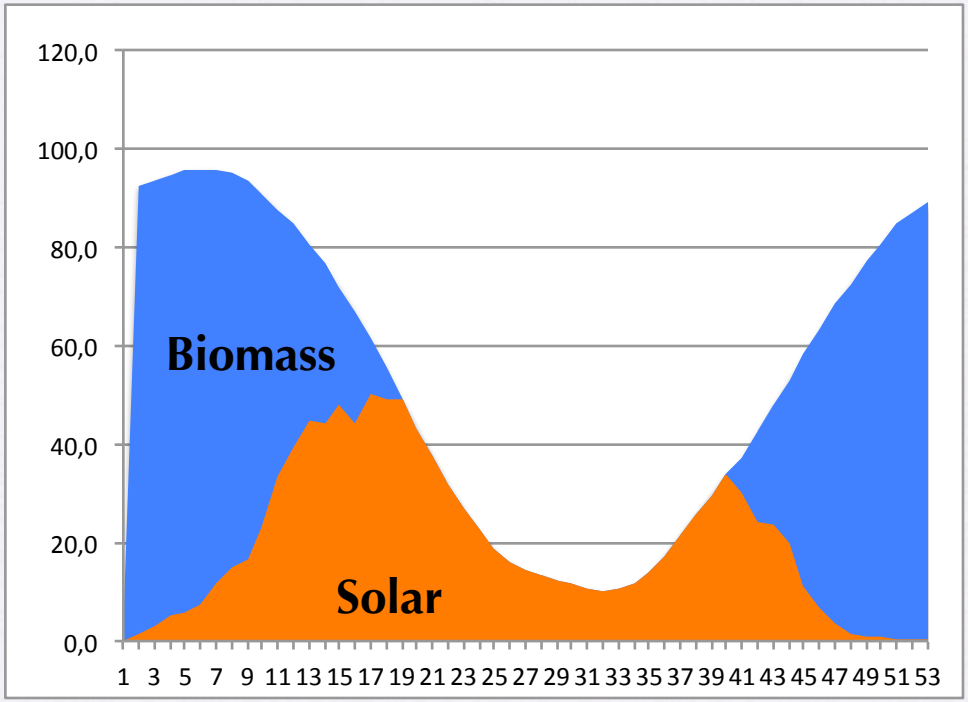
Renewable energy for heating - solar

Combining biomass heat (wood, straw) with solar heating - Ørnesædet /Havdrup

Heat demand: 2.500 MWh
Solar plant: 1.500 m2
Cover 21% of heat demand
80% are used
Price: 0,30 Danish kroner pr kWh



Heat demand: 2.500 MWh
Solar plant: 4.000 m2
Cover 38% of heat demand
54% are use
Price: 0,45 Danish kroner pr kWh



Solrød - Example 4 - heating plant

Neighbour heating plant - Gl. Havdrup

Straw district heating

Solrød - Example 4 - heating plant

Neighbour heating plant

Gl. Havdrup

Overview:

Buildings to be connected a small district heating systems based on straw

No mandatory connection, only »connection-desire« - DH is approx. 10% cheaper than oil, electricity and naturalgas heating, however, depending on size and heat requirements

The heating plant placed in a local eco-farm and operated by the local district heating plant »Solrød Fjernvarmeværk a.m.b.a.«

Solrød - Example 4 - heating plant

Neighbour heating plant

Significant potentials in the so-called zone IV for the establishment of small plant

The benefits:

- Uses local biomass: 300 tons of straw annually.
- There are no CO2 emissions by burning straw - CO2 neutral
- The residue is recycled: ashes to be returned to the farmers who supplied the straw
- Affordable heating: Collective straw heating (DH) is cheaper than electric heating and oil burner.
- High security of supply - straw heat is a safe and stable heat supply
- Higher property valuation

Solrød - Example 4 - heating plant

Prices

Nuværende forsyning Udgifter inkl. moms	Energiforbrug		Energipriser		Varme-udgift	Brænder oliepumpe	Eftersyn service	Afdrag på lån	Samlet udgift
Oliefyr, fyringsolie	2.000	liter	11,50	kr./liter	23.000	805	2.000		25.805
Oliefyr, bioolie	0	liter	8,25	kr./liter	0				0
Elvarme/elvandvarmer	0	kWh	2,15	kr./kWh	0				0
Jordvarme	0	kWh	2,15	kr./kWh	0				0
Luftvarmepumpe	0	kWh	2,15	kr./kWh	0				0
Brændeovn, træ	0	kg	1,00	kr./kg	0				0
Brændeovn, briketter	0	kg	2,00	kr./kg	0				0
Træfliskedel	0	kg	1,45	kr./kg	0				0
Træpillefyr	0	kg	2,50	kr./kg	0				0
Koksfyr	0	kg	9,00	kr./kg	0				0
Samlede årlige udgifter					**23.000**	**805**	**2.000**		**25.805**

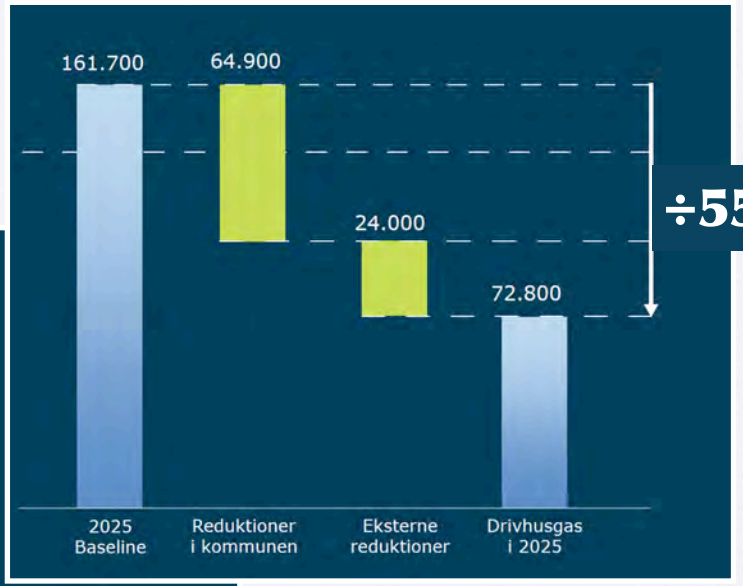
Fjernvarme Udgifter inkl. moms	Tarifforslag		Energiforbrug MWh	Årlige varmeudgifter inkl. afdrag på lån kr./år
Ombygninger	0	kr.		0
Forbrugsafgift	581	kr./MWh	17,0	9.871
3-års forbrugsgennemsnit	581	kr./MWh	17,0	9.871
Fast afgift pr. stik	1.688	kr./år		1.688
Samlede årlige udgifter			17,0	**21.429**

Pillefyr Udgifter inkl. moms			Energiforbrug MWh	Årlige varmeudgifter inkl. afdrag på lån kr./år
Ombygninger, lager	10.000	kr.		1.295
Investering, fyr	65.000	kr.		8.418
Årlige varmeudgifter	Effektivitet	80%	21,3	10.842
Drift og vedligehold				3.000
Samlede årlige udgifter				**23.555**

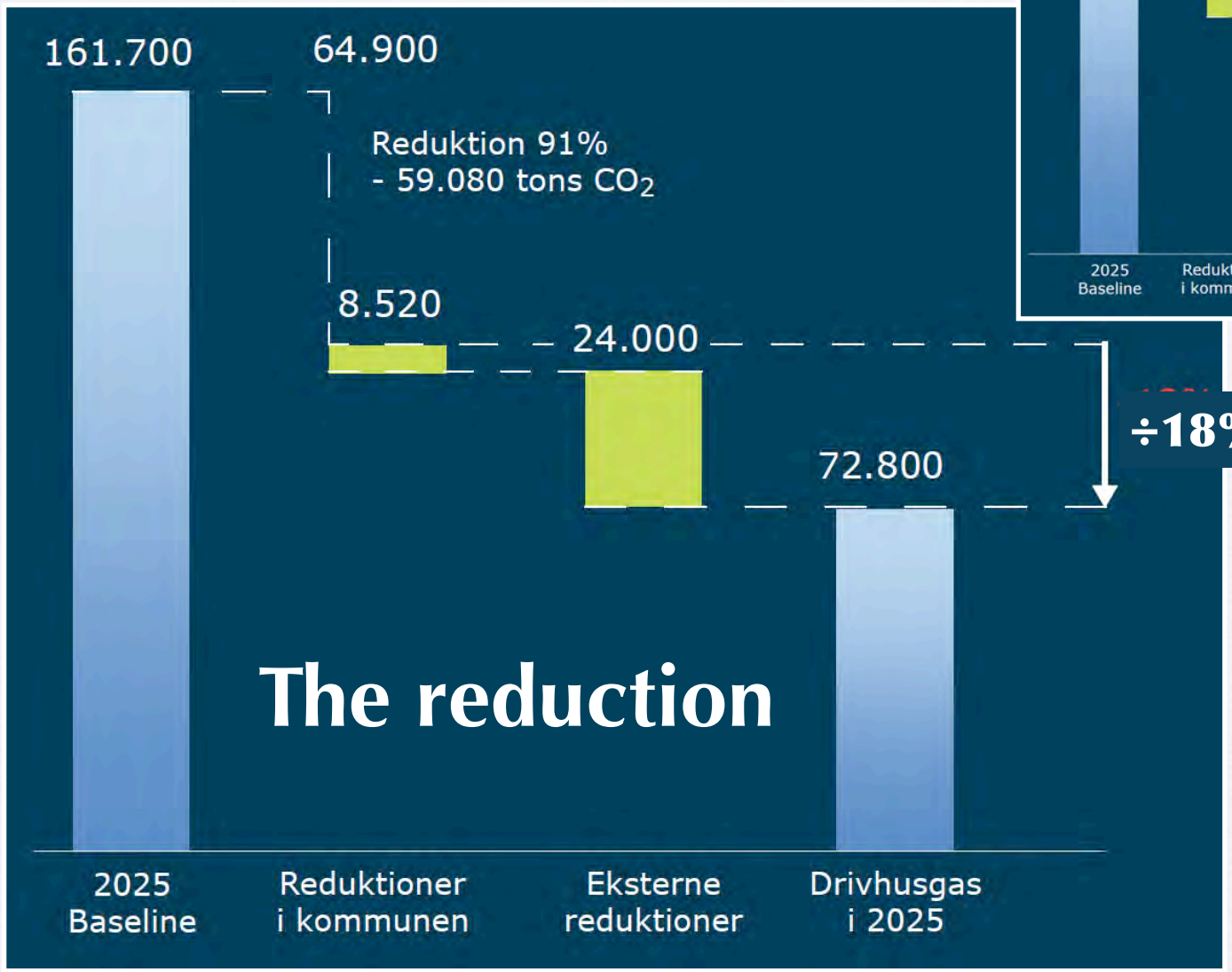
Varmepumpe Udgifter inkl. moms			Energiforbrug MWh	Årlige varmeudgifter inkl. afdrag på lån kr./år
Ombygninger	0	kr.		0
Investering, jordvarme	125.000	kr.		16.188
Eludgifter	COP =	3,20	5,3	11.422
Årligt serviceeftersyn				1.875
Samlede årlige udgifter				**29.485**

Overview

The action plan - results



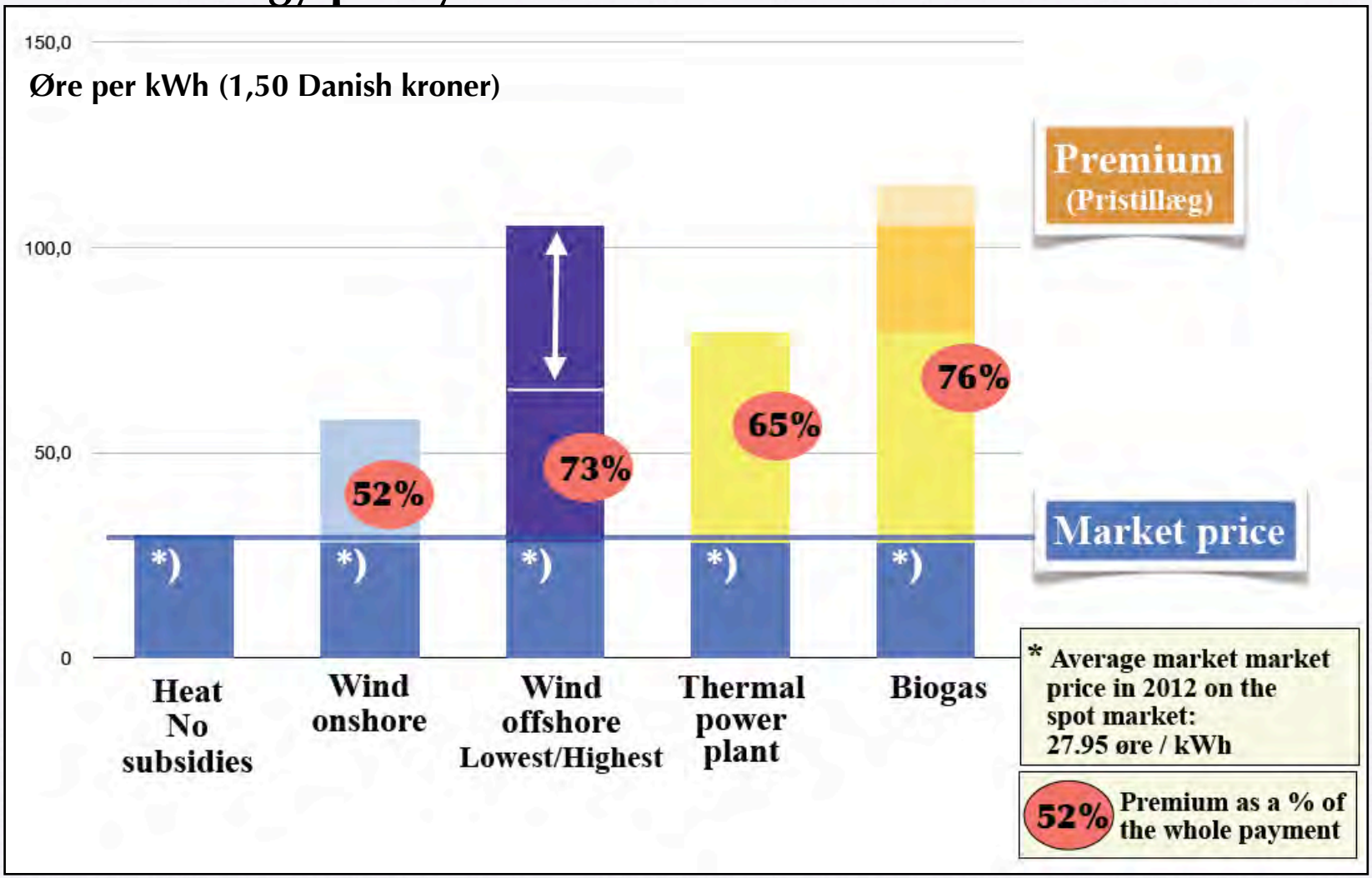
The goal to year 2025



Overview

Subsidies - Premium

The new Danish energy policy



CBSS-BALTIC 21 LIGHTHOUSE PROJECT

Bioenergy Promotion

Baltic Sea Region Programme 2007-2013

LOW AND NO FOSSIL ENERGY, OUR FUTURE

.... Yes, we can