Lars Byberg, CEO Bioenergi Vest A/S

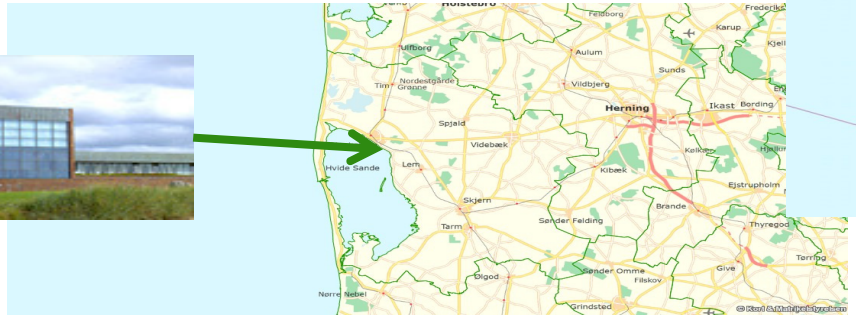
BIOENERGI VEST

Biogas

RKSK-Model

Bioenergi Vest

Ringkøbing-Skjern Municipality



BIOENERGI VEST

Buildings
Habit's

Other
RE-sources

Bio Energy

100 % RE

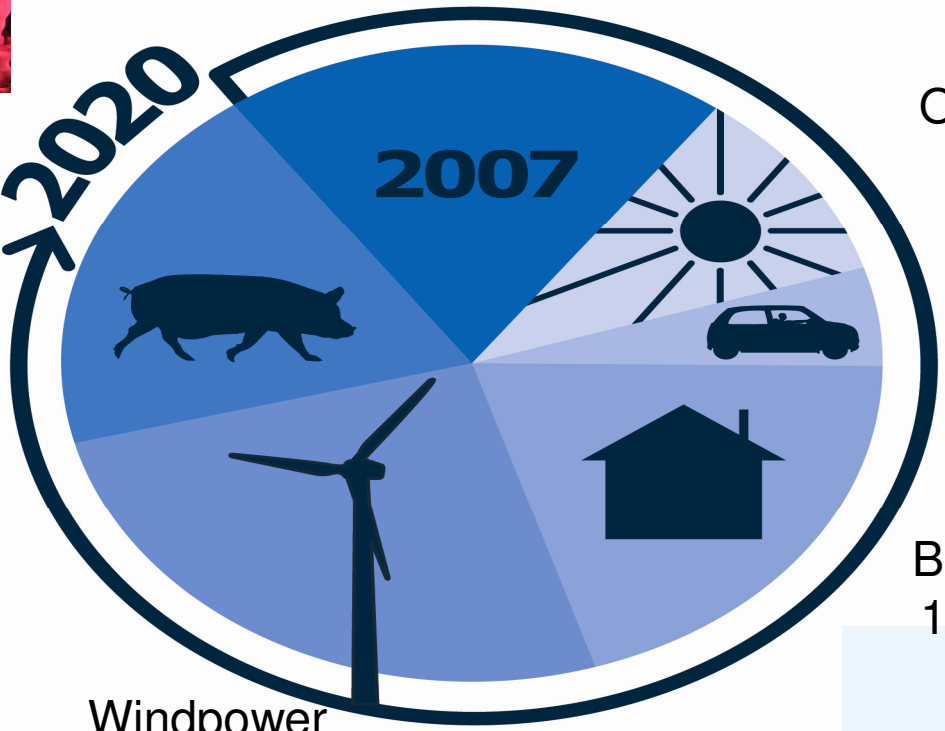
Transportation

Wind

BIOENERGI VEST

Baseline 2007
20 %

Other sources
10-25 %



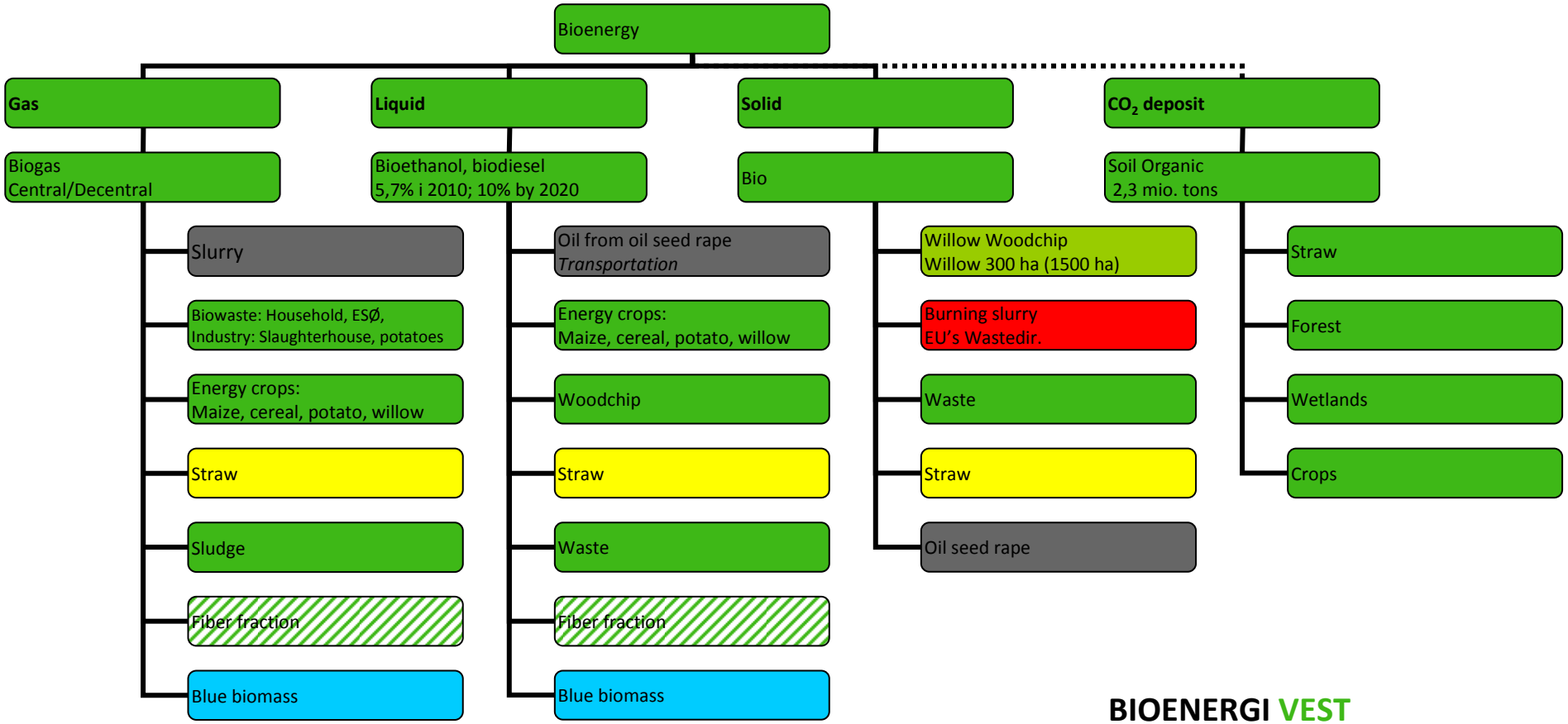
Bio energy
15-25 %

Transportation
5-15 %

Buildings
10-20 %

Windpower
25-30 %

Bioenergy mapping in Ringkøbing-Skjern Municipality



BIOENERGI VEST

Impact on emission of CO_2 *equivalent*

Report:

Landbrug og Klima Ministry of Food Dec. 2008

Tabel 2.1. Skønnet potentiale for reduktion af drivhusgasemissioner fra landbruget i perioden frem til 2020, 1000 ton CO_2-ækv. pr. år

Virkemidler	Omfang	$CH_4 + N_2O$	Jord-C	Bioenergi	I alt
Bioenergi					
Halm til kraftvarme	150.000 ha	21	-98	384	298
Husdyrgødning til biogas	45 %	546	-90	350	807
Afbrænding afgasset gylle	30 %	73	-53	59	79
Afbrænding separeret svinegylle	30 %	52	-43	43	52
Græs fra naturpleje til biogas	75.000 ha	-45	0	148	103
Pileflis	100.000 ha	27	157	1087	1270
Energimajs til biogas	100.000 ha	-232	0	763	531
Forbedret gødningshåndtering					
Køling af svinegylle i stalde	20 %	4	0	0	4
Hyppig udslusning af svinegylle	20 %	-12	13	0	2
Overdækning af gyllebeholdere	40 %	41	0	0	41
Overdækning af fast gødning	80 %	1	0	0	1
Husdyr					
Øget fedt til malkekøer	50 %	248	0	0	248
Forbedret N-udnyttelse					
Reduceret N-norm græsmarker	200.000 ha	93	0	0	93
Nitrifikationshæmmere	100 %	272	0	0	272
Arealanvendelse					
Efterafgrøder	400.000 ha	-14	293	0	280
Reduceret jordbearbejdning	200.000 ha	0	66	-8	58
Udtagning af lavbundsarealer	27.000 ha	20	274	0	295
Udtagning af højbund til græs	100.000 ha	64	183	0	247
Udtagning af højbund til skov	100.000 ha	64	257	0	321
I alt, under hensyn til overlap mellem virkemidler		1281	556	2020	3851

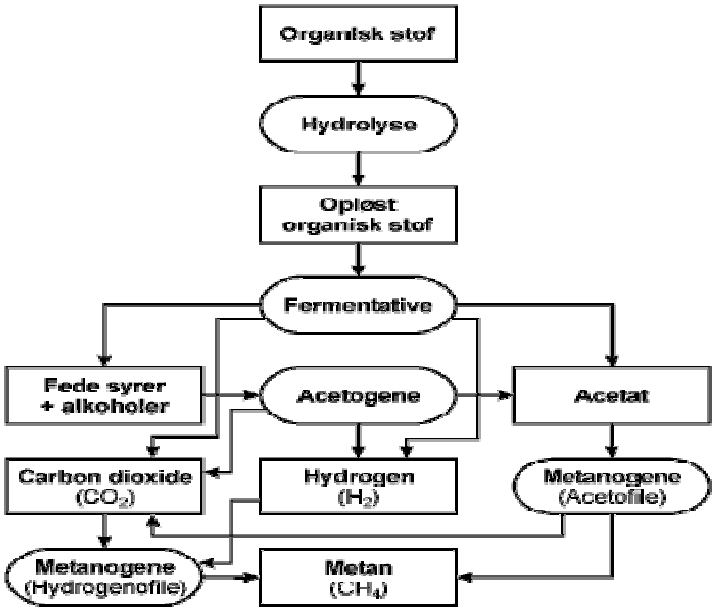
Note: Reduktionspotentialet er opgjort i effekter på metan og lattergasemissionerne (efter nye emissionsfaktorer fra IPCC), kulstoflagring i jord og substitution af fossil energi. Negative værdier angiver at udledningerne øges ved det pågældende virkemiddel.

Biomass technology	Heat, Elec., Biofuel	Technologi development level	Basis of raw material	Energy Yield	Central/ Decentrale
Direct heating	**H, E**	***	***	***	**C/D**
Termal gasification	**H, E**	**	***	***	**C/D**
Transformation to hydrogen	**H, E, B**	*	***	?	**C/D**
Biogas	**H, E, B**	***	***	**	**D/C**
Biomass to liquid	**B**	*	***	**	**C**
Raw planteoil	**H, E, B**	***	*	*	**D/C**
Biodiesel (RME)	**H, E, B**	***	*	*	**C**
Ethanol from starch (1. gen.)	**B**	***	**	*	**C**
Ethanol from lignocellulose (2. gen.	**V, E, B**	*	***	**	**C**

Report: ”Jorden - en knap ressources”
Ministry of Food Jan 2008

Biogas = 65 % CH_4 og 35 % CO_2

- Microorganisms spontaneously produce CH_4 in an anarob environment
- Temperature 52 gr.



Kilde: "Stimuleret in situ reduktiv deklorering. Vidensopsamling og screening af lokaliteter "Version 1.0 Februar 2005, © Miljøstyrelsen.

BIOENERGI VEST

The Biogas Board 2009

Project manager
Lars Byberg

Jesper Skovhus Andersen
Bjarne Bødker

Ole Kjær
Kim Heiselberg

Knud Christensen
Niels Erik Kjærgård

Goal:
Establish an energy and economic sustainable business model

Farmers

Ole Kjær,
Vestjysk Lbf
Kim Heiselberg

Distinct heating gr.

Jesper Skovhus Andersen
Bjarne Bødker

Municipality

Hans Holt Poulsen,
RKSK
Lars Byberg

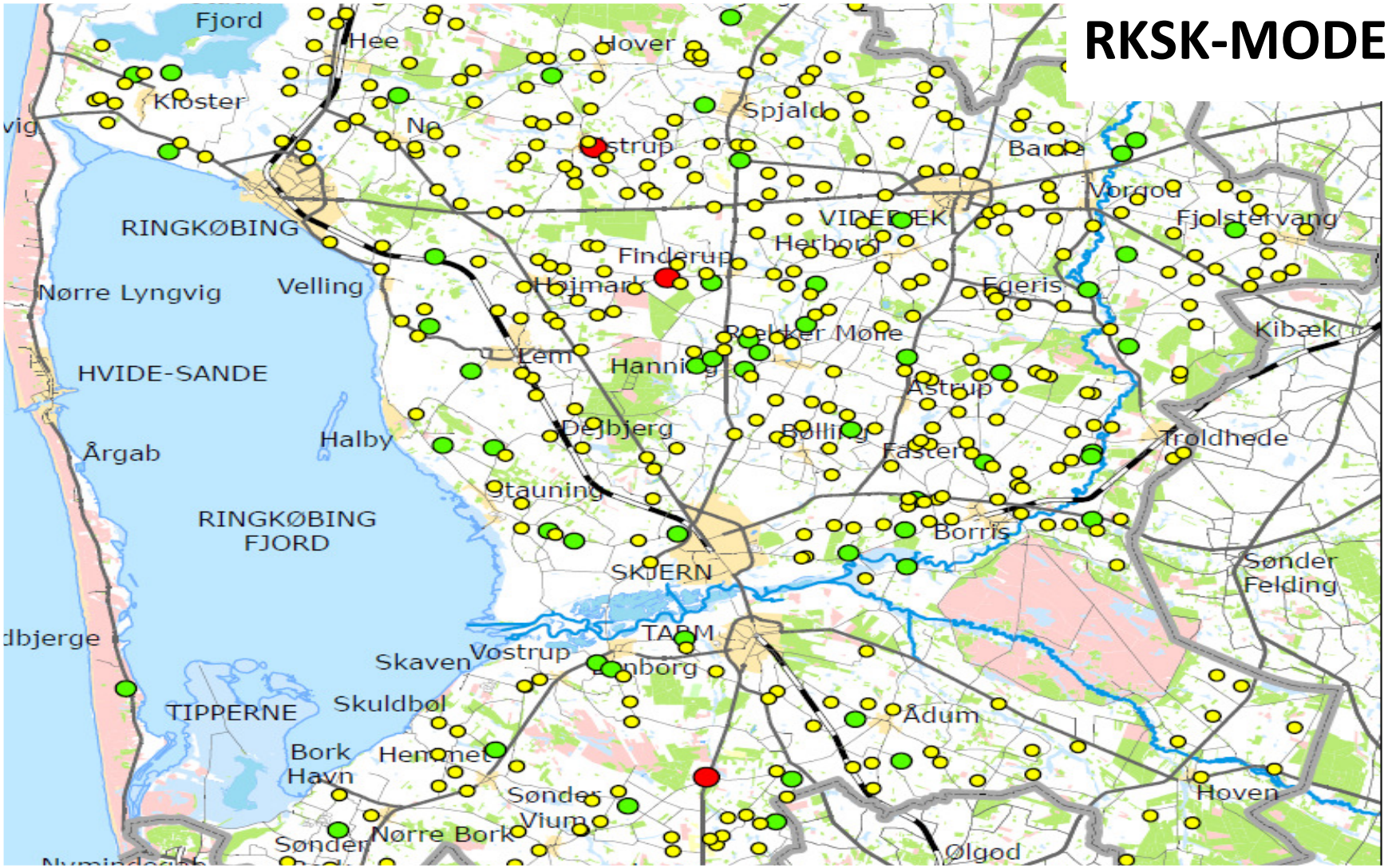
Manufactore

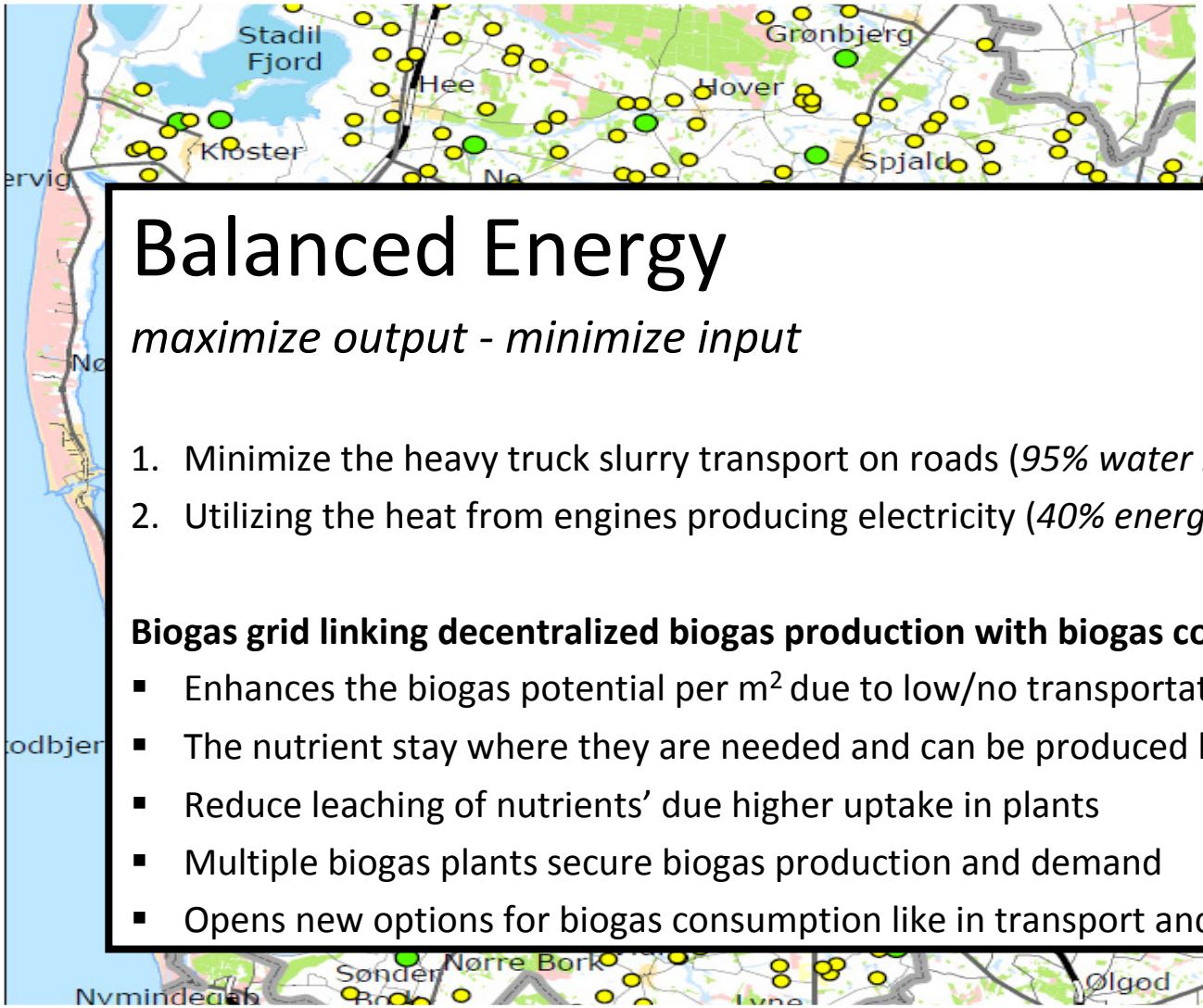
Kent Skaanning,
Danish Biogas Gr.

Biogas Grid

Lars Byberg
Torben K. Jensen,
DGC

RKSK-MODEL


Fjord
Hee
Hover
Kloster
Spjald
Barde
Vorgod
Fjolstervang
RINGKØBING
Herborg
Finderup
Nørre Lyngvig
Velling
Egeris
Kibæk
HVIDE-SANDE
Astrup
Halby
Troldhede
Årgab
Faster
RINGKØBING
FJORD
Borris
Sønder
Felding
SKJERN
TARM
Vostrup
Skaven
TIPPERNE
Skuldbøl
Ådum
Bork
Havn
Hoven
Sønder
Vium
Nørre Bork
Ølgod



RKSK-MODEL

Balanced Energy

maximize output - minimize input

1. Minimize the heavy truck slurry transport on roads (*95% water in slurry*)
2. Utilizing the heat from engines producing electricity (*40% energy loss as heat*)

Biogas grid linking decentralized biogas production with biogas consumers

- Enhances the biogas potential per m^2 due to low/no transportation cost
- The nutrient stay where they are needed and can be produced locally
- Reduce leaching of nutrients' due higher uptake in plants
- Multiple biogas plants secure biogas production and demand
- Opens new options for biogas consumption like in transport and energy storage

Sketch report summer 2009: The Biogas Potential

	Udnytteligt potentiale m3 CH4/år	
Husdyrgødning	27.283.000	80% af total
Fiber fra afgasset gylle	3.250.000	50% separeret
Energiafgrøder	27.360.000	Anslået sæsonregulering
Fiber fra afgasset energiafgrøder	1.465.000	50% separeret
Naturaffald	-	Ikke opgjort
Have/park affald	-	Ikke opgjort
Husholdningsaffald	240.000	
I alt udnytteligt potentiale	59.598.000	

- Biogas can substitute 20% of the total energy consumed in RKSK
- The Biogas potential is 60 mio. m^3 CH_4 a year
  - Degasification of Slurry contributes with 30 mio. m^3 CH_4 a year
  - Energy crops (corn) 30 mio. m^3 CH_4 a year
- Energy crops will cover 5% of the farmland in the Municipality and deliver 50% of the biogas
  - The energy crops can be stored. This will make the biogas production flexible with a high production in the winter

Biogas production

Biogas consumption and production

- In a year with a peak consumption

	mio m^3 CH_4
District heating plants:	60
Additional Industry:	40
Total	100

Biogas production pr year	no.	mio m^3 CH_4	Total
Central biogas plant	2	12,7	25,3
Decentral biogas plant 500 DE	25	0,5	12,5
Decentral biogas plant 1500 DE	44	1,1	50,0
Decentral biogas plant 2500 DE	6	1,9	12,2
Total biogas production mio m^3 CH_4			100,0

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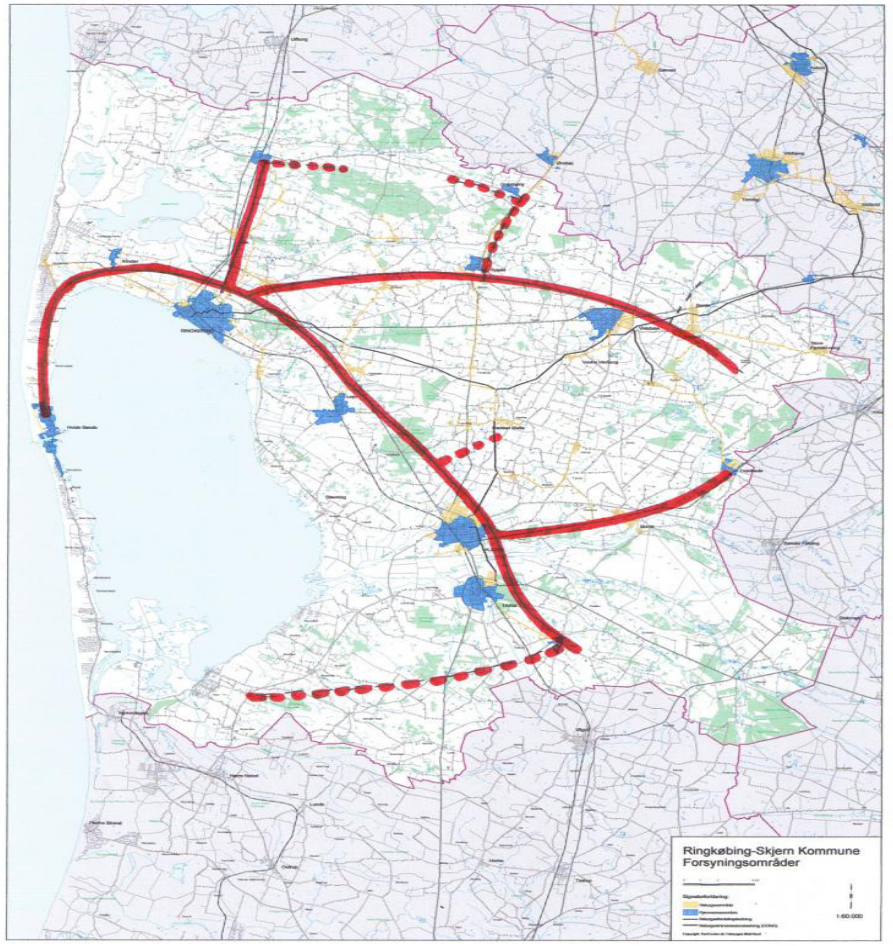
Back bone of the RKSK-Model

200 km Biogas Grid
Transmissionssystem

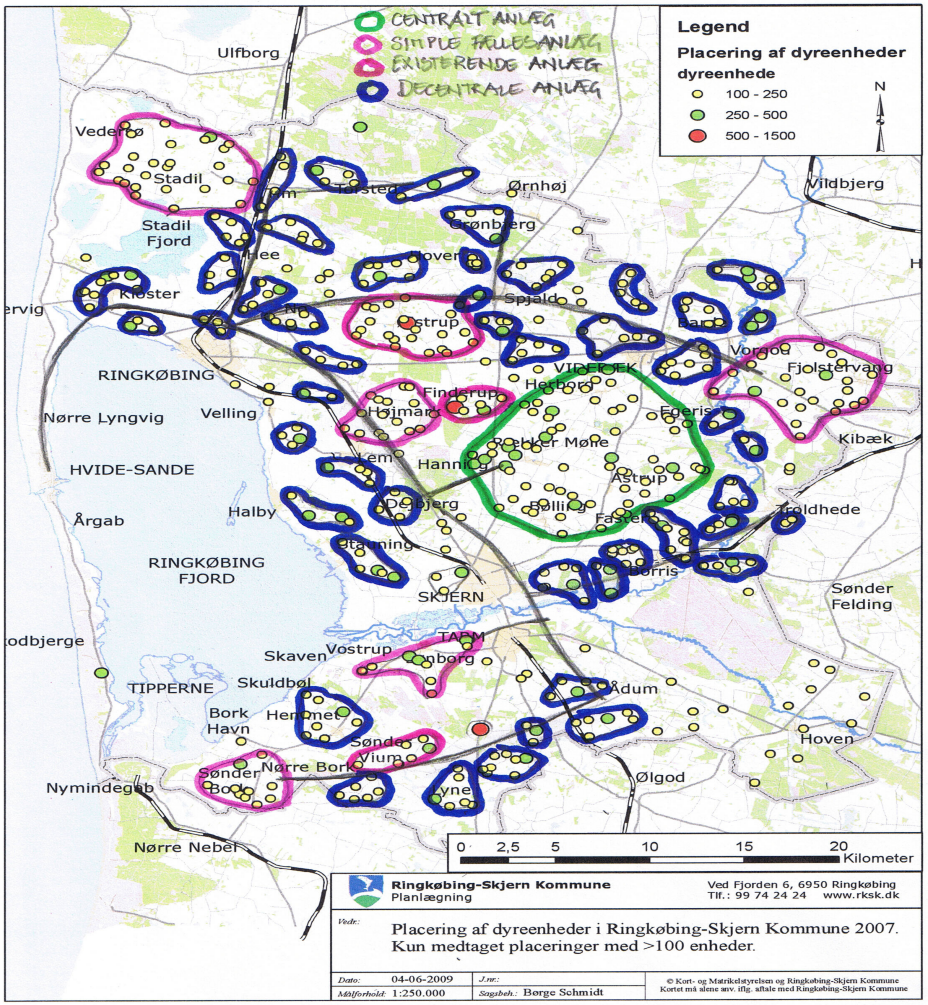


RKSK-model

- 30 – 90 Decentrale biogas plants
- 1 - 2 Centrale biogas plants

  (service plants)

  - Fiber fraction
  - All kind of biomass



Investments fully implemented RKSK-model

100 mio m^3 CH_4	No./km	Price mio d.kr	mio d.kr
Central biogas plant	2	250	500
Decentral biogas plant 500 DE	25	6	150
Decentral biogas plant 1500 DE	44	10	444
Decentral biogas plant 2500 DE	6	12,5	75
Transmission grid	200	0,6	120
Total mio d.kr			1.289
App a total mio 175 EU.			

BIOENERGI VEST

Etape 1.

35 km grid *Lyne to Skjern*

5 biogas plants 1500 DE

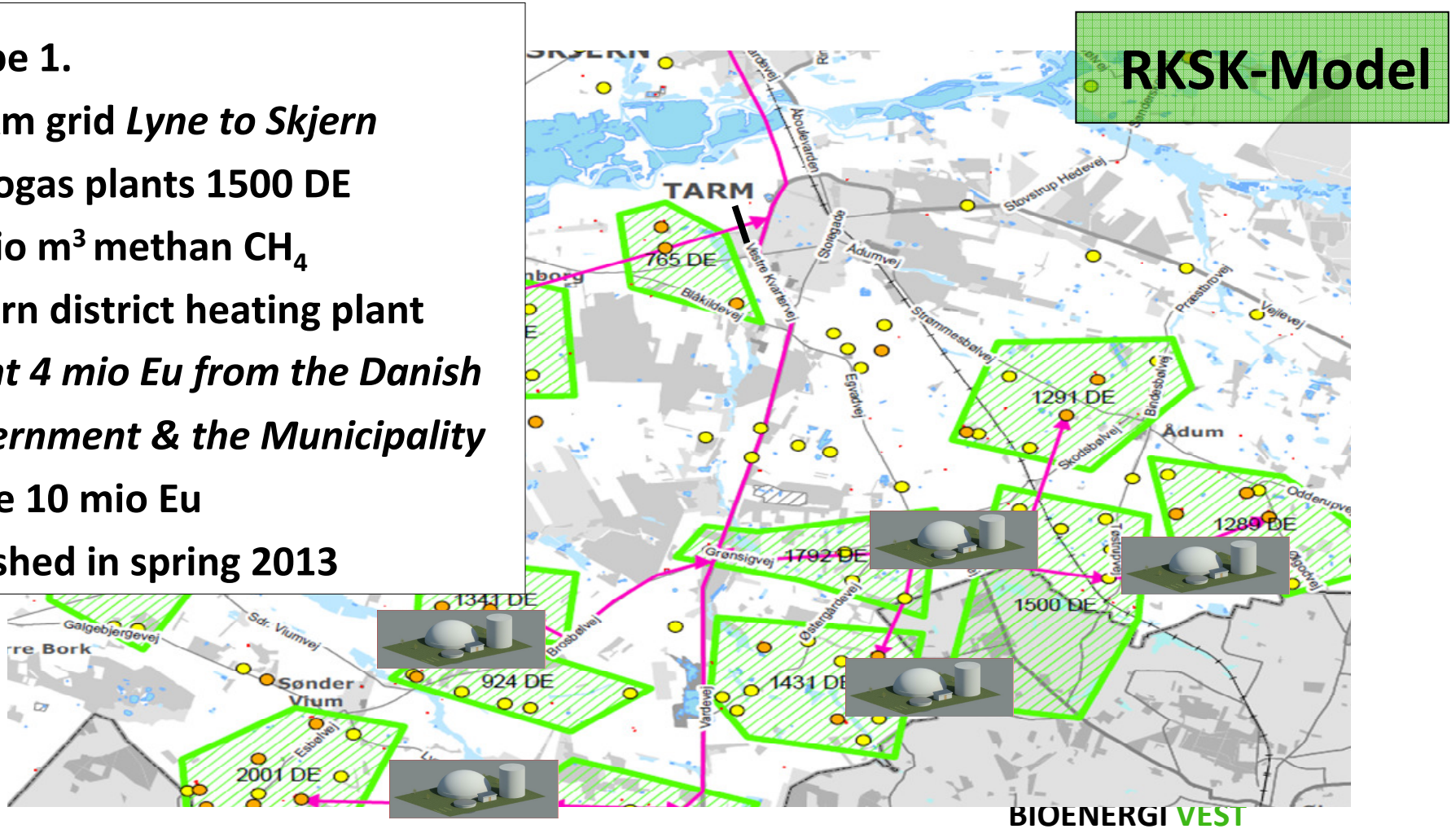
5 mio m^3 methan CH_4

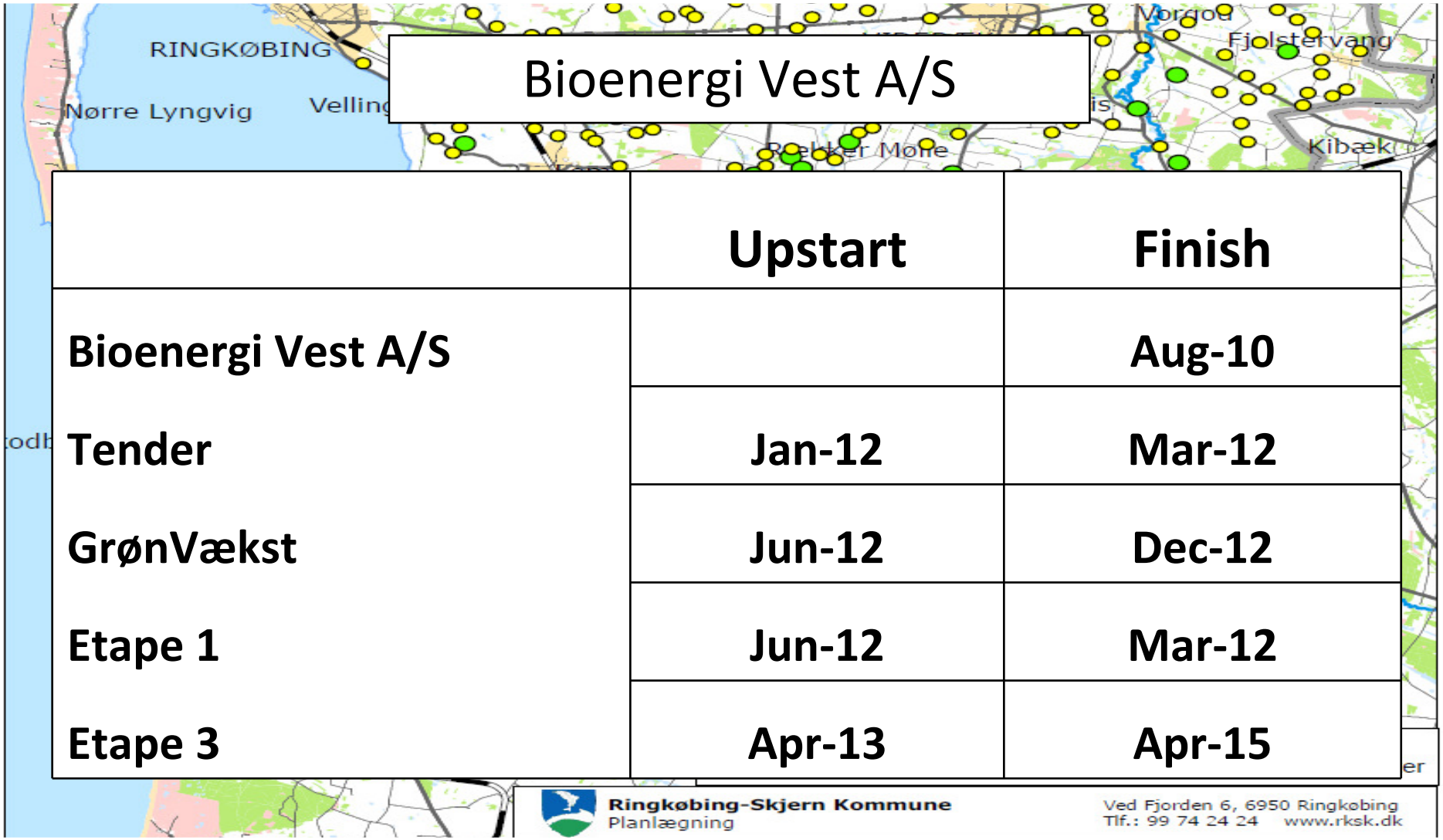
Skjern district heating plant

Grant 4 mio Eu from the Danish Government & the Municipality

Price 10 mio Eu

Finished in spring 2013





Bioenergi Vest A/S

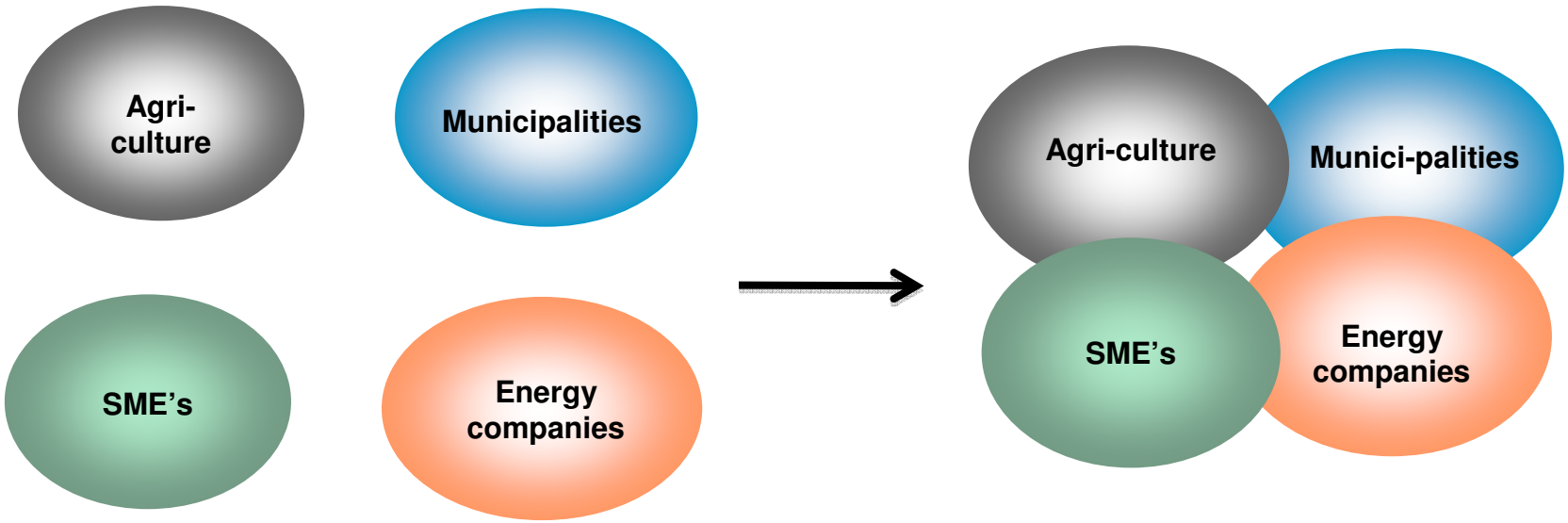
	Upstart	Finish
Bioenergi Vest A/S		**Aug-10**
Tender	**Jan-12**	**Mar-12**
GrønVækst	**Jun-12**	**Dec-12**
Etape 1	**Jun-12**	**Mar-12**
Etape 3	**Apr-13**	**Apr-15**

BIOENERGI VEST

- Orchestra the implementation of
  - Biogas plants
  - Biogas infrastructure
  - Biogas service
  - Biogas trading

  - Export of know-how

Start by: Involving the players in the bioenergy field

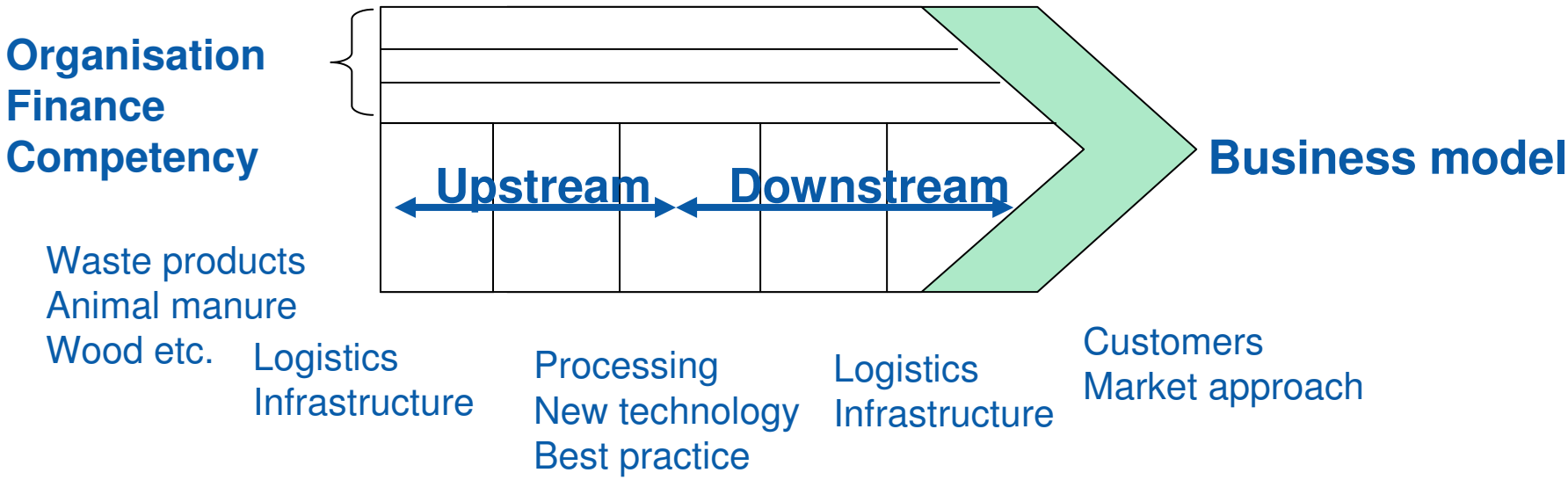


From: Uncoordinated players in the bioenergy field

To: Dialog, innovation and utilization of bioenergy

BIOENERGI VEST

The value chains of bioenergy

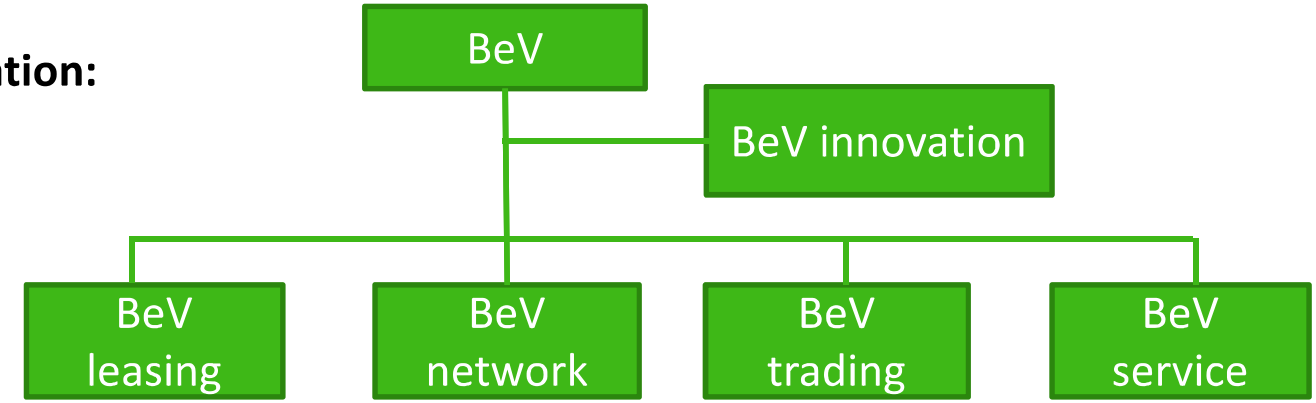


Organisation

The right organisation setup is just as important as the technical!

BioenergiVest (BeV) is created to organise the entire project implementation and operation

Organisation:



Owners: Municipal (50%), Farmers union (25%), Business Center (25%)

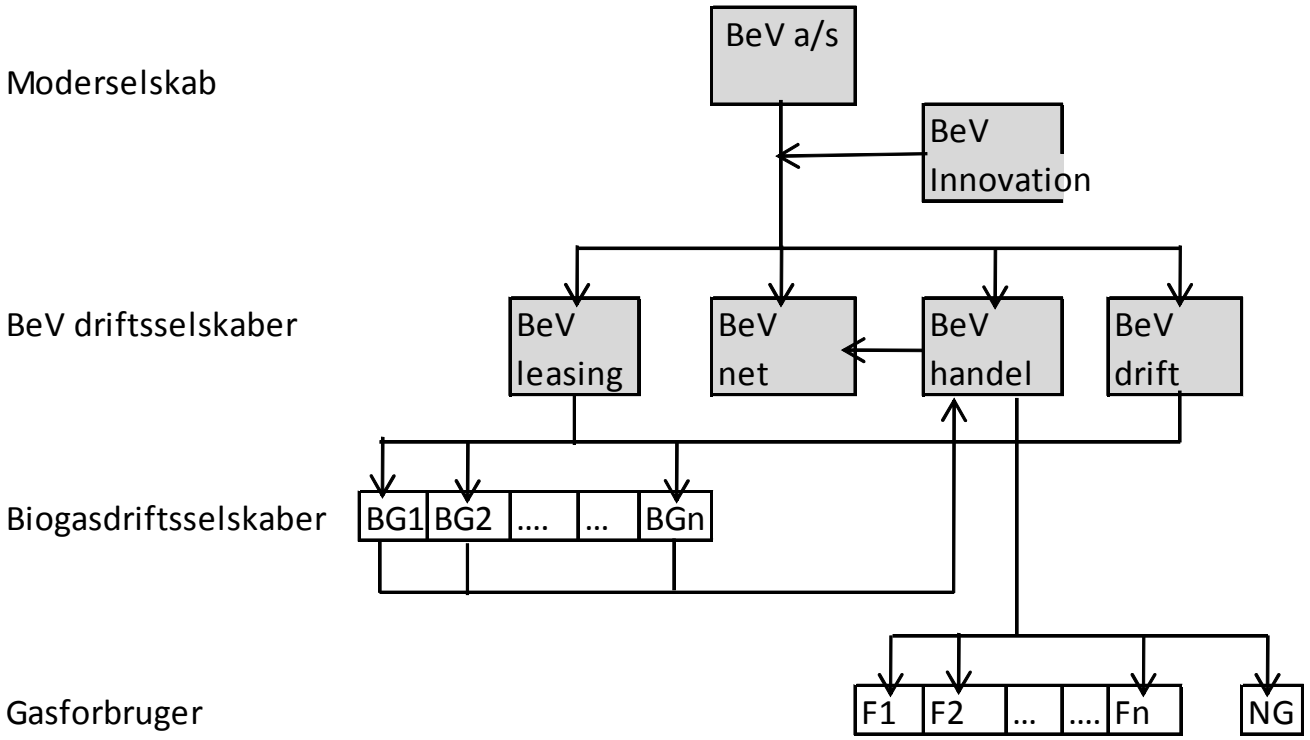
Board: Owners, representatives from District Heating Plants

The BeV business model

Input: The farmers have the biomass
Majority of farmers lack financial power

BeV: Finance and purchase the biogas plants
Lease biogas plants to the farmers
Bye all gas from the biogas plant
Sell all gas to district heating companies or others

Farmer Coop: Create a “Biogas Operation Company”
Pay the lease
Take care of daily operations
Get all income from sales of gas



BIOENERGI VEST

BeV innovation ApS is a network of biogas know-how partners

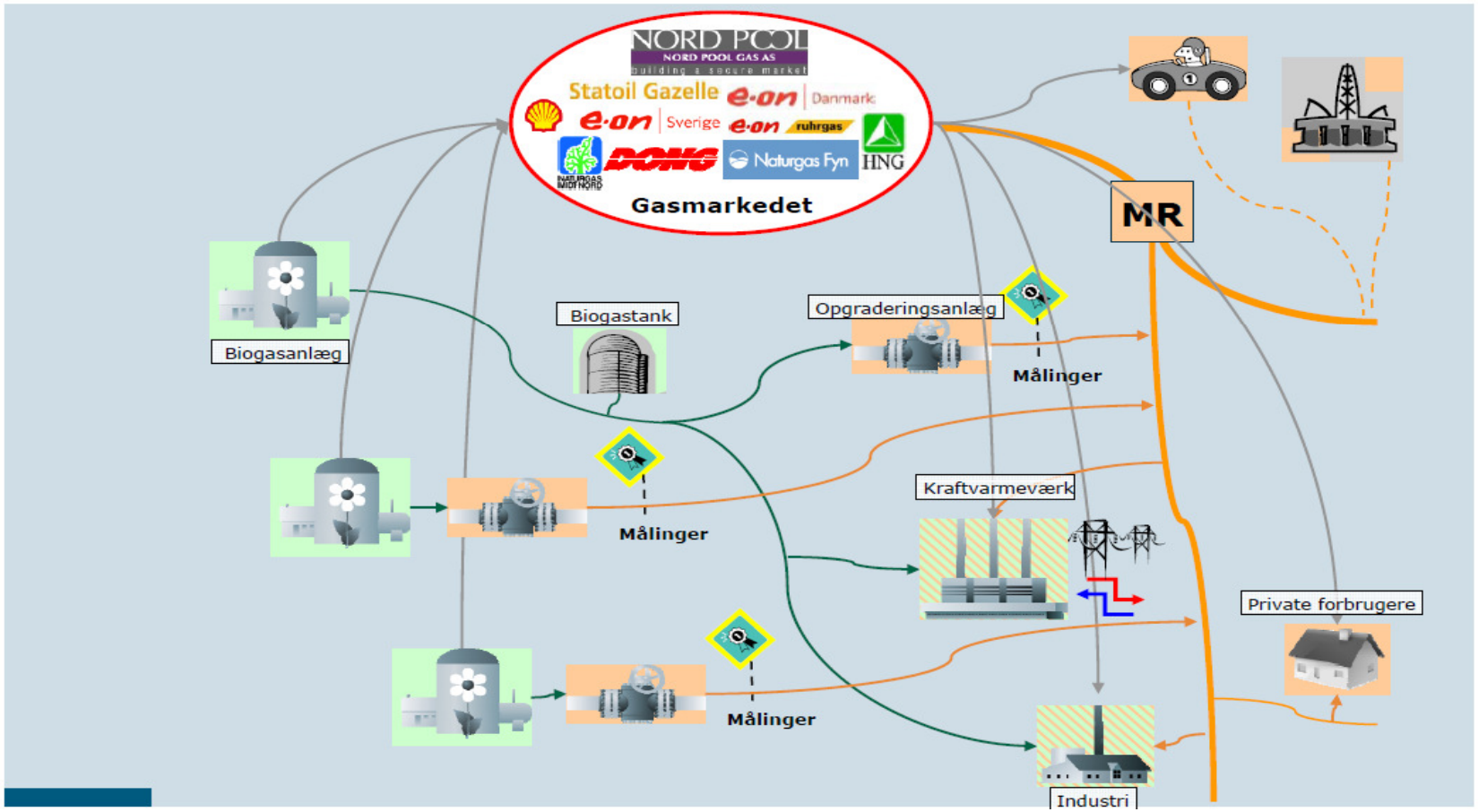
The objective of BeV innovation is to

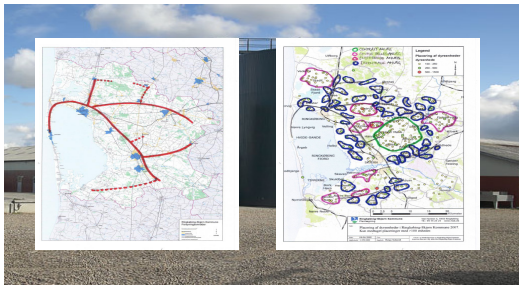
- Implement the RKSK-model in an open cooperation with local promoters
- Provide biogas infrastructure consultancy
- Supply biogas infrastructure key parts as well as turn-key solutions

In a cooperation with local promoters BeV innovation produces "Balanced Energy" and develop decentralised biogas scheme from idea to reality

BIOENERGI VEST

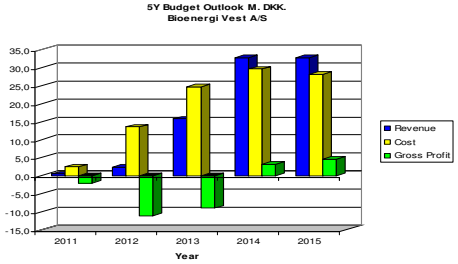
Flere anlæg i V1.0 ...





RKSK-model – *the grid reduces transport & optimizes consumption – balanced energy*

175 million EU – *will make 59.000 people self-sufficient with gas*



Solid profit after 3 years

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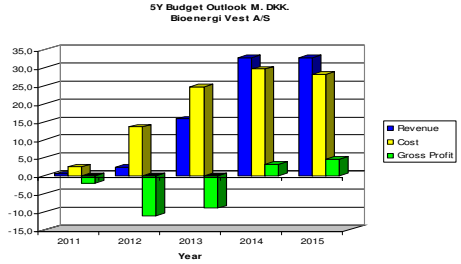

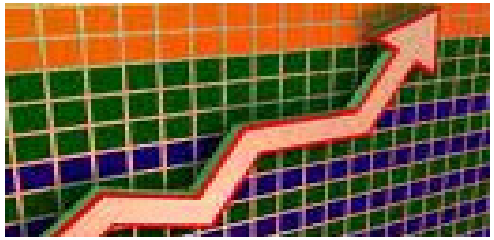

Future increase in demand on renewables

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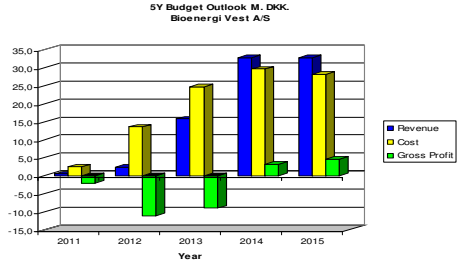
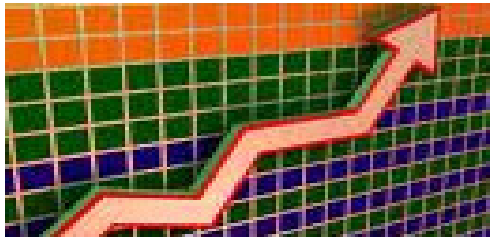
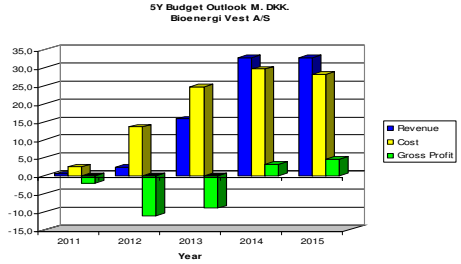
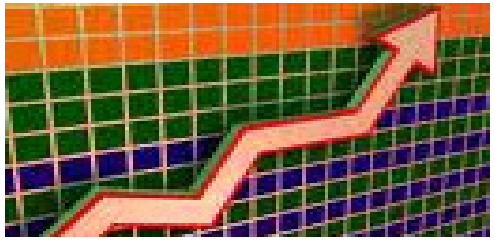


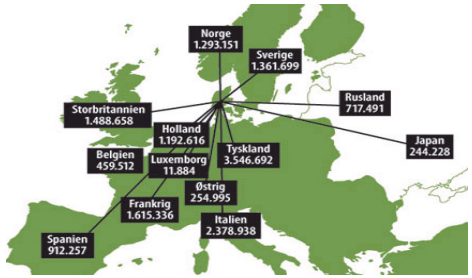


1600 new jobs in the region !!! (*Tyge Kjær, RUC, Denmark*)

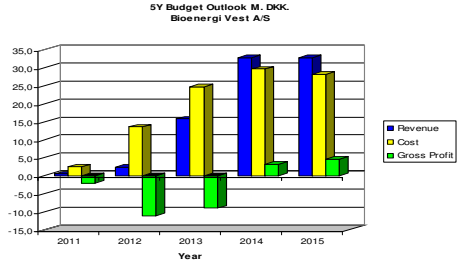
BIOENERGI VEST

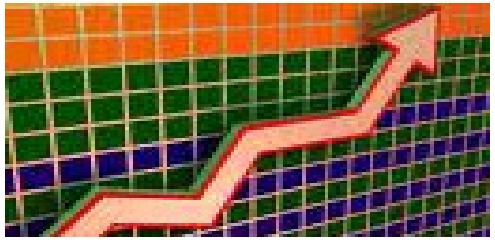


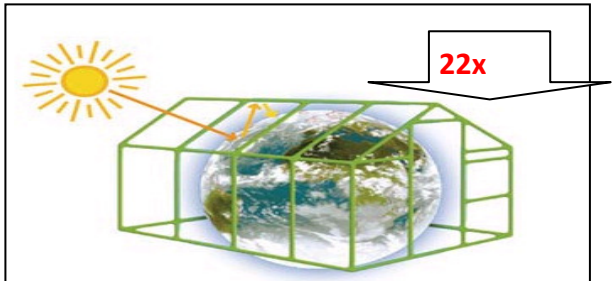


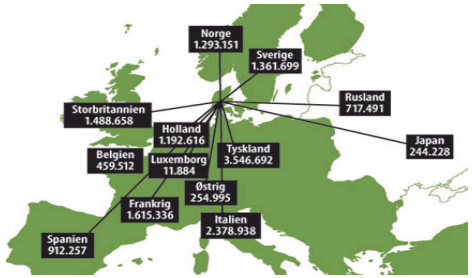


The RKSK-model increases the biogas potential in a given area



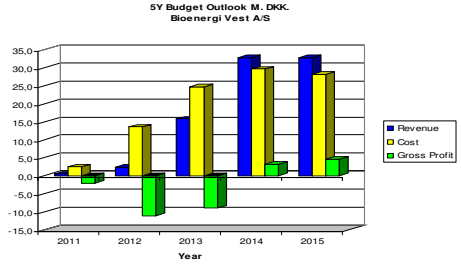


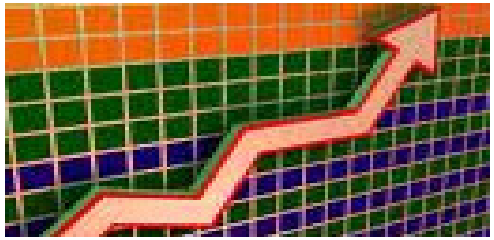


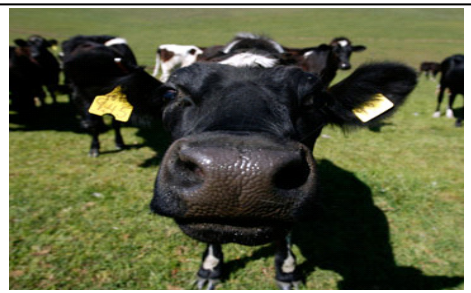


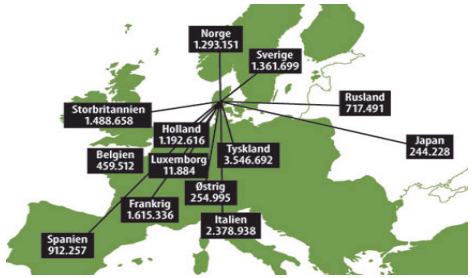
Reduced green house effect

BIOENERGI VEST

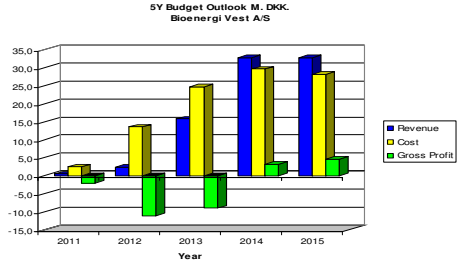


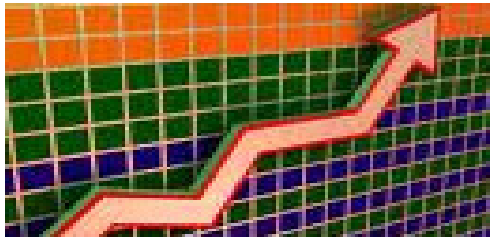


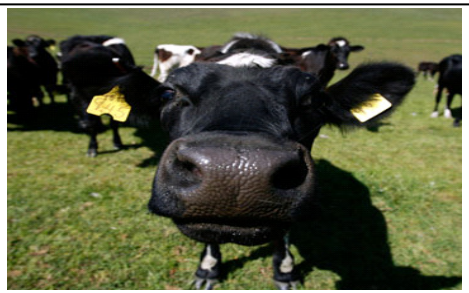


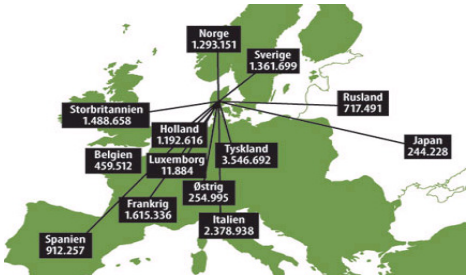


Biogas reduces the loss of nutrients' (N,P) and the CO_2 emission

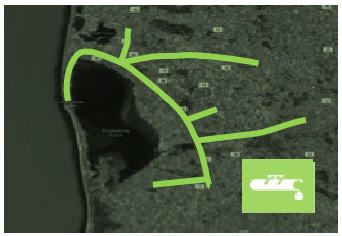








The decentralized biogas grid model become the European standard?



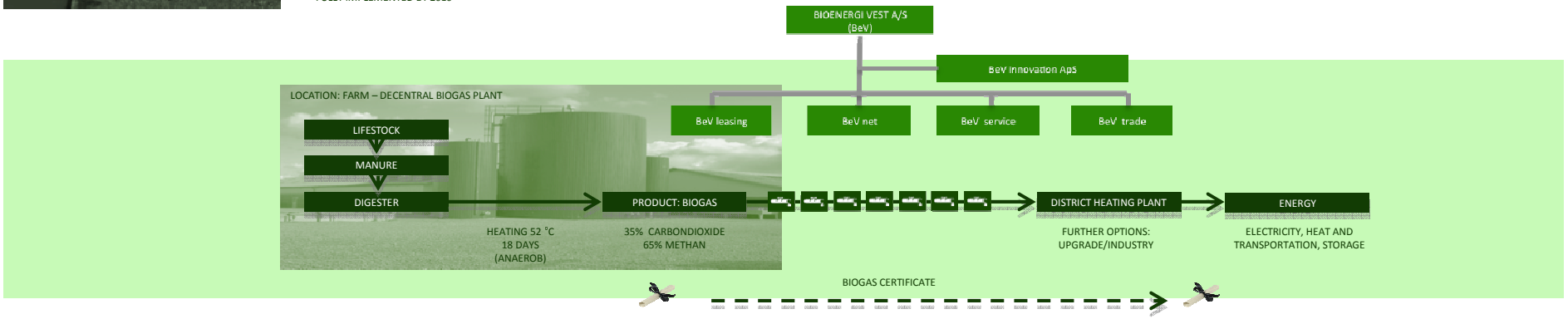
RINGKØBING-SKJERN BIOGAS MODEL

SYSTEM PRODUCTION CAPABILITIES:
80% OF THE TOTAL MANURE IS PROCESSED
5% OF THE AREABLE LAND USED FOR BIOENERGY CROPS
100 MIO. M^3 METHANE

SYSTEM SPECIFICATIONS:
200 KILOMERS BIOGAS PIPES
75 DECENTRAL BIOGAS PLANTS
1 CENTRAL BIOGAS PLANT (HANDLES SPECIAL BIOMASS)

COST
175 MIO. EURO
FULLY IMPLEMENTED BY 2016

ELECTRICITY, HEAT, TRANSPORTATION, FOR PRIVATE HOUSEHOLDS, INDUSTRY AND MUNICIPIALITY



\+ REDUCES MANURE TRANSPORTATION (95% WATER)

\+ PLANT NUTRITIONS ARE KEPT ON FARM THE BIOGAS PLANT WILL BE ABLE TO PRODUCE PLANT NUTRITIONS

\+ BIOGAS REDUCES LEACHING OF NUTRIENTS FROM MANURE DUE TO HIGHER UPTAKE IN PLANTS

\+ LOCAL PRODUCTION ENHANCES THE TOTAL BIOGAS POTENTIAL IN AN AREA

\+ MULTIPLE BIOGAS PLANTS SECURE BIOGAS PRODUCTION, DEMAND AND PRICE

\+ UTILIZES THE HEAT WHILE PRODUCING ELECTRICITY

\+ GREEN HOUSE EFFECTS ARE REDUCED BY FACTOR 22 PER CAPTURED METHANE MOLECULE

\+ DECENTRAL BIOGAS PRODUCTION POTENTIALLY CREATES 1600 NEW JOBS IN THE REGION

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For further information

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