



Lars Byberg, CEO Bioenergi Vest A/S

BIOENERGI VEST

#2

agenda



Biogas

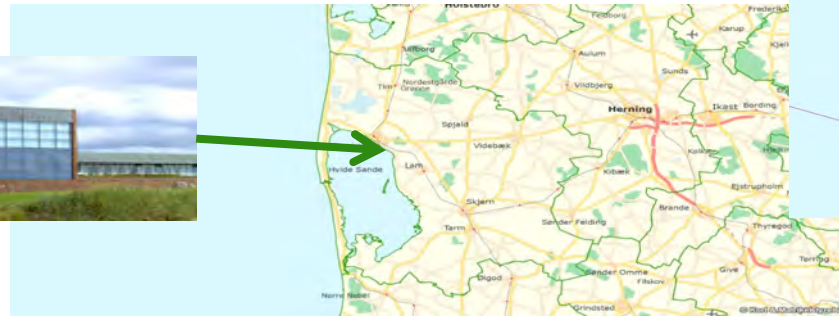
RKSK-Model

Bioenergi Vest



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Ringkøbing-Skjern Municipality



1.489 Km²

59.000 Citizens

Ringkøbing, Skjern, Hvide Sande, Tarm og Videbæk



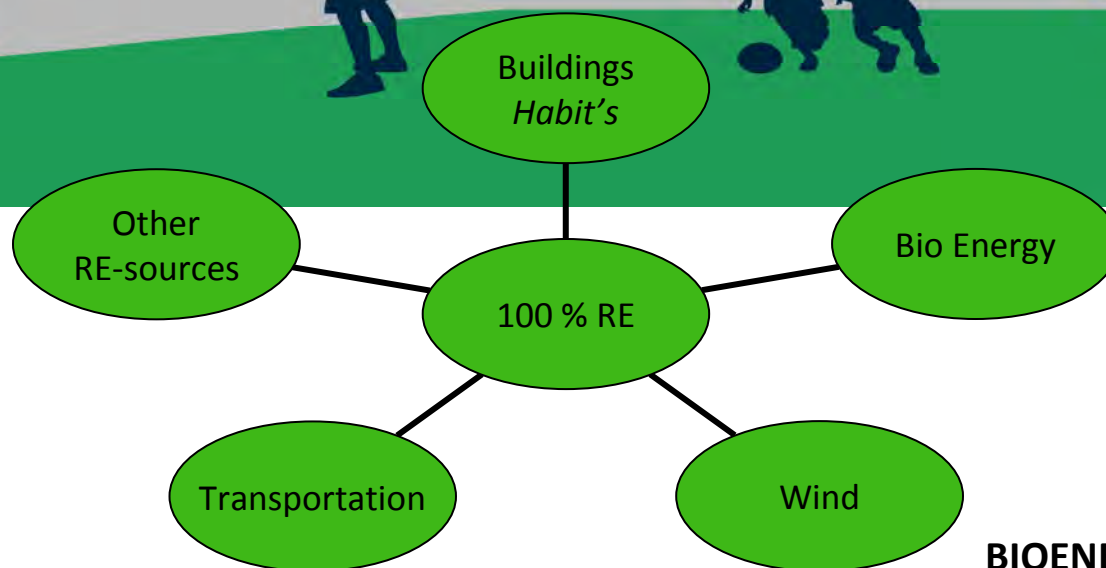
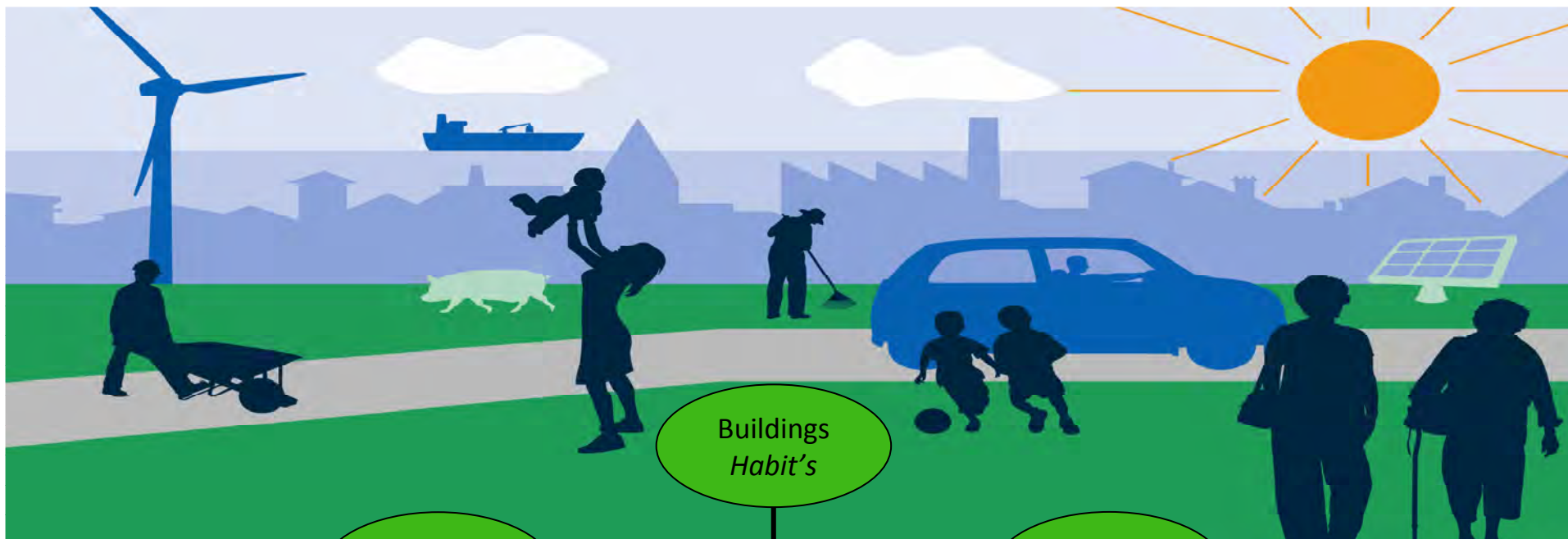
1000 cattle and pig farms
100.000 ha cultivated



Energi 2020

Ringkøbing-Skjern – 100 % vedvarende

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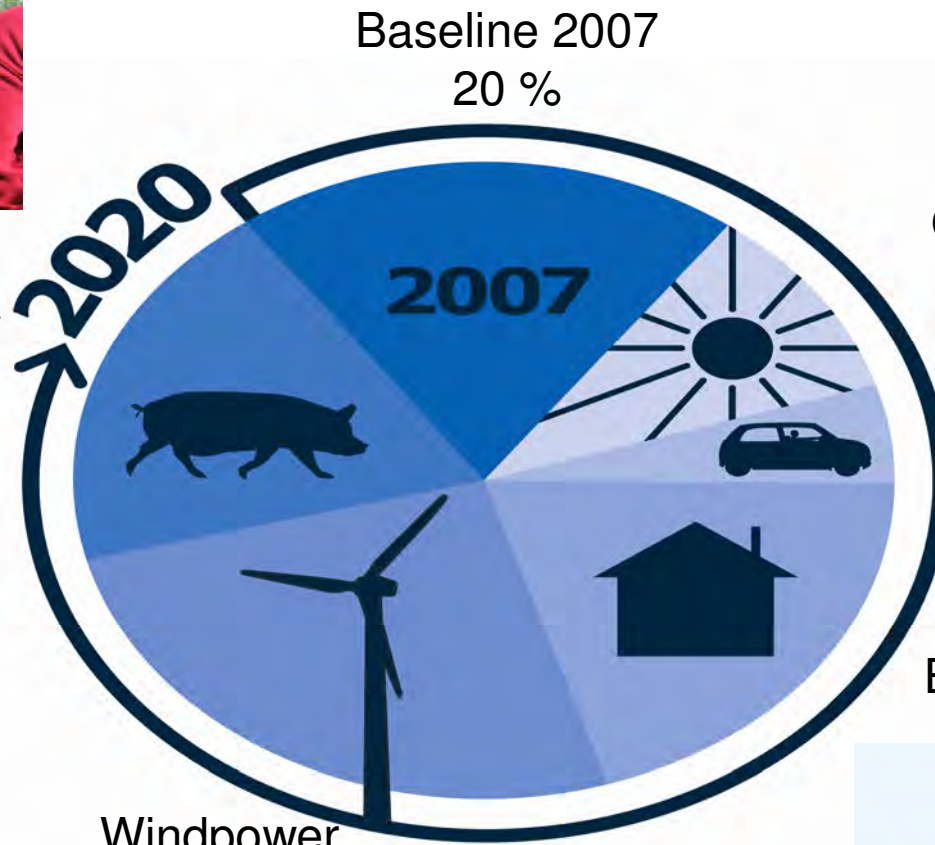
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Bio energy
15-25 %



Windpower
25-30 %



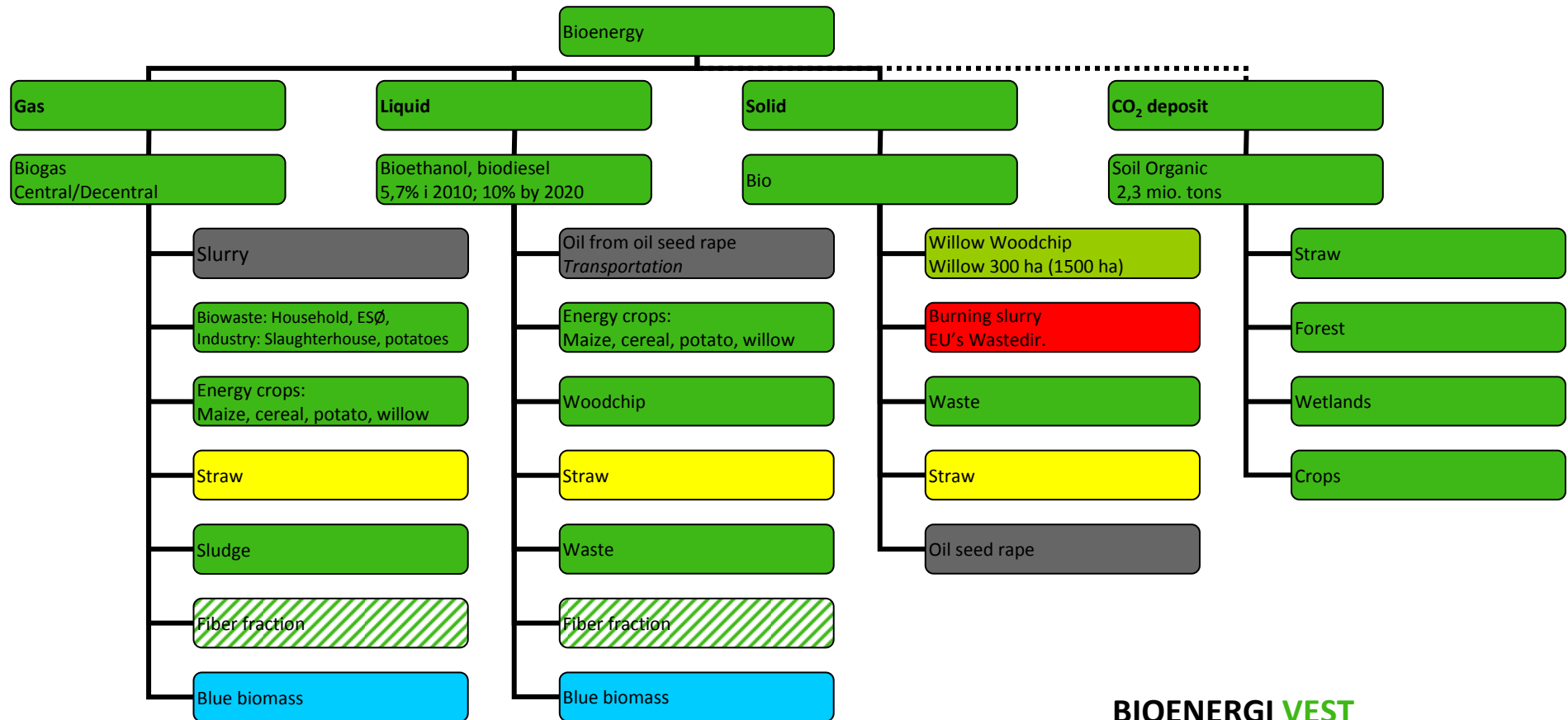
Other sources
10-25 %

Transportation
5-15 %

Buildings
10-20 %



Bioenergy mapping in Ringkøbing-Skjern Municipality



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Impact on emission of CO₂ 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 CO₂-ækv. pr. år

Virkemidler	Omfang	CH ₄ + N ₂ O	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

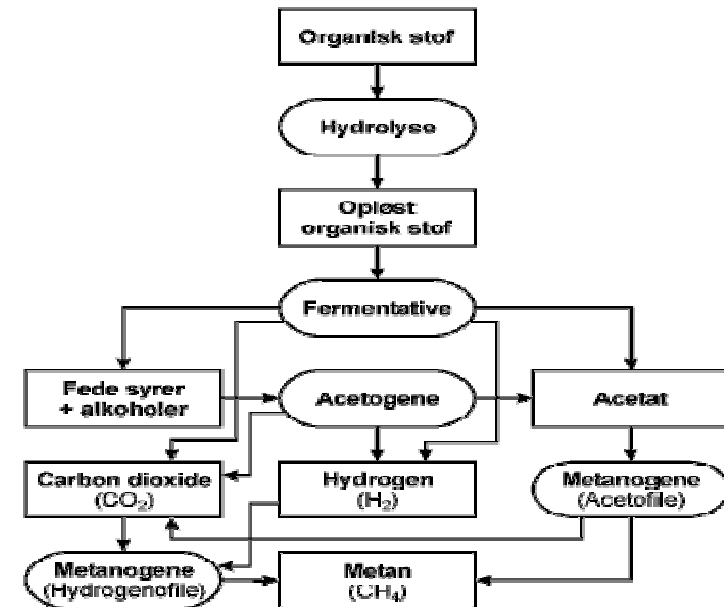
	Heat, Elec., Biofuel	Technology development level	Basis of raw material	Energy Yield	Centrale/Decentrale
Direct heating	H, E	***	***	***	C/D
Thermal gasification	H, E	**	***	***	C/D
Transformation to hydrogen	H, E, B	*	***	?	C/D
Biogas	H, E, B	***	***	**	D/C
Biomass to liquid	B	*	***	**	C
Raw plant oil	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 ressource"
Ministry of Food Jan 2008

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Biogas = 65 % CH₄ og 35 % CO₂

- Microorganisms spontaneously produce CH₄ 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

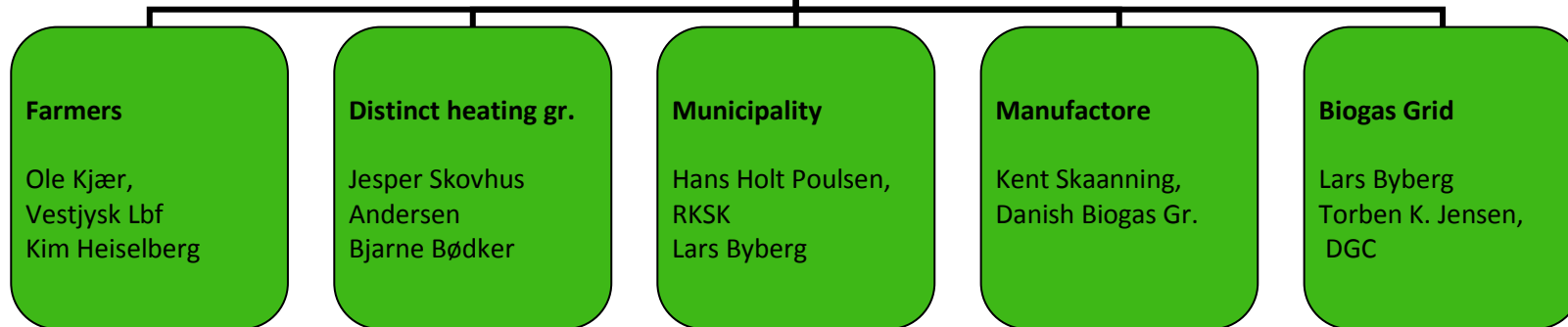
Project manager
Lars Byberg

Jesper Skovhus
Andersen
Bjarne Bødker

Ole Kjær
Kim Heiselberg

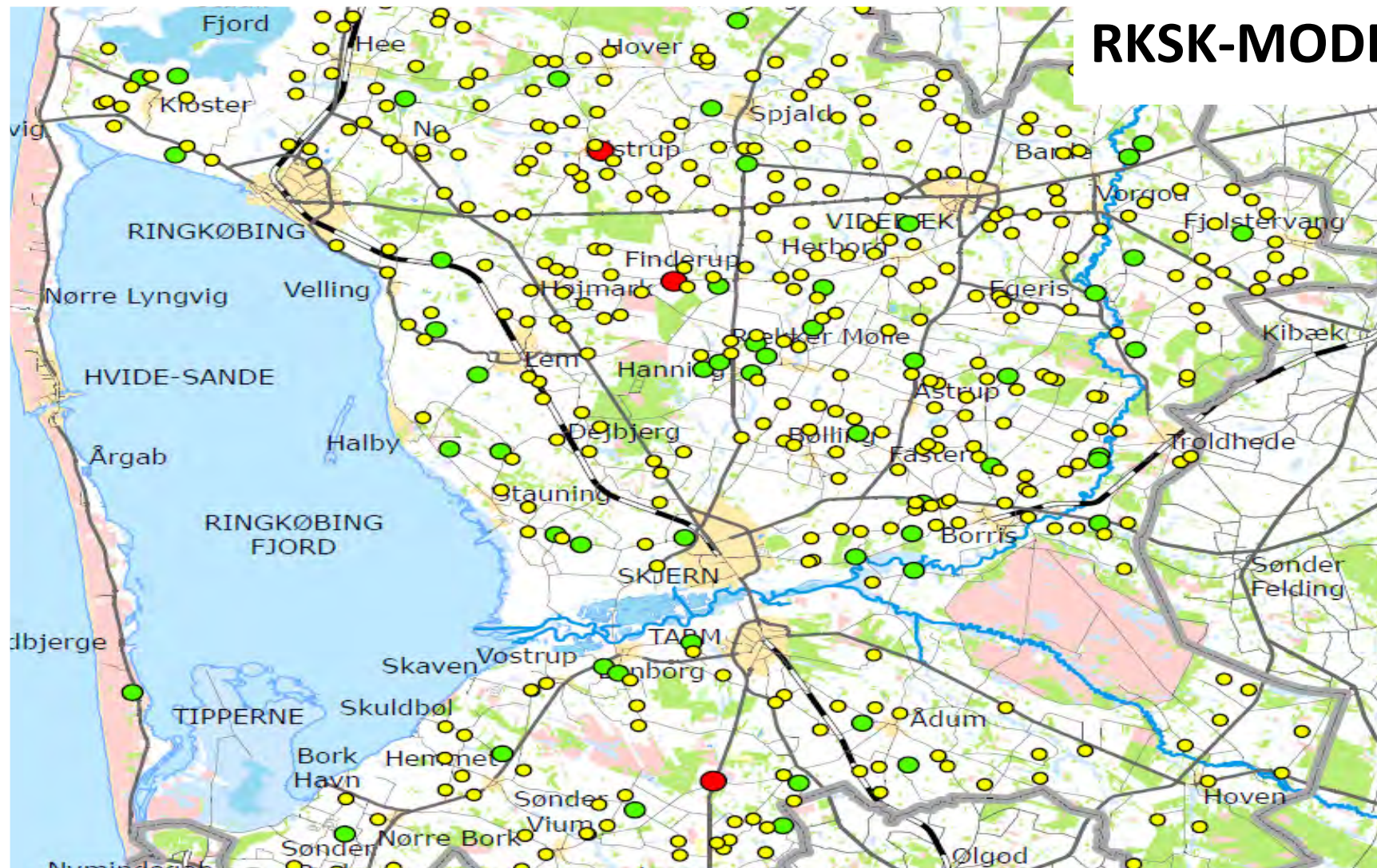
Knud Christensen
Niels Erik Kjærgård

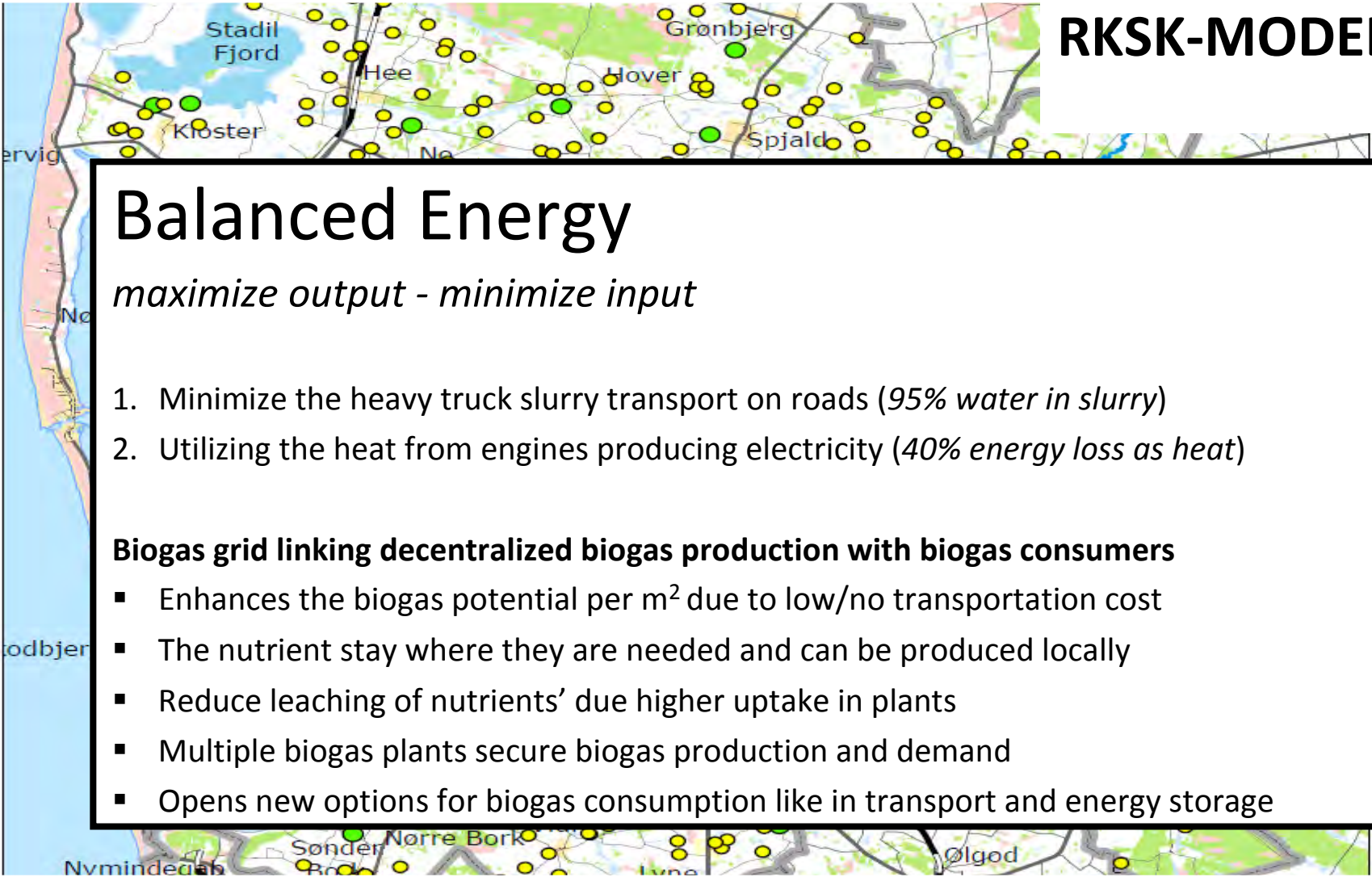
Goal:
Establish an energy and
economic sustainable
business model



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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 m² 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 m ³ CH ₄ /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 RSKS
- The Biogas potential is 60 mio. m³ CH₄ a year
 - Degasification of Slurry contributes with 30 mio. m³ CH₄ a year
 - Energy crops (corn) 30 mio. m³ CH₄ 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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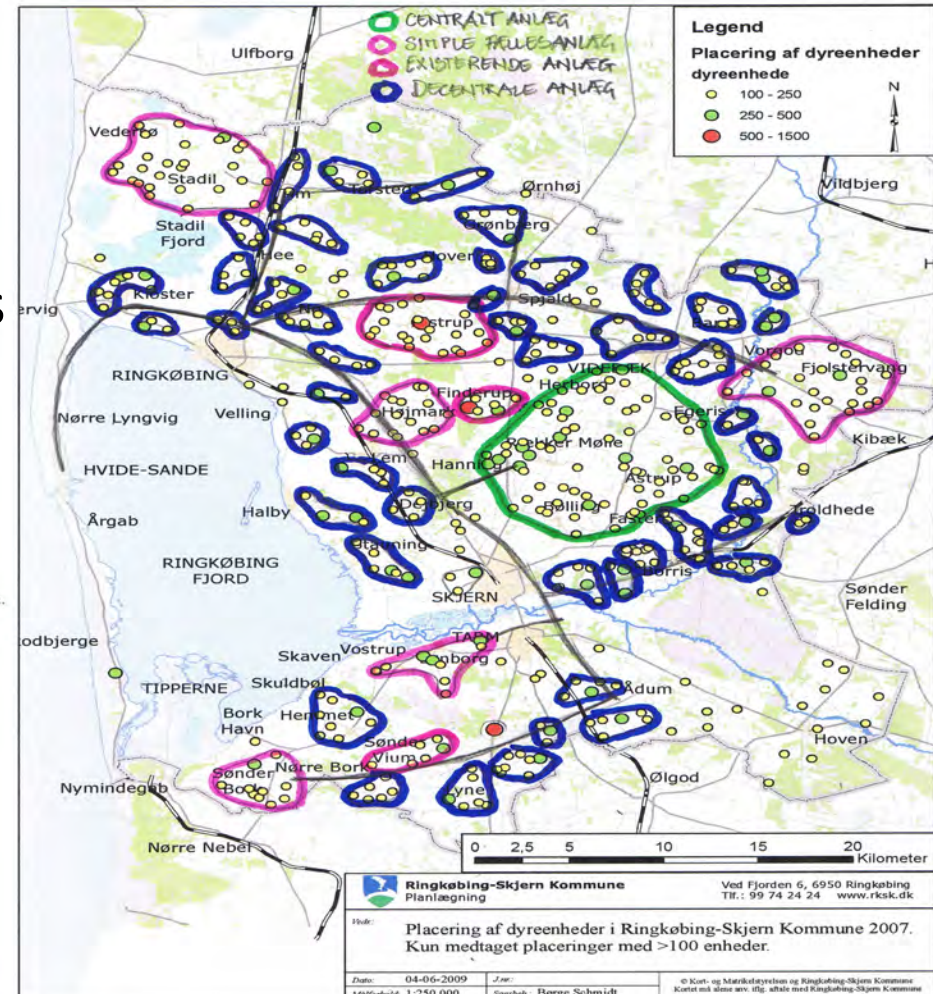
Back bone of the RKSK-Model

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

<i>100 mio m³ CH₄</i>	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.			

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Etape 1.

35 km grid *Lyne to Skjern*

5 biogas plants 1500 DE

5 mio m³ metan CH₄

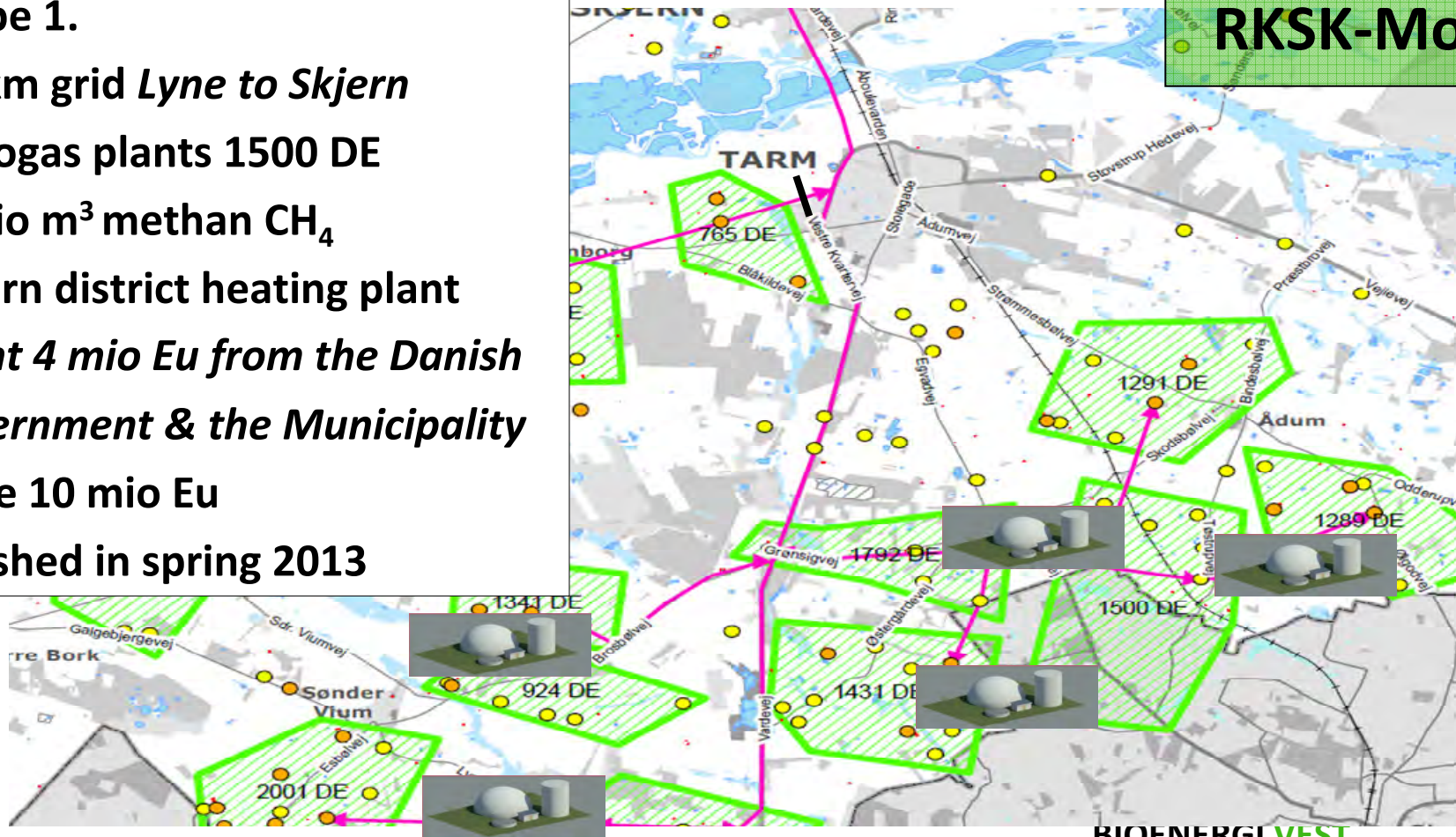
Skjern district heating plant

Grant 4 mio Eu from the Danish Government & the Municipality

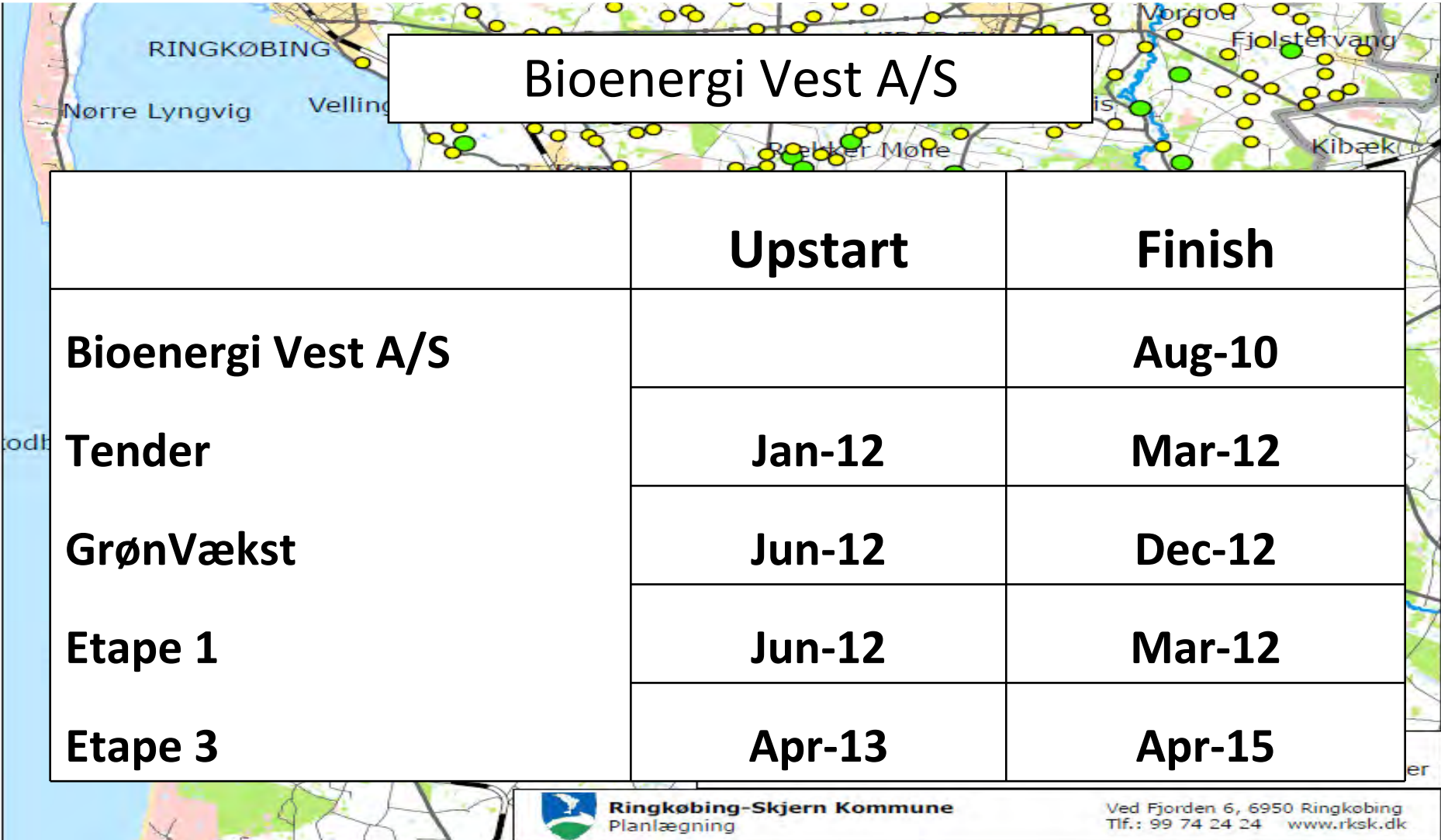
Price 10 mio Eu

Finished in spring 2013

RKSK-Model



BIOENERGI VEST



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



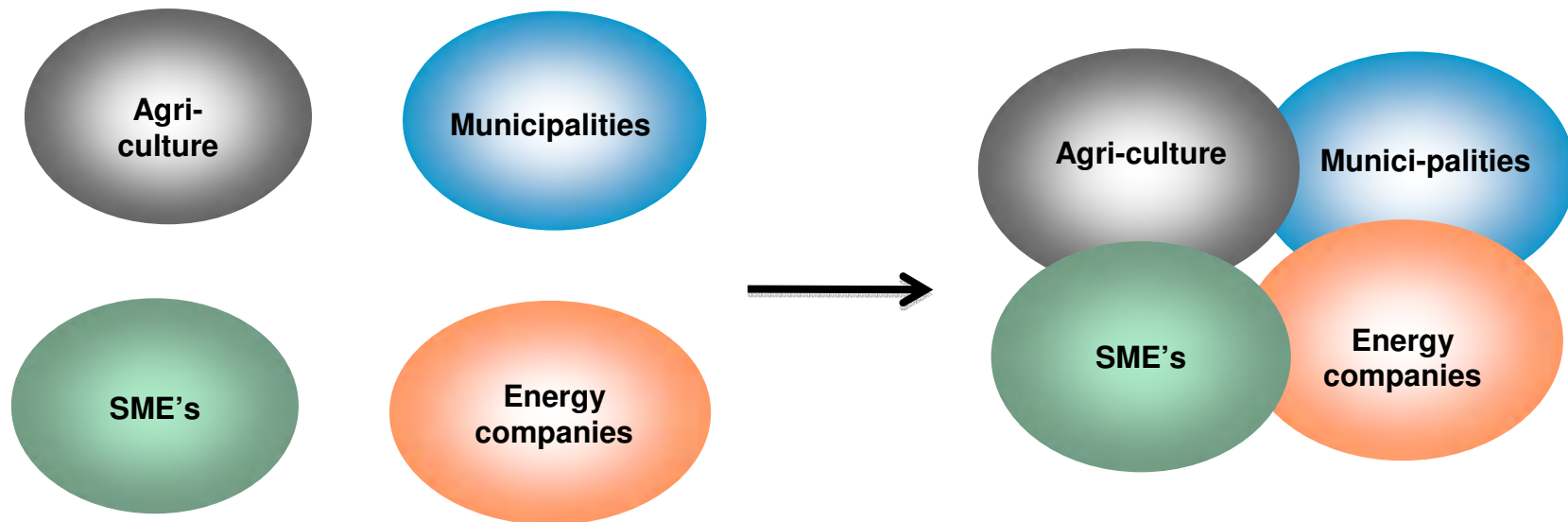
Ringkøbing-Skjern Kommune
Planlægning

Ved Fjorden 6, 6950 Ringkøbing
Tlf.: 99 74 24 24 www.rksk.dk

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- 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

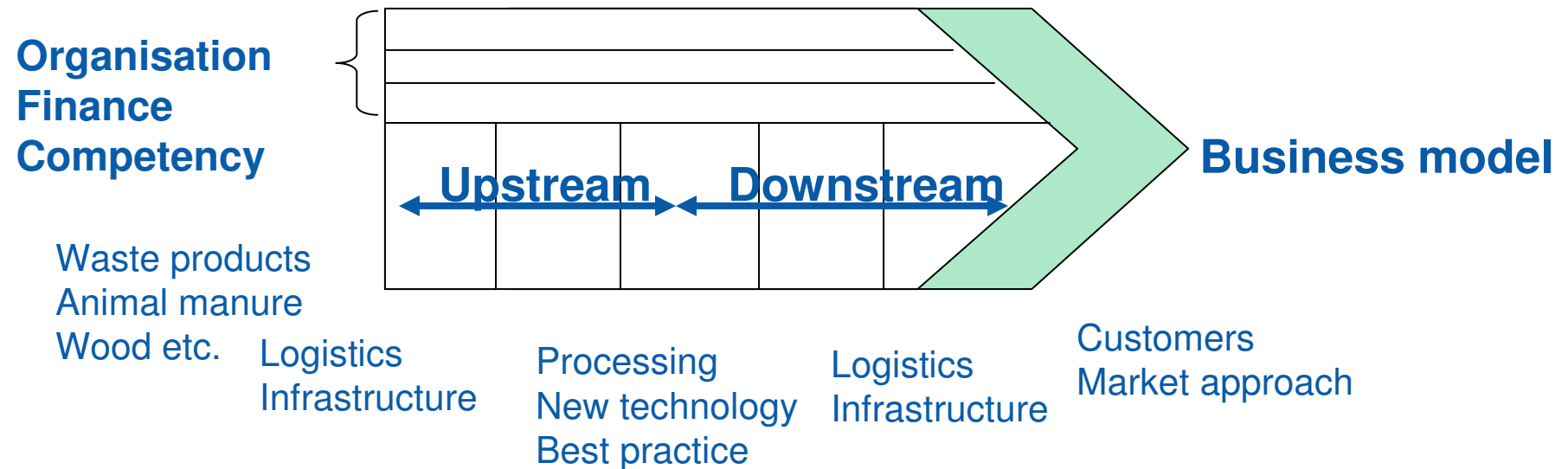


From: Uncoordinated players in the bioenergy field

To: Dialog, innovation and utilization of bioenergy

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The value chains of bioenergy

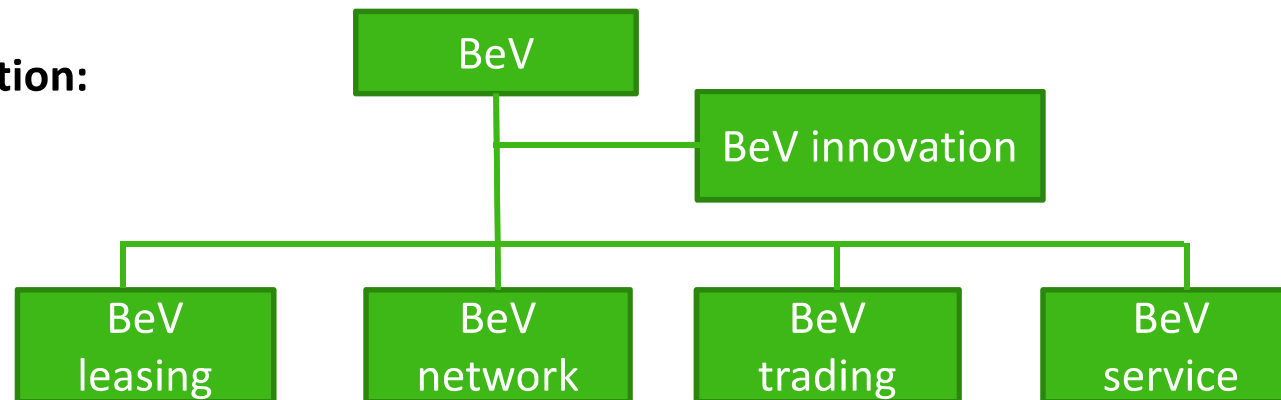


Organisation

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%)

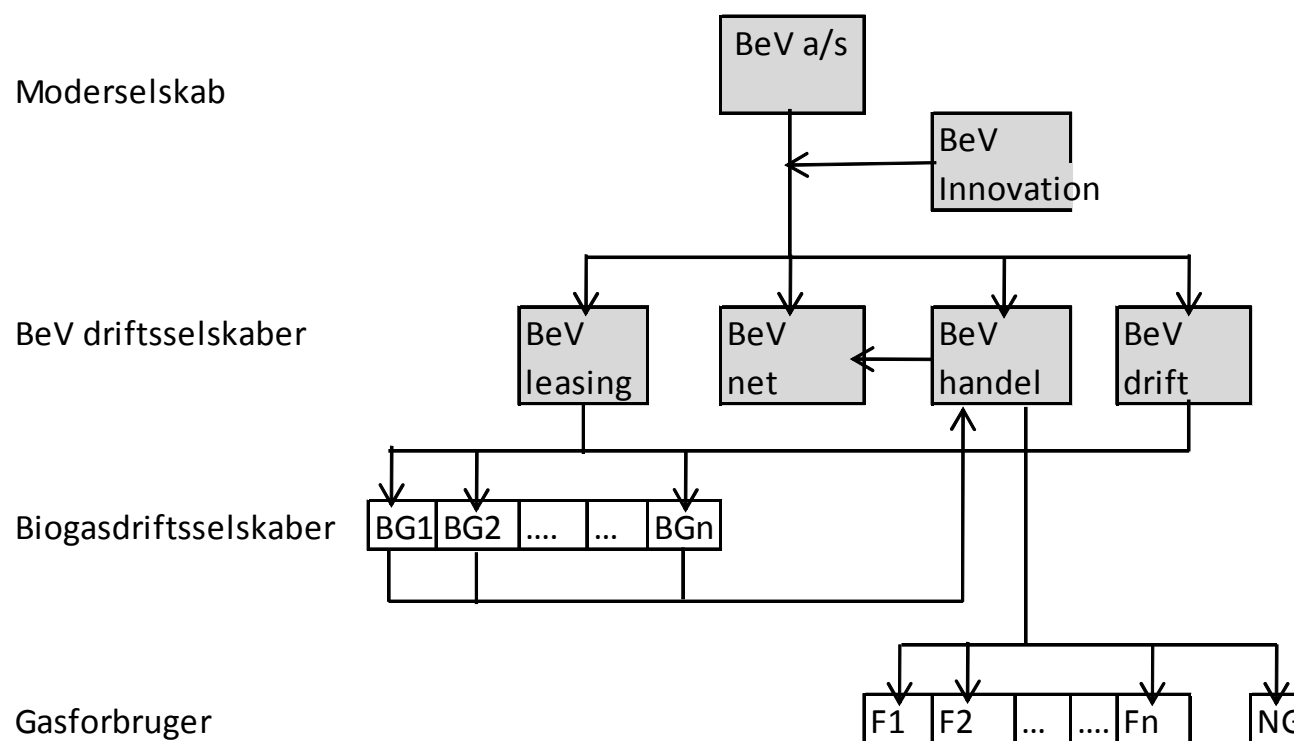
Board: Owners, representatives from District Heating Plants

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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 Buy 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



BIOENERGI VEST

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

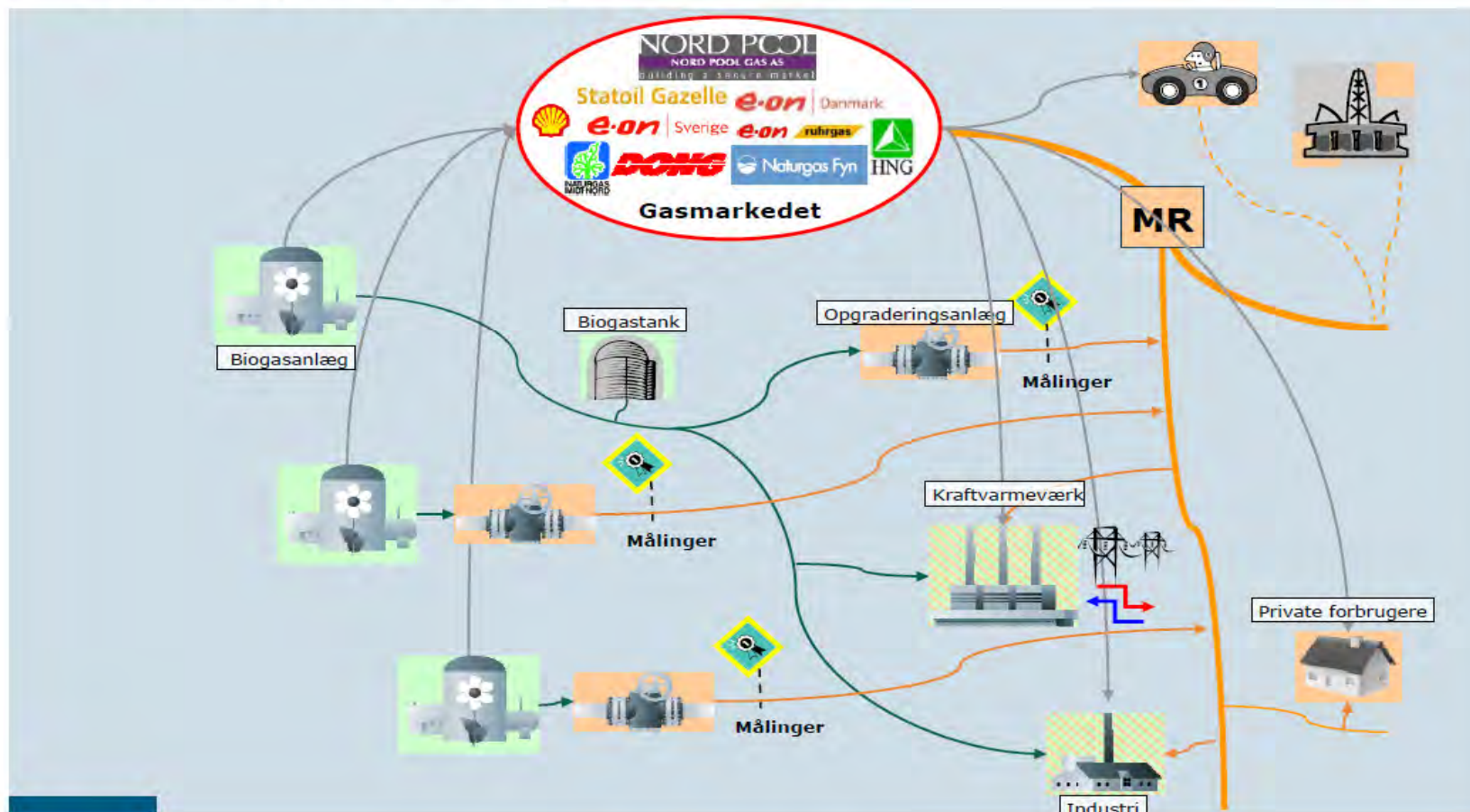
The objective of BeV innovation is to

- 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

Flere anlæg i V1.0 ...

ENERGINET/DK

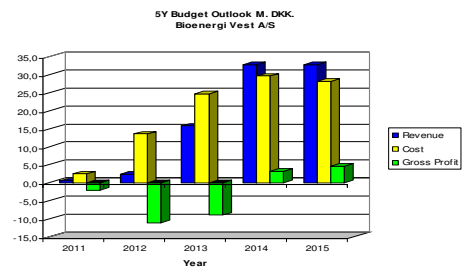




RKSK-model – the grid reduces transport & optimizes consumption – balanced energy

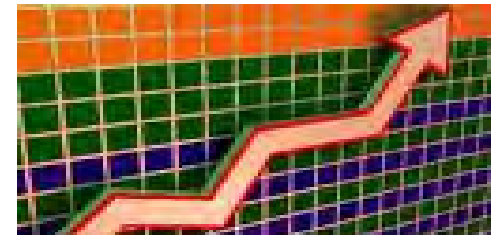
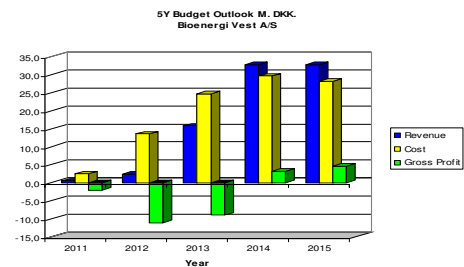


175 million EU – will make 59.000 people self-sufficient with gas



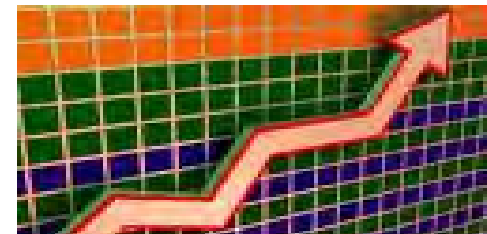
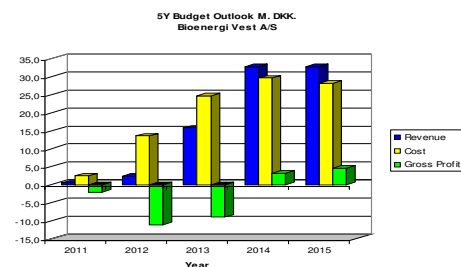
Solid profit after 3 years

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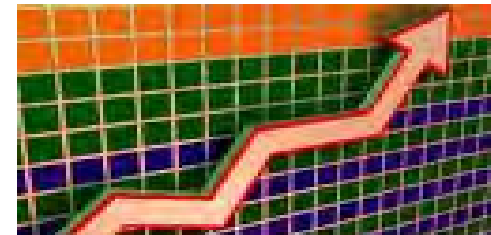
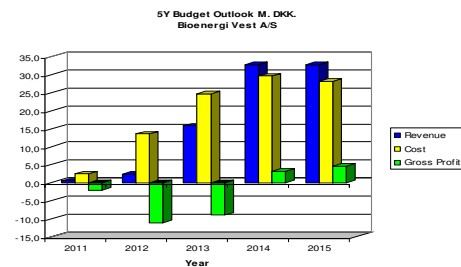
Future increase in demand on renewables

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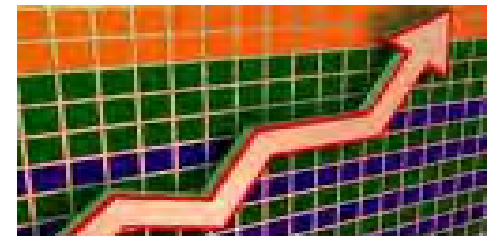
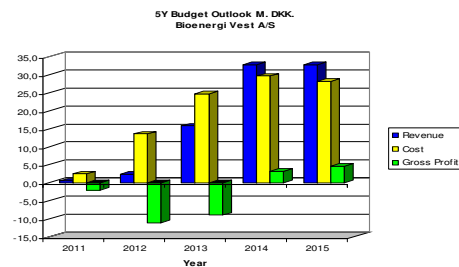


1600 new jobs in the region !!! (*Tyge Kjær, RUC, Denmark*)

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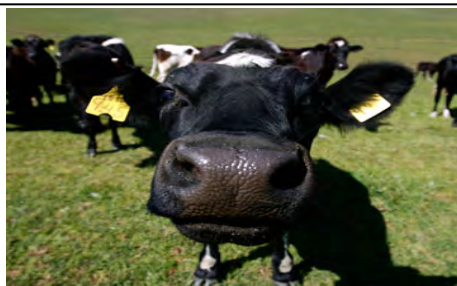
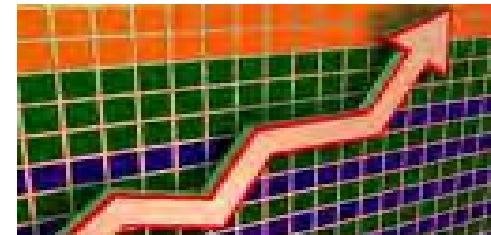
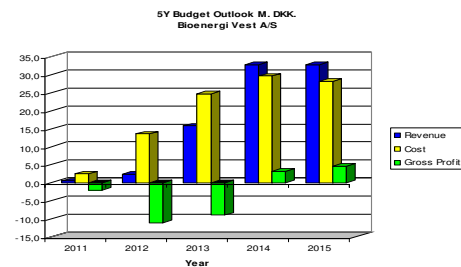


The RKSK-model increases the biogas potential in a given area

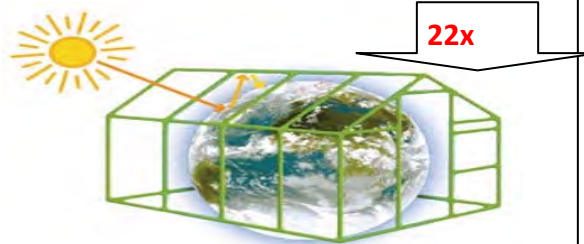
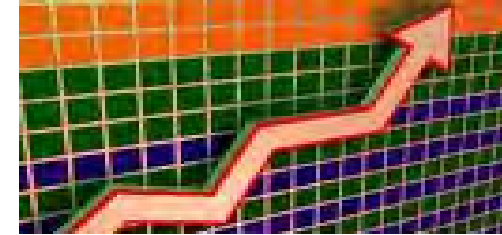
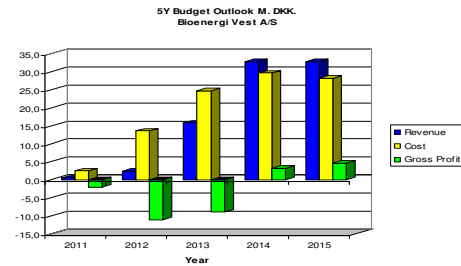


Reduced green house effect

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Biogas reduces the loss of nutrients' (N,P) and the CO₂ emission



The decentralized biogas grid model become the European standard?



RINGKØBING-SKJERN BIOGAS MODEL

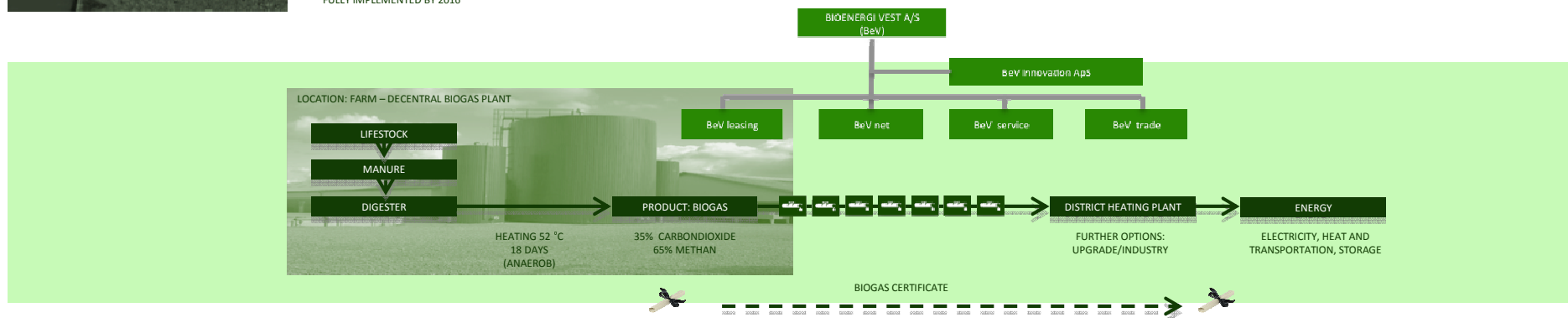
SYSTEM PRODUCTION CAPABILITIES:
 80% OF THE TOTAL MANURE IS PROCESSED
 5% OF THE AREABLE LAND USED FOR BIOENERGY CROPS
 100 MIO. M³ METHANE

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

OF THE TOTAL ENERGY CONSUMPTION
25%

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



+
 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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