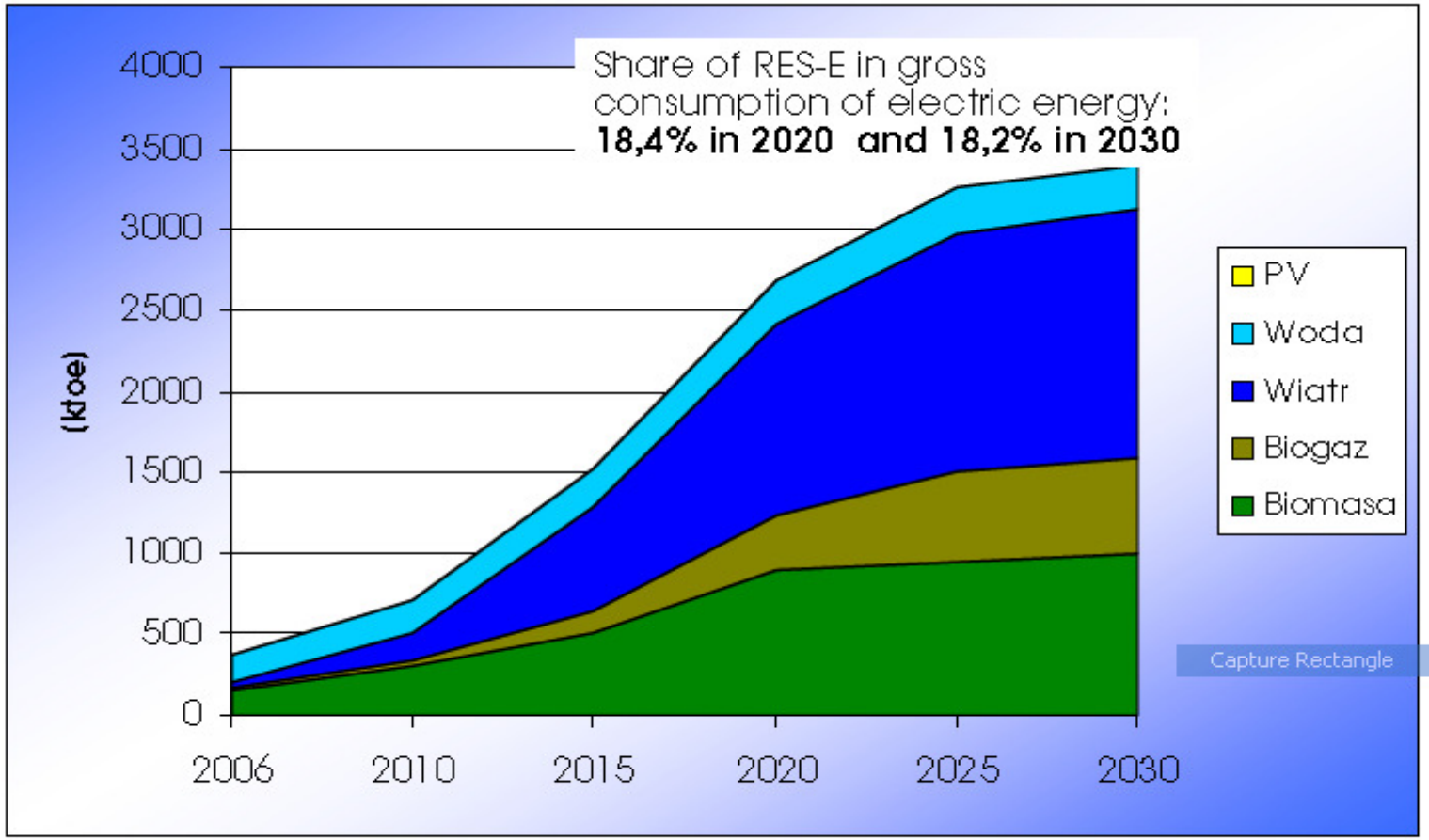

CEERES: Changing Waste to Energy
Putting Your Investment on the Renewable Energy Trend Line
Central and Eastern Europe Renewable Energy Solutions Sp. z o.o.

POLISH BIOGAS GROWTH



IEO, Status and Prospective of Development of Renewable energy in Poland, November 2009 (POLEKO).

POLISH PROJECTED GROWTH FOR 2020

The total renewable energy sector will grow by 7% each year up to 2020, the deadline for EU targets.

BIOGAS in Poland will grow at 30% per year.

Source:Polish Renewable Energy Institute(2009)

LEFT: The New Energy Reality? The Frito Lay plant in New England (USA), now energy independent due to biogas from its wastes.

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BIODEGRADABLES: OUT OF LANDFILLS

According to the Article 16 of the Act of 27 April 2001 on waste (J. of L. No. 62, item 628 with later amendments) gminas are responsible for municipal waste management. They must ensure conditions for reduction of quantity of biodegradable municipal waste going to landfills:

* by 31st December 2010 – biodegradable municipal waste must be reduced to 75% of the totalamount of biodegradable municipal waste produced in 1995
* by 31st December 2013 – biodegradable municipal waste must be reduced to 50% of the total amount of biodegradable municipal waste produced in 1995
* by 31st December 2020 – biodegradable municipal waste must be reduced to 35% of the total amount of biodegradable municipal waste produced in 1995.

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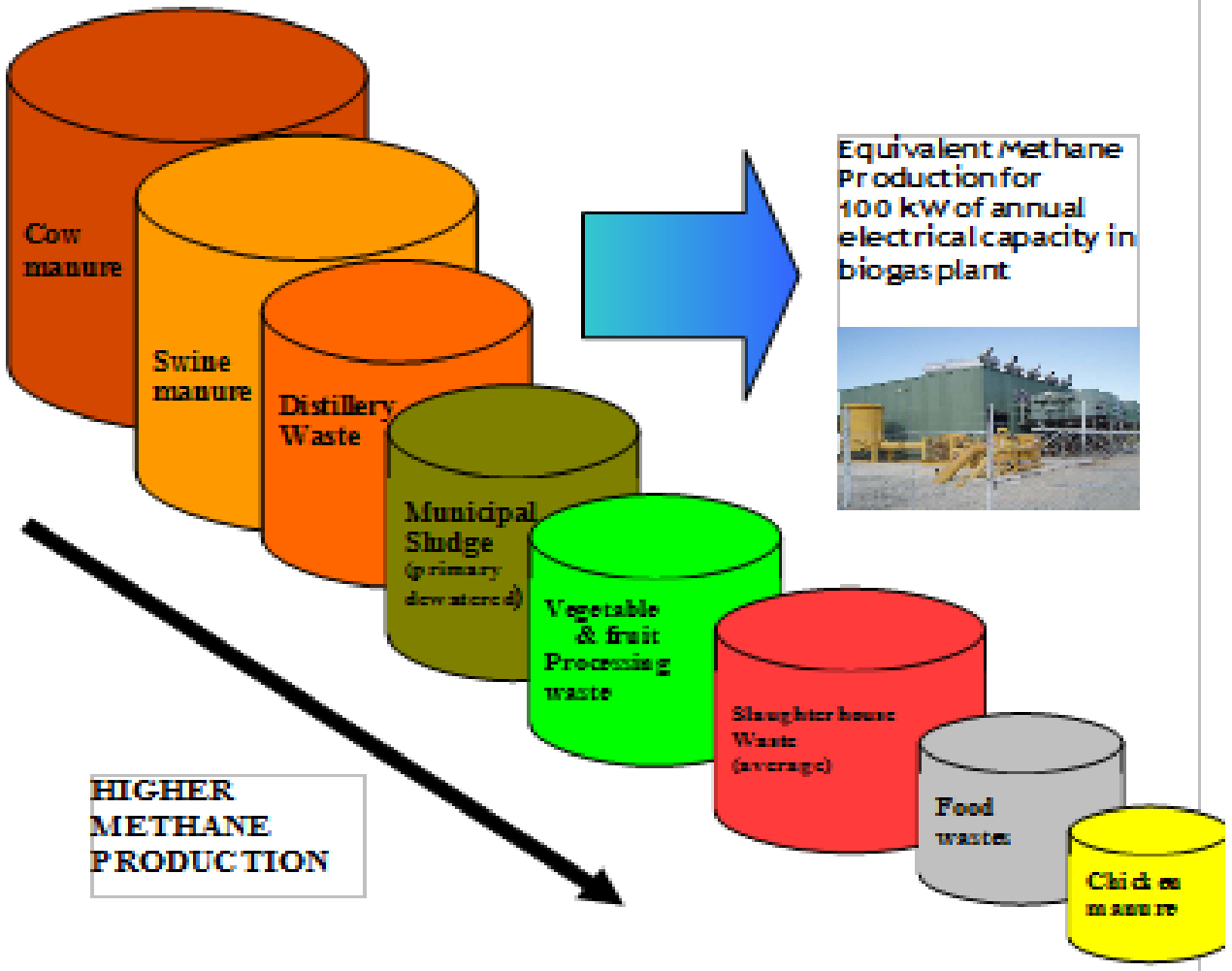
ENERGY VALUE OF VARIOUS WASTES AS BIOGAS SUBSTRATES @



Swine manure @ 16m3/ton ,	14,000 tons = 100 kW
Cow manure @ 18m3/ton	12,000 tons = 100 kW
Distillery @ 30 m3/ton	7,300 tons = 100 kW
Potato waste @ 39m3/ton	5,600 tons = 100 kW
Municipal sludge @ 50-80m3/ton	4,400 tons = 100 kW
Vegetable/fruit canning/pickling @ 100m3/ton	2,200 tons = 100 kW
Slaughterhouse @ 100m3/ton	2,200 tons = 100 kW
Household food waste @120 m3 CH4/ton	1,800 tons = 100 kW
Chicken manure @ 130 m3/ton	1,700 tons = 100 kW

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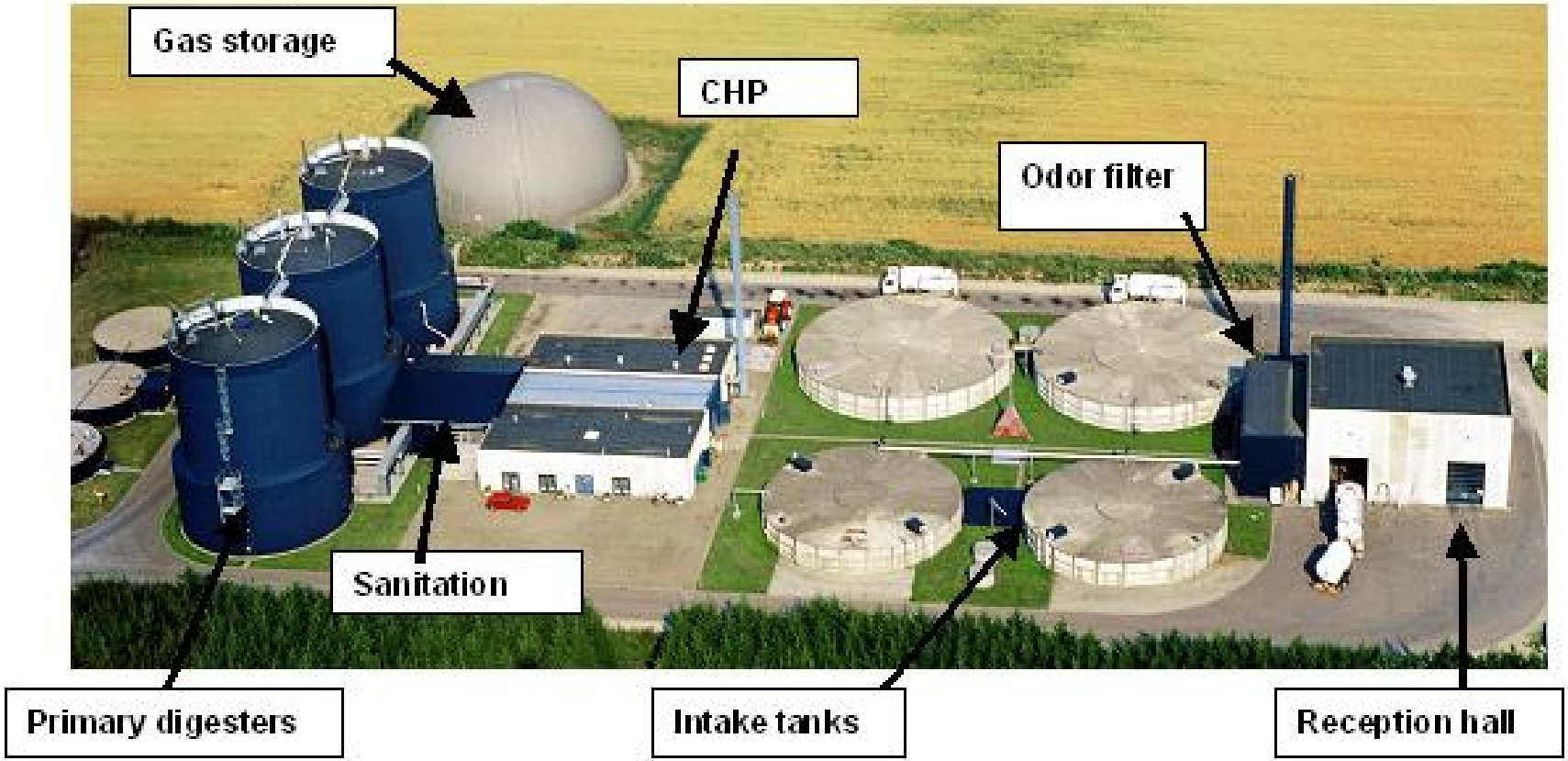
How a Biogas Plant Works

Lemvig Biogas plant (Denmark) 2.5 MW



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ODOR REDUCTION: QUANTIFIED

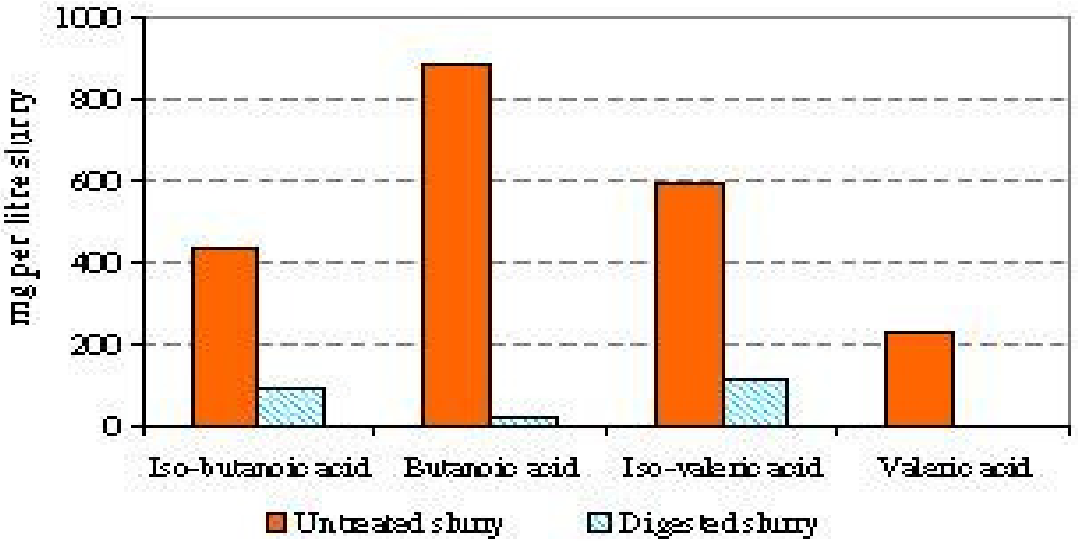

Figure 6.3. Concentrations of four very bad smelling volatile fatty acids in untreated and digested slurry

PROBIOGAS 2007

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Composition of Digestate

Table 1. Typical digestate (*Source: Nordberg & al., 2002*)

Parameter	Digestate Linkoeping
Total solids [%]	4,5
Volatile solids [%TS]	75
pH	8,1
Total-N [kg/m^3]	7,2
Ammonia-N [kg/m^3]	4,9
P [kg/m^3]	0,7
K [kg/m^3]	1,0
Pb [mg/kgTS]	<5,0
Cd [mg/kgTS]	0,12
Cu [mg/kgTS]	71
Cr [mg/kgTS]	5,7
Hg [mg/kgTS]	<0,05
Ni [mg/kgTS]	5,2
Zn [mg/kgTS]	309

Precise composition will vary with substrates. These levels are generally typical of the Danish plants. Several EU countries have detailed digestate standards for fertilizer application. Germany uses about 10 million tons a year of digestate as fertilizer.

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DIGESTATE QUALITY

By reducing the supply of nitrogen in mineral fertiliser a reduction in nitrate leaching can be expected. The specific reduction is dependent on the autumn and winter cover of the fields, the soil type etc. In general a reduction in nitrate leaching of 0.33 kg nitrate-N per kg reduction in nitrogen in mineral fertiliser was used in the evaluation of the second Danish environmental protection plan.

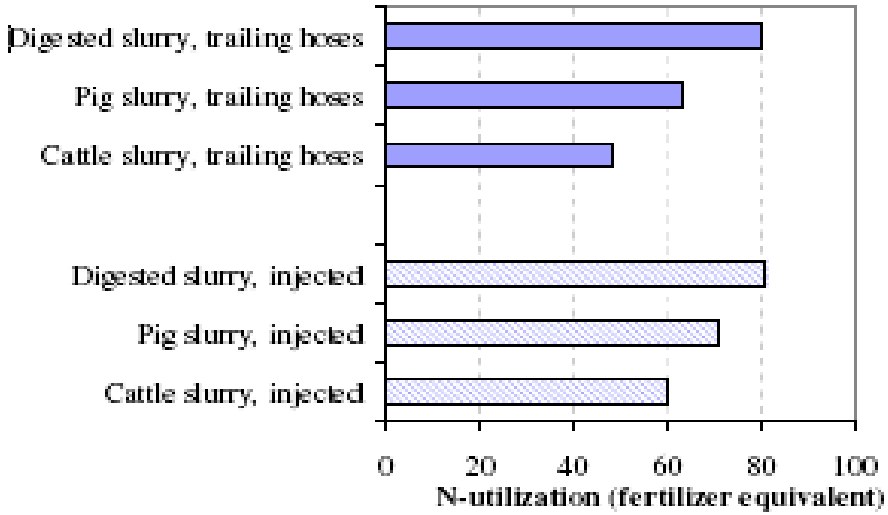

Figure 6.2. Utilization of nitrogen in digested slurry compared with pig and cattle slurry in field trials at Danish Agricultural Advisory Service. Average of 11 trails with digested slurry, 15 trials with pig slurry and 15 trials with cattle slurry

Digestate fertilizer use: ProBiogas, EC (2007).

Management Team

R.Mott*: 30 years in environmental and energy field

L. Baadstorp: 30 years in biogas projects worldwide; past President of Danish Biomas Association

Ole Bang: 30 years waste-to-energy; Denmark and EU.

S. Hamilton: 500 projects, top-rated waste eng. firm by Engineering News; biogas feasibility studies for World Bank

Blabjerg biogas plant, Denmark

Thorso biogas plant, Denmark

Studsgaard biogas plant, Denmark

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INCENTIVES FOR SITE OWNERS

CEERES offers enormous incentives for plant owners and local govts to collaborate with us on biogas:

- Drastic reduction in their waste disposal costs/best alternative for food waste
- Reduction of their electric& heating bill;
- Odor control - 80-90% reduction;
- Green public relations opportunity.

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BIOGAS MUST BE DONE INTELLIGENTLY

GERMAN CAPEX TOO MUCH.

PL range 12-20 mil PLN/MW. CEERES at 11-15 mil PLM/MW, but with sanit. And odor control

WRONG MODEL

WITH TWICE LEVEL OF POLISH SUBSIDIES. But average size only 350 kW.

Michael Kottner, director of German Biogas Institute, September 10 ,2008, Sofia Bulgaria.

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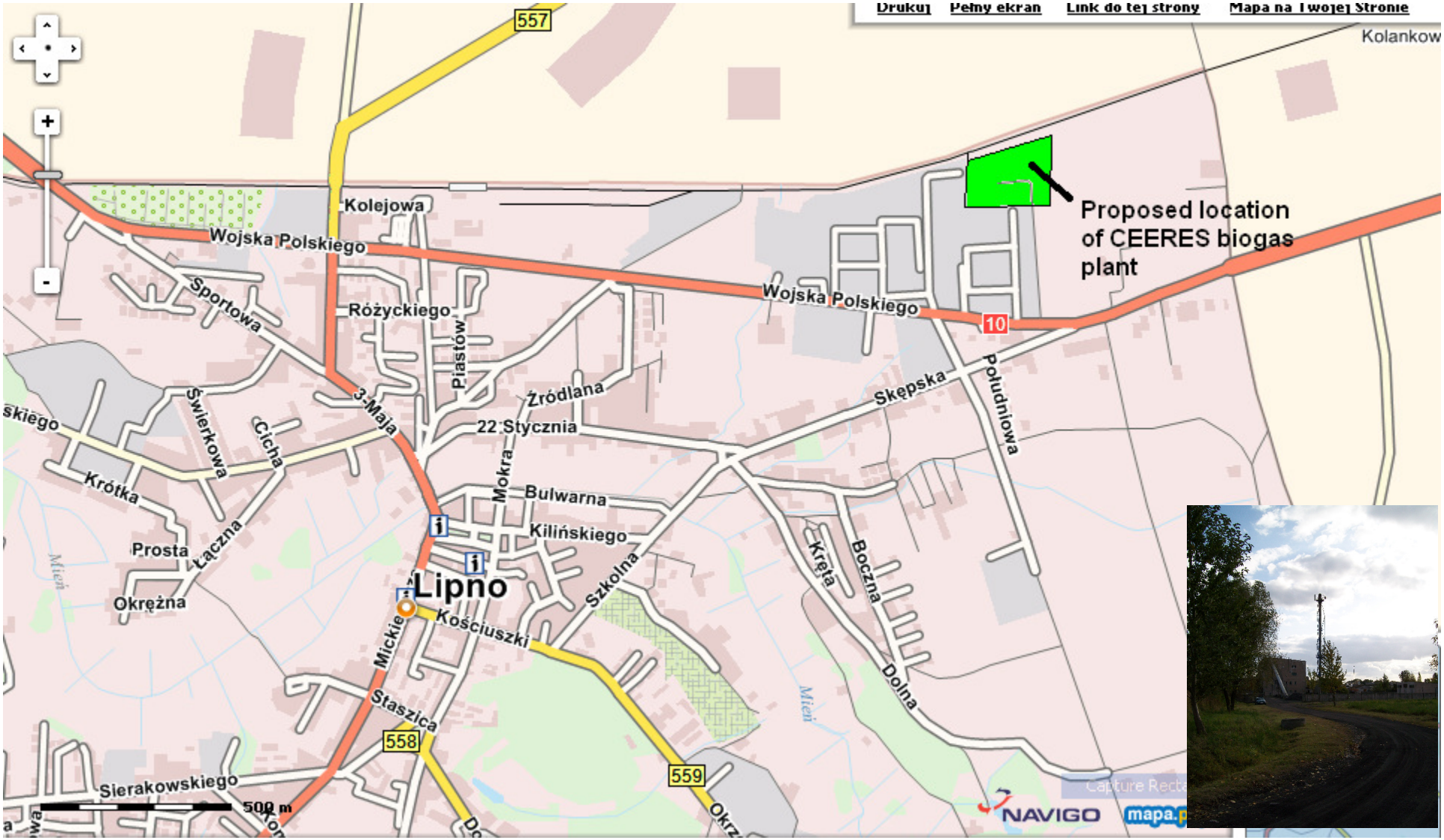
LIPNO BIOGAS PROJECT



SIEDLCE BIOGAS PLANT

4 million m3 CH4 direct use in current 10 MW natural gas CHP. Substrates: chicken slaughterhouse, distillery, dairy, communal wastes.

THANK YOU FOR YOUR TIME!

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