Iowa Farm Bureau Seminar

February 28, 2007

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The news view

" Pump enough CO2 into the sky, and the last part per million of greenhouse gas behaves like the 212th degree Fahrenheit that turns a pot of water into a plume of billowing steam. Melt enough Greenland ice, and you reach the point at which you're not simply dripping meltwater into the sea but dumping whole glaciers" (p.34)

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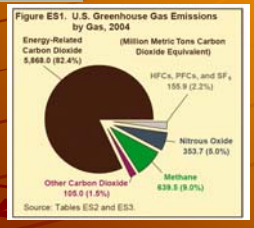
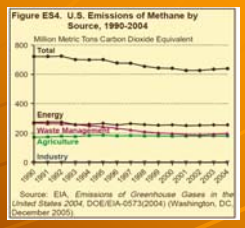
The scientist view: Greenhouse Gas Emissions





- The majority of greenhouse gas emissions are energy-related carbon dioxide emissions
- The majority of methane emissions are also caused by energy-related activities

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The Administration's view

- President George Bush stated in his 2006 State of the Union address: "Keeping America competitive requires affordable energy. And here we have a serious problem. America is addicted to oil, which is often imported from unstable parts of the world. The best way to break this addiction is through technology"
- He went out to say that we must develop renewable alternatives alternatives to gasoline and diesel fuel.

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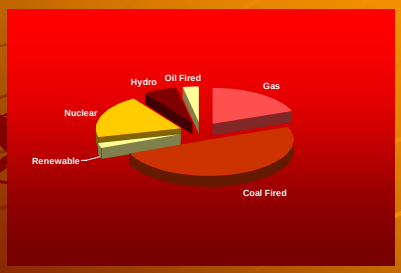
The reality



Data: Energy Information Administration

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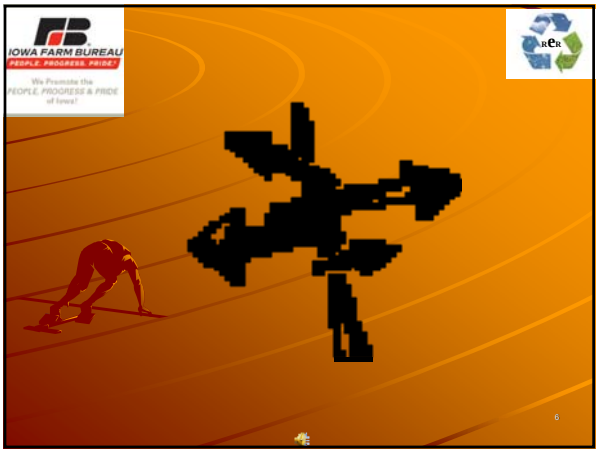

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Challenge and Possible Solutions

Conventional Ethanol

8 Meg

At 118 MMbtu/hour
800K to 1 Million

Ex Cap 87 125 Million

Modified to save energy

4 Meg

At 5 MMbtu/hour
50 K

Ex Cap 87 Million

Linkogas Amba

Co-operative owned by 60 farmers

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Linkogas Amba - with BIOREK® plant

Cattle slurry	275	tonnes/day	100,000	tonnes/year
Pig slurry	205	tonnes/day	75,000	tonnes/year
Other biomass	125	tonnes/day	45,000	tonnes/year
Totally	605	tonnes/day	220,000	tonnes/year

Biogas production	9.6 mill.	Nm^3/year
Digester capacity (4 x 2400 m^3)	9600	m^3
Process temperature (thermophilic)	52	°C
Gas storage capacity	5000	m^3
Utilisation of biogas	Gas engines 3 x 1 MW, CHP-generation + gas boiler	
Biomass transport vehicle	1 x 20 m^3 and 2 x 30 m^3 vacuum tankers	
Separation equipment	Decanter centrifuge, ultrafilters, ammonia stripper, RO	

Contractor	BIOSCAN A/S
Engineering	BIOSCAN A/S
Operation start-up/Rebuilt	1990/1999/2004

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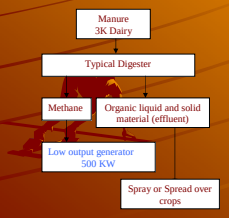
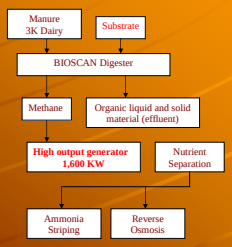
Current Solution



Proposed



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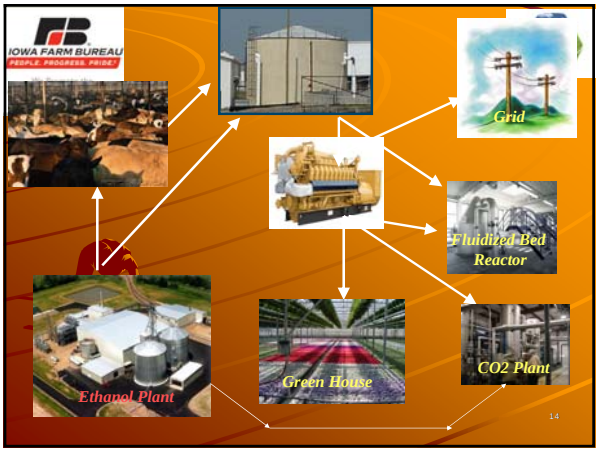

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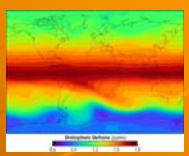
The GWP of Methane

- A methane molecule is able to absorb a much greater percentage of heat energy radiated from the earth than a CO2 molecule
- Therefore, one unit of methane contributes more to global warming than an equal unit of CO2.
- Because of this, the GWP of methane is given a GWP rating of 23 given a 100 year time-horizon



Methane concentrations in the Stratosphere

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Crediting Rate of Methane

- Methane's greater GWP is reflected in the crediting rate of methane in comparison to CO2
- One carbon credit= one metric ton of CO2
- Methane has a crediting rate on the Chicago Climate Exchange (CCX) of 18.25 metric tons of carbon dioxide per ton of methane combusted

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Potential Credits

- The current (CCX) value for one carbon credit is $4.55 (as of 7/5/2006)
- One 3516 generator can burn 1458 tons of methane/yr
- 1458 tons/yr x 18.5 credit rate = 26,973 carbon credits per generator/yr
- One 3516 generator has the potential to produce **$122,2727** in carbon credits
- One 3520 generator can burn 2141 tons of methane/yr
- 2141tons/yr x 18.5 credit rate = 39,609 carbon credits per generator/yr, or **$180,221**

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What if….

- We became open to new ideas and new technology
- We are environmentally driven and fiscally responsible …. all at the same time
- Work with DNR, IFB, Government, Industries, and others to create a business model that works for everyone

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