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Agricultural Biomass for Energy in Minnesota: Trends and Future

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Fueling the Future: The Role of Woody Biomass for Energy Workshop

April 29, 2009

St. Cloud

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Ag. Biomass for Energy in Minnesota: Trends and Future

By: Mark Lindquist Biofuels Program Manager

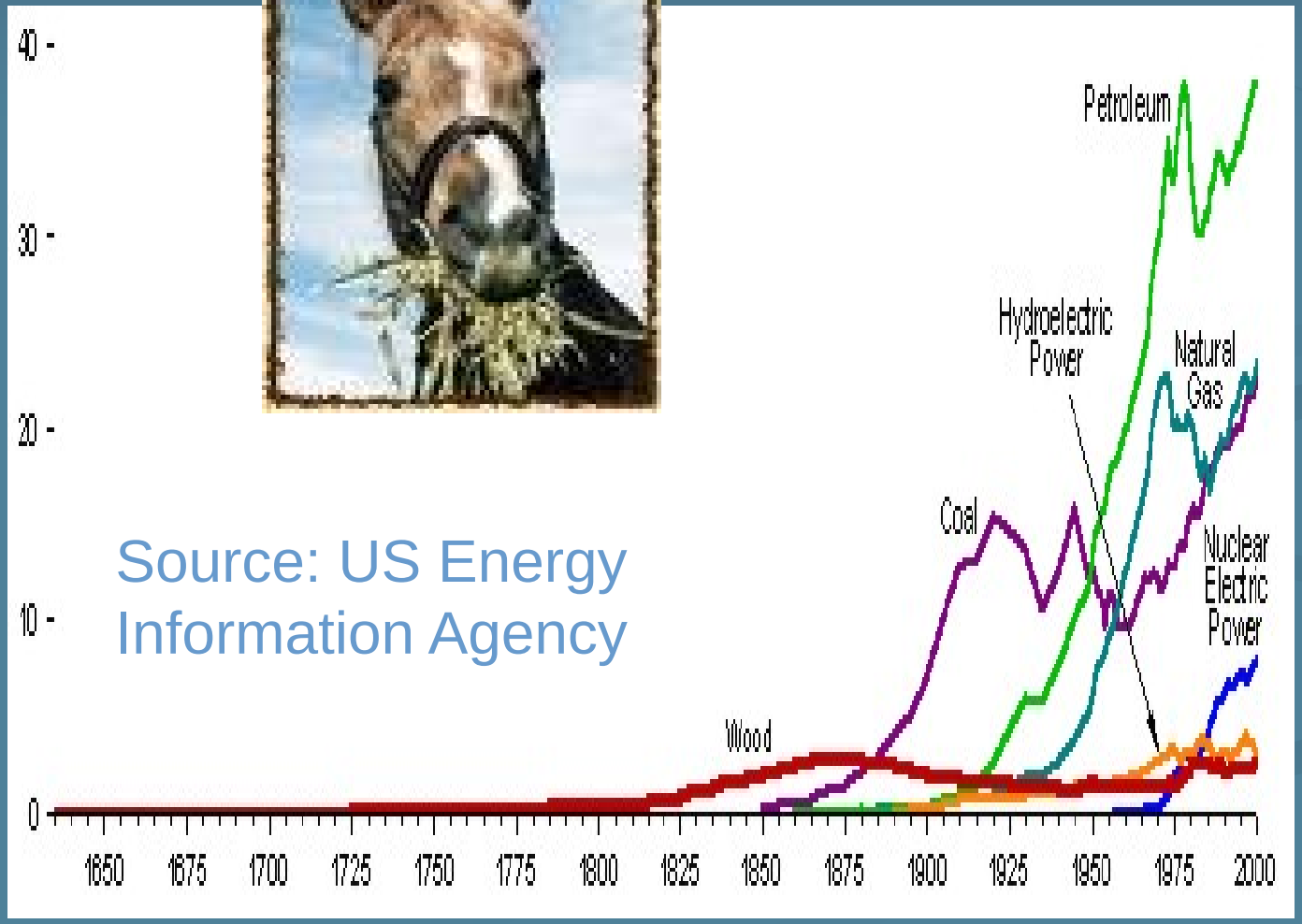
To: *Fueling the Future: The Role and Use of Biomass for Energy*

April 29, 2009

DNR Mission

- Work with citizens to conserve/manage state's natural resources
- Provide outdoor recreation opportunities
- Provide for commercial uses of natural resources to create sustainable quality of life

Biomass – Always a part of the energy system



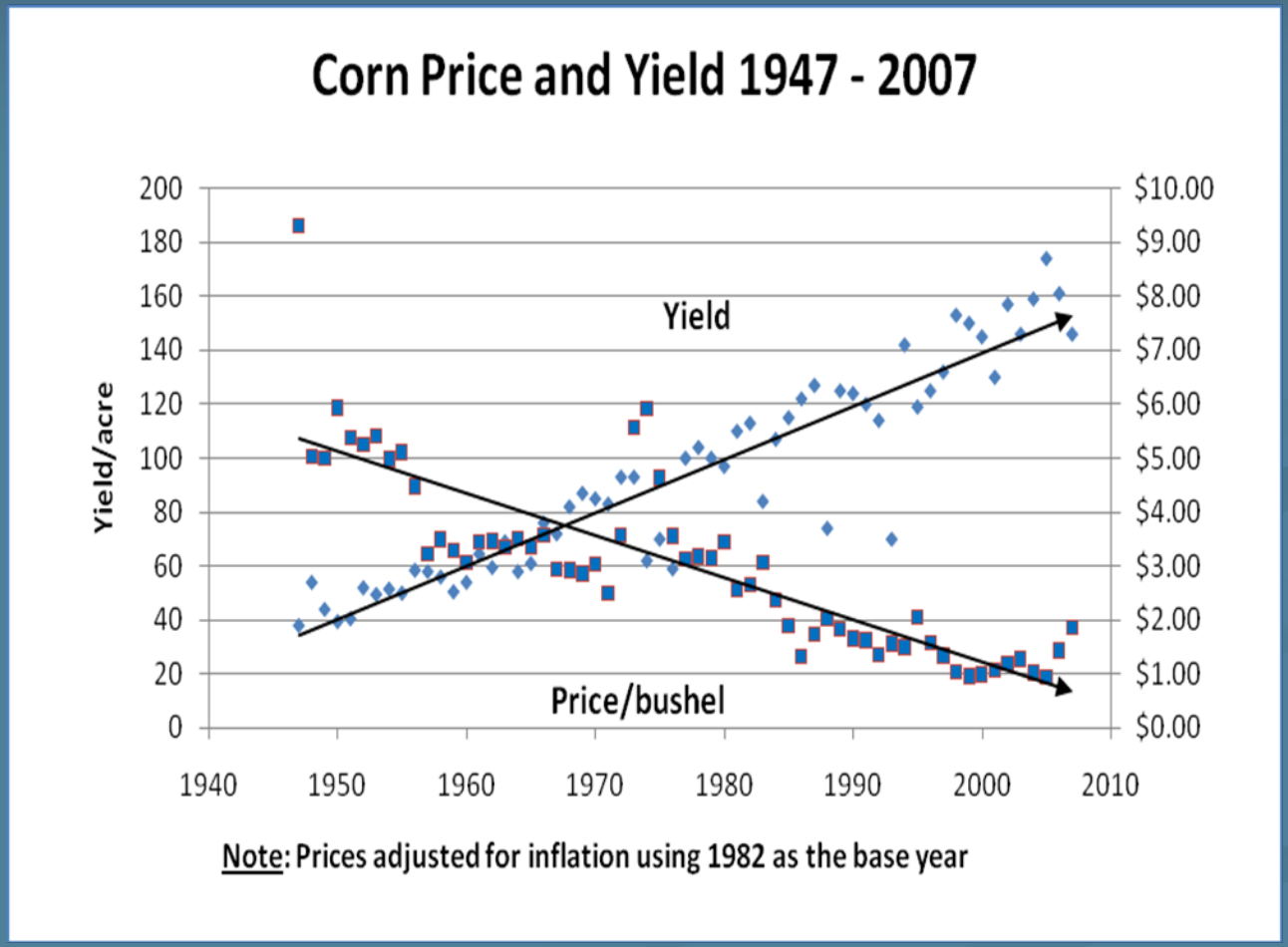
Source: US Energy Information Agency

Agricultural Biomass Utilization

First Generation Biofuels – Policy Driven

- Ethanol: 850 million gallons capacity
  - ~310 million bushel
  - ~5 ¾ million ton, accounting for distillers grains
  - ~250 million plus idle capacity
- Biodiesel
  - ~63 million gallons cap.
  - ~123,000 tons vegetable oil
  - ~30 million gallons idle capacity

Long term Corn Productivity



Biomass – Well-Defined Development Path

Feedstock

- Corn

→

Technology

- Dry Mill Ethanol Plant

→

Market

- Gasoline extender

Future Driving Factors

- Long term price trends for oil and gas
- Federal cellulosic fuel standard
- State and federal renewable electric standards.
- Greenhouse gas regulations
- Sustainability concerns
- Farm program structure

Biomass – Ill-Defined Development Path

Feedstock

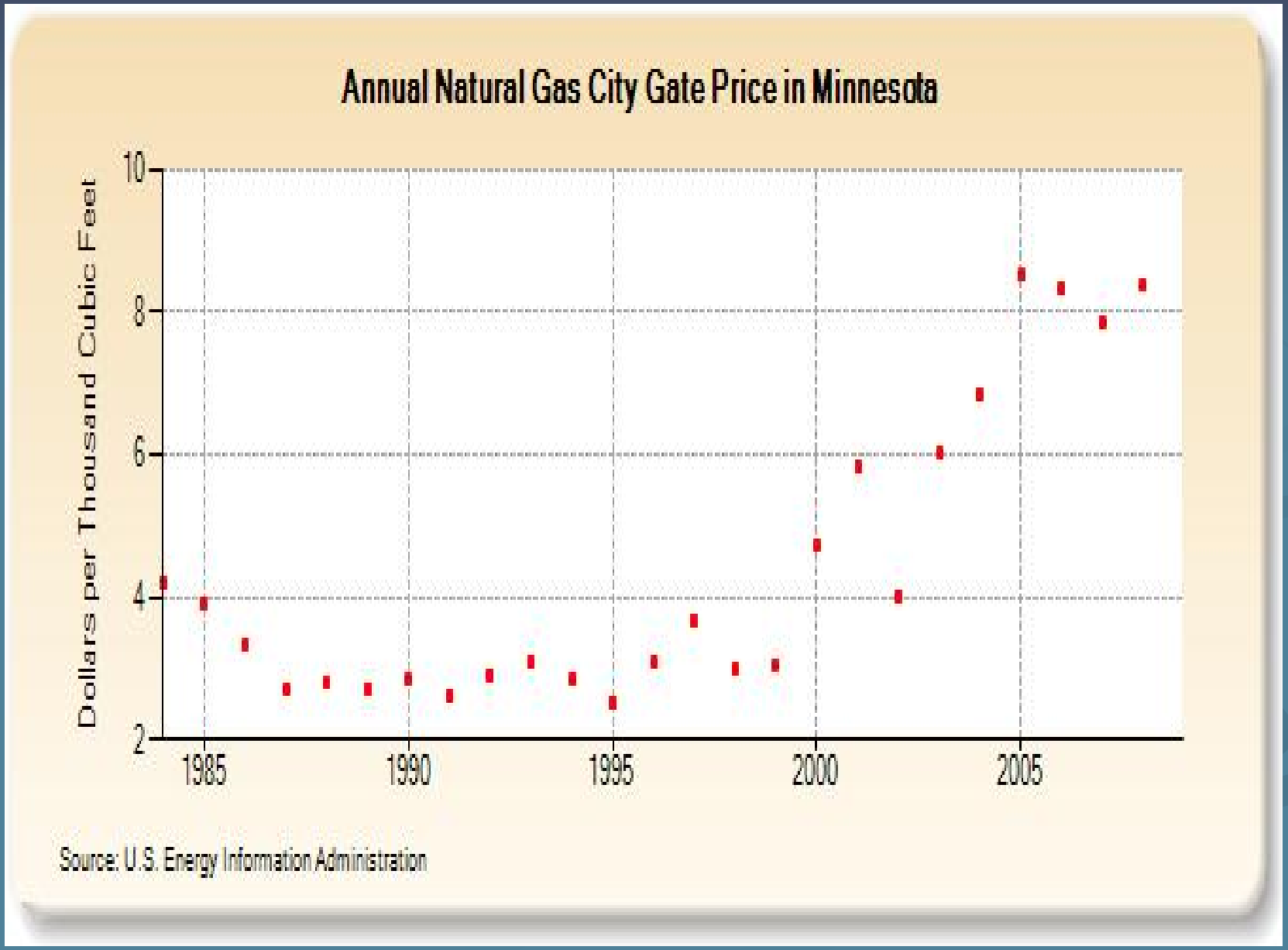
- Grain
- Crop residue
- Timber Slash
- Mill Residue
- Manure
- Urban Wastes
- SRWC
- Prairie grass

Technology

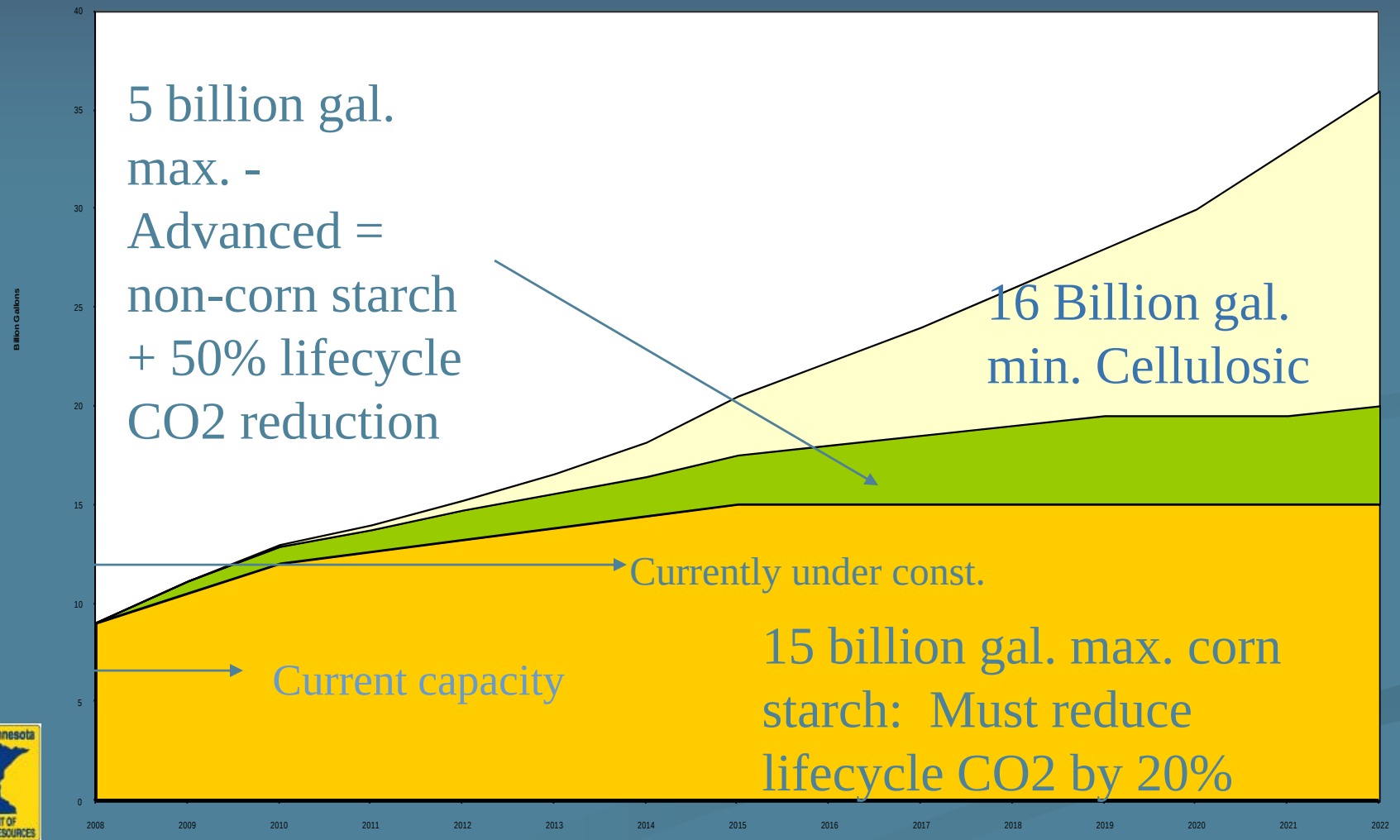
- Combustion
- Gasification
- Pyrolysis
- Fermentation
- Combined Heat and Power

Market

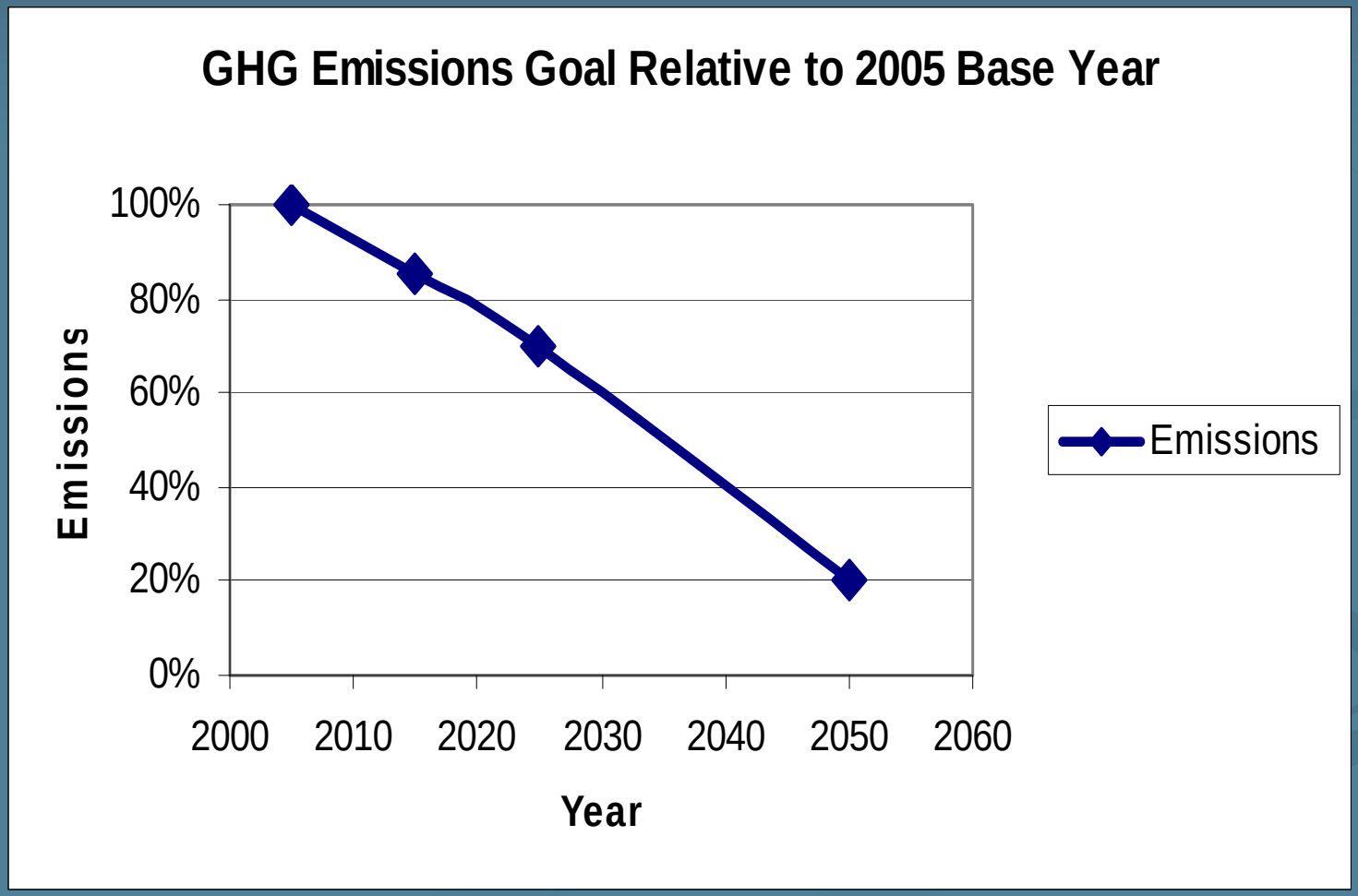
- Electric Power
  - Grid
  - On-Site
- Industrial Process Heat
- Home Heating
- Transportation Fuels
- Chemicals


Annual Natural Gas City Gate Price in Minnesota
Dollars per Thousand Cubic Feet
10
8
6
4
2
1985
1990
1995
2000
2005
Source: U.S. Energy Information Administration

Federal RFS


Billion Gallons
40
35
30
25
20
15
10
5
0
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
5 billion gal. max. - Advanced = non-corn starch + 50% lifecycle CO2 reduction
16 Billion gal. min. Cellulosic
Currently under const.
Current capacity
15 billion gal. max. corn starch: Must reduce lifecycle CO2 by 20%

Next Gen Energy Act



Agricultural Biomass Utilization

- Fibrominn 55 MW Power plant ~ 500,000 tons turkey litter
- 60,000 tons oat hulls sold for fuel
- Rahr Malting/KODA Energy

  175,000 tons mixed biomass
- CornPlus Ethanol – Thin Stillage
- 3 Dairy manure digesters

Emerging Ag Biomass Projects

- Chippewa Valley Ethanol

  Corn cobs ~ 100,000 tons / year
- University of Minnesota Morris

  Corn stalks, prairie ~ 6,000-9,000 tons / Yr
- Minnesota Valley Alfalfa Producers

  Biomass pellets ~
- Northern Quality Seeds

  Grass seed chaff

Significant Projects to Watch

- Poet Project Liberty Cellulosic EtOH - IA
- Show Me Energy Coop - Pellets – MO
- EERC Small Scale Gasifier – ND
- Chariton Valley Switchgrass Co-Firing IA

Crop Residue

- IT IS NOT A WASTE
- Corn stover

  Largest identified resource – Backbone of USDOE “Billion Ton Study”

  USDA Soil Scientists: No harvest on land that produces less that 150 bu corn
- Cereal Grain Straw

  Similar issues to stover

The Cob

- Very good fuel properties
- Relatively little contribution back to soil fertility
- Relatively easy harvest, transport storage logistics
- Poet leading the way with
  Project Liberty
- ~4 million ton potential in MN

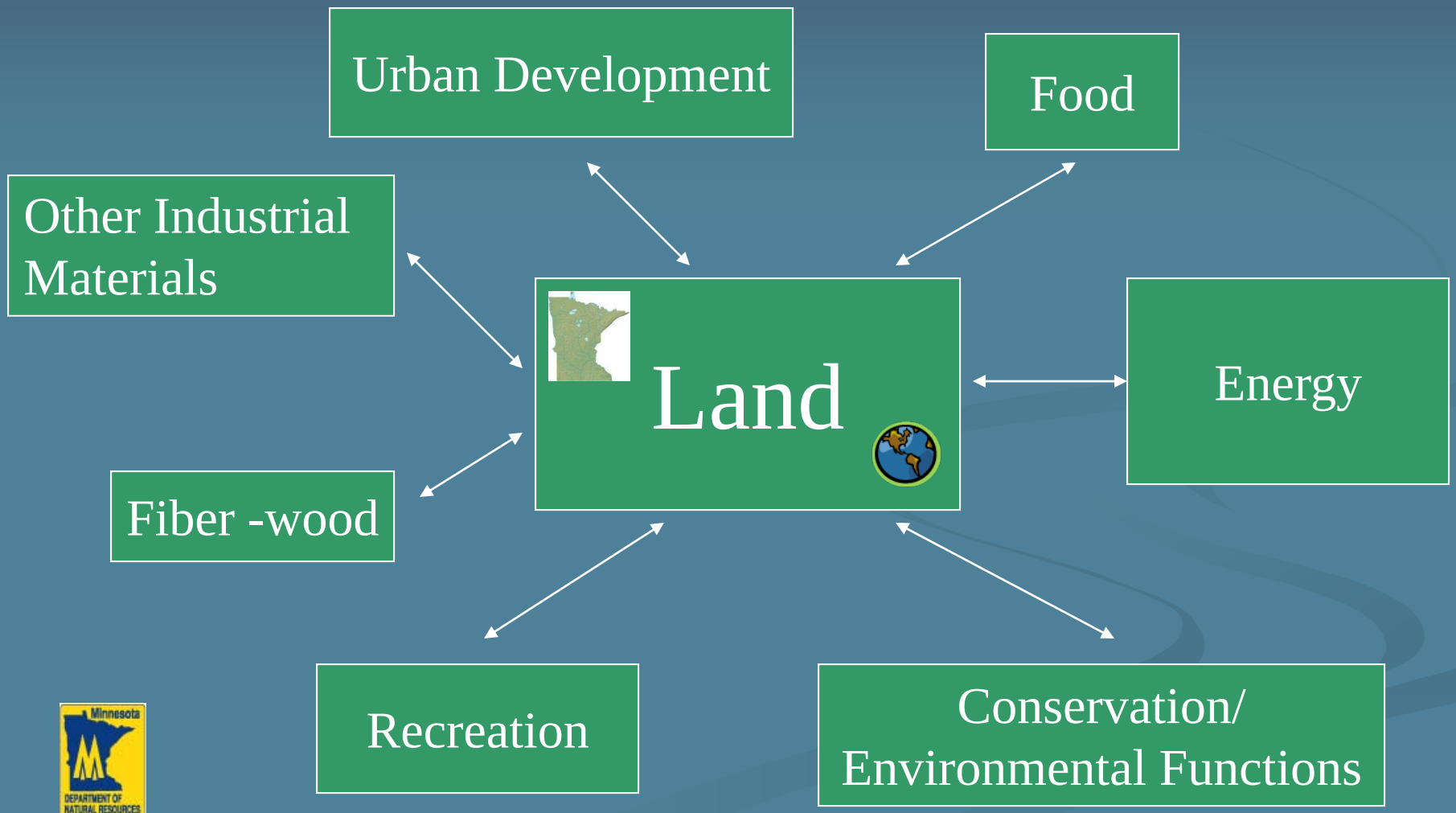
A Matter of Scale

MN Energy Goal	Dry Biomass	Compar
80% MN Energy	100 mm	
40% FFR ~ equal to oil	50 mm	All major crops
25 x 25	33 mm	Corn crop
2% of federal Cel. RFS.	4 mm	All cobs or Timber

“Non-Food Crops”

- Prairie Grasses
  - Improved or wild
- Exotic Grasses – ex. miscanthus
  - Significant ecological concerns
- Short rotation woody crops
  - Verso Paper 25,000 acres
- Do you convert conservation lands or croplands?

Multiple Demands from the Land



Productivity and Trade Offs

MORE:

- Crops / Biomass
- Wildlife
- Clean Water
- Jobs…

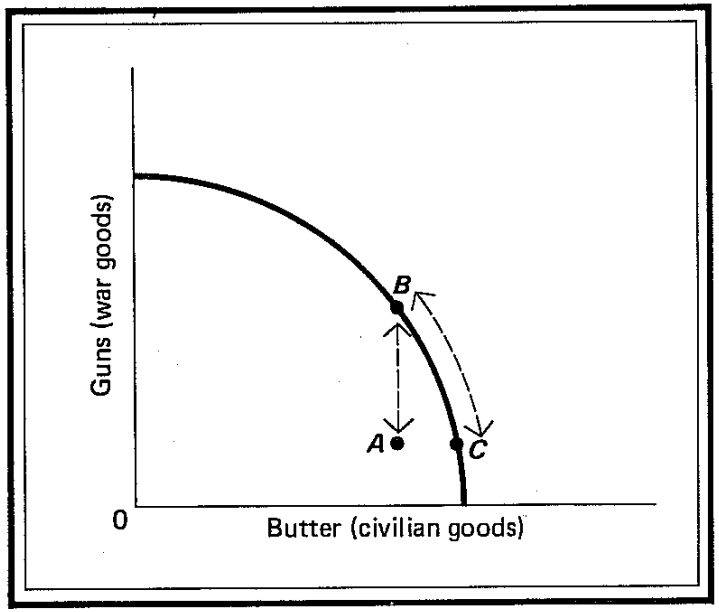


FIGURE 39-2 THE WAR INDUSTRY AND THE PRODUCTION POSSIBILITIES CURVE

Where can we get more, without getting less?

- Corncobs – low soil fertility value, good fuel properties
- Corn stover / cereal straw – may require agronomic or technology mitigation to return organic matter to soils
- Prairie grass harvest every 3-4 years on conservation lands like CRP to improve conservation values

Where is the market going?

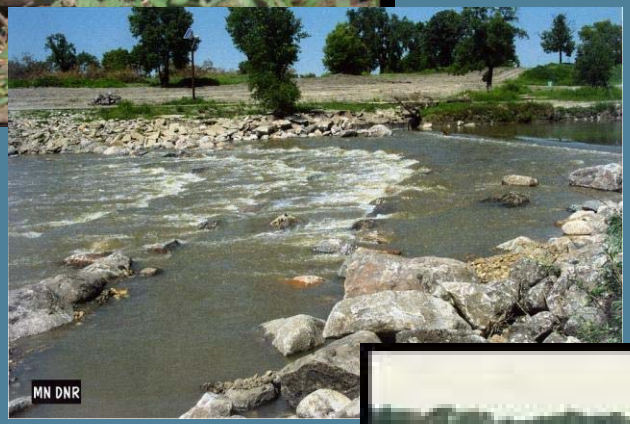
- Biomass development path is not well defined – competing visions
- Better broad-based understanding of the size of the biomass supply
- Need more definition of the most strategic and beneficial use of biomass

Challenges

- There are real and meaningful opportunities
- We will make mistakes
- We need to anticipate mistakes and manage risk / consequences
- We need to think about how to enhance productivity very broadly – beyond conventional agronomy.

If we do it right, we get more…

Wildlife



Clean Water

Rural Prosperity

Questions?

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