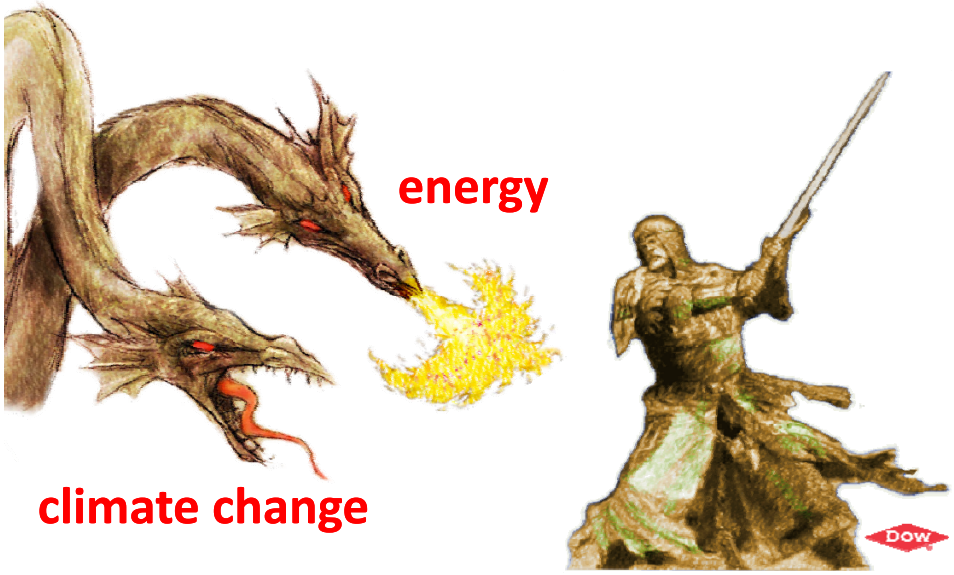
Mark Jones
Executive External Strategy and Communications Fellow
June 2012

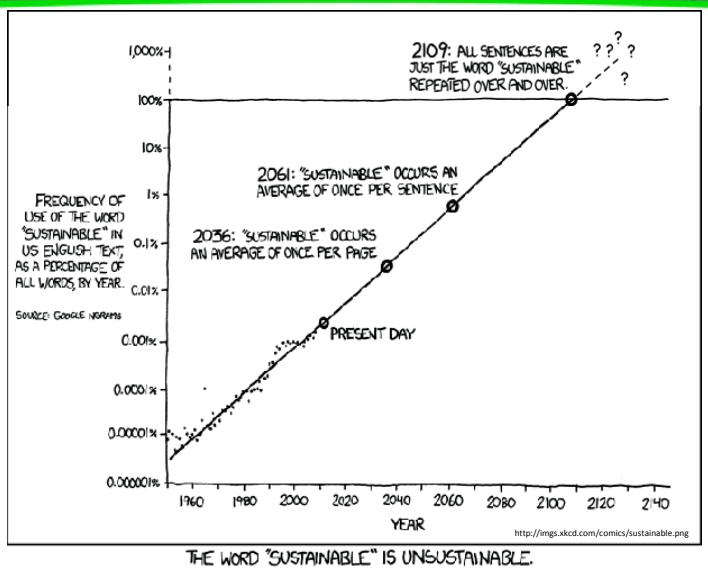
Biomaterials and Biofuels:

Path to Perdition or the Promised Land?

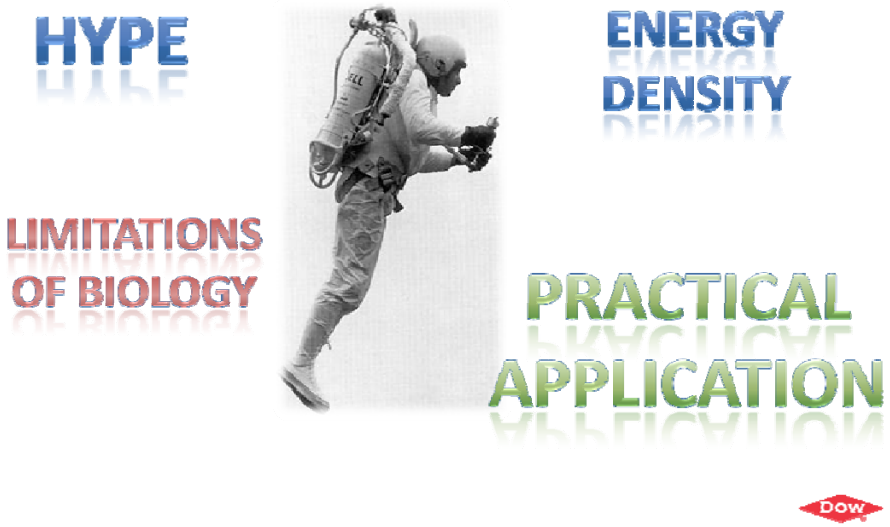
Slaying the Dragon



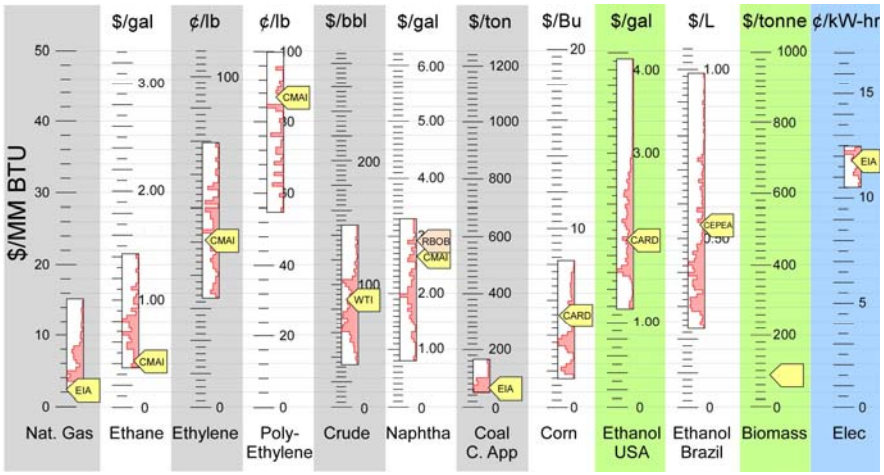
Sustainability Hype?



Possible versus Practical



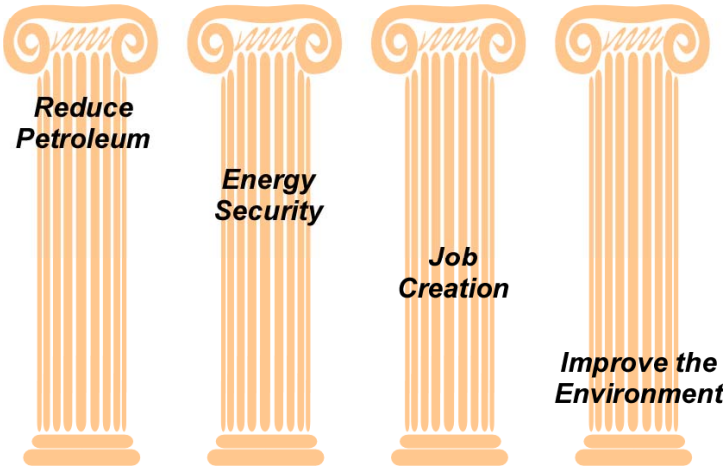
Energy Content



EIA is DOE Energy Information Agency, CMAI is an IHS affiliate, CARD is Iowa State Center for Agricultural and Rural Development, CEPEA is Centro de Estudos Avancado em Economia Aplicada – data for 3-5 years depending on source.

6 June 2012

Biomass Fuels Program



How CAPITALISM Works….

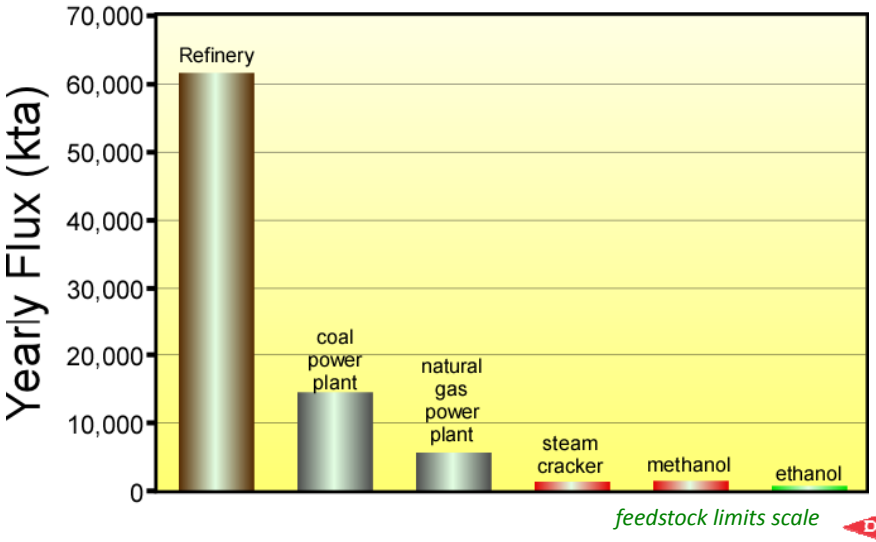
Companies have to make money

Money flows towards higher returns

Investors are risk adverse

Wrong investments drive companies to collapse

Largest Plants



feedstock limits scale

Bloom is Off the Cellulosic Rose

- How much *biomass is available?*
  not enough to replace fossil fuels
- How much *will the biomass cost?*
  it is not cheap!
- How much *will biofuels cost? more than fossil*
- How much *more are we willing to pay? no premium*
- How realistic *is chemical production from biomass?*
  we already do, but chemical use doesn't address the big issues

NRC, "Renewable Fuel Standard: Potential Economic and Environmental Effects of U.S. Biofuel Policy", 4 October 2011.

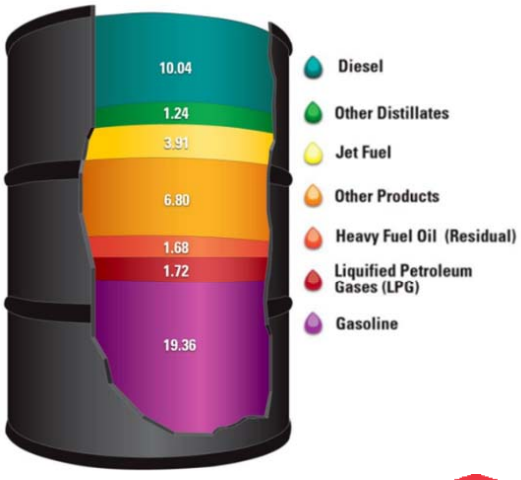
Changing Emphasis

Biomass 2011: Replace the Whole Barrel, Supply the Whole Market
The New Horizons of Bioenergy

July 26–27, 2011

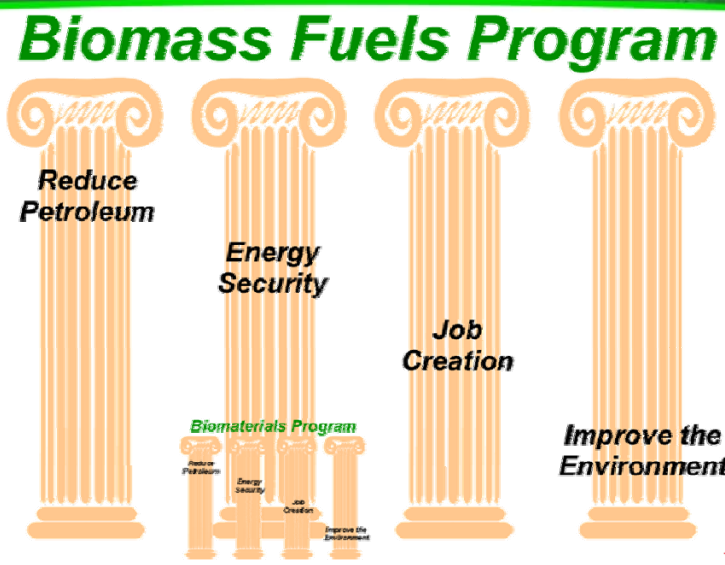
U.S. DEPARTMENT OF ENERGY BIOMASS 2011

"sugar is the new crude"

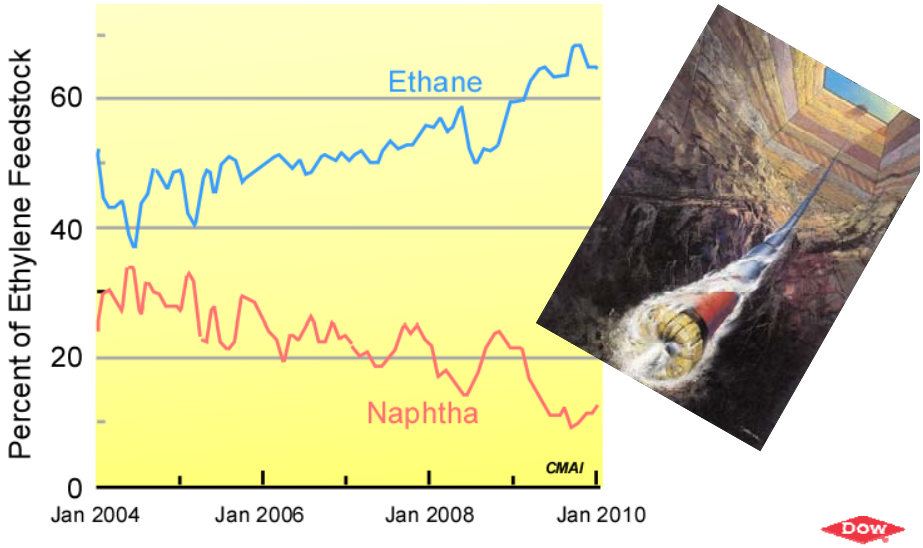


Biomaterials Instead of Biofuels

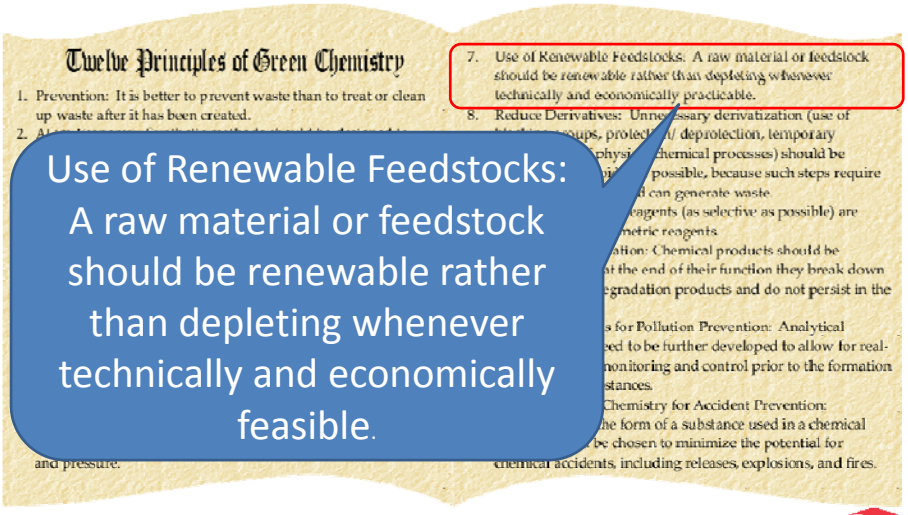
a much smaller target



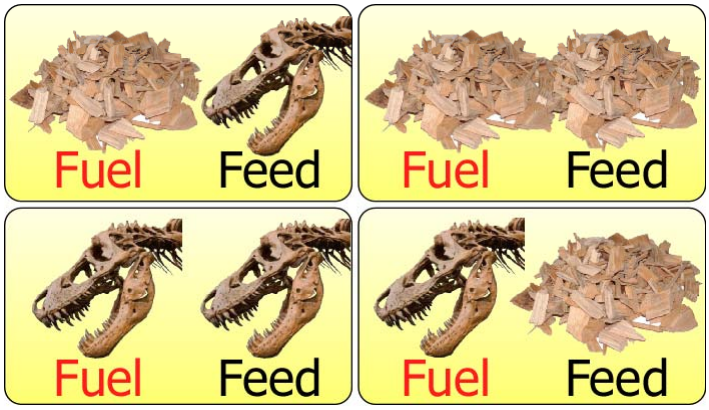
Shale Gas Revitalizes the Industry



Green Chemistry Principles



Two Carbon Flavors



DOW

LCA of Polymers

Biopolymers rank in the middle of LCA rankings

POLYMER	Material	Green Design Rank	LCA Rank
Polylactic Acid – NatureWorks	Sugar/cornstarch	1	6
Polyhydroxyalkanoate-Stover	Cornstalks	2	4
Polyhydroxyalkanoate-General	Corn kernels	2	8
Polylactic Acid-General	Sugar/cornstarch	4	9
HD Polyethylene	Petroleum	5	2
PET	Petroleum	6	10
LD Polyethylene	Petroleum	7	3
Bio-PET	Petroleum /plants	8	12
Polypropylene	Fossil fuels	9	1
General Purpose Polystyrene	Petroleum	10	5
PVC	Chlorine/petroleum	11	7
Polycarbonate	Petroleum	12	11

Tabone, MD; Cregg, JJ; Beckman, EJ; Landis, AE. Environ. Sci. Technol. 2010, *44*, 8264-9.

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Polycarbonate	Petroleum	12	11
Bio-PET	Petroleum /plants	8	12

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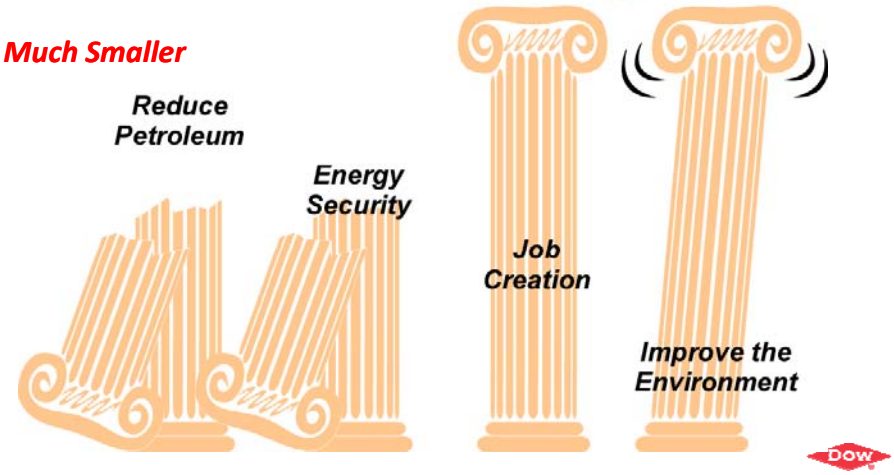
Biomaterials Program

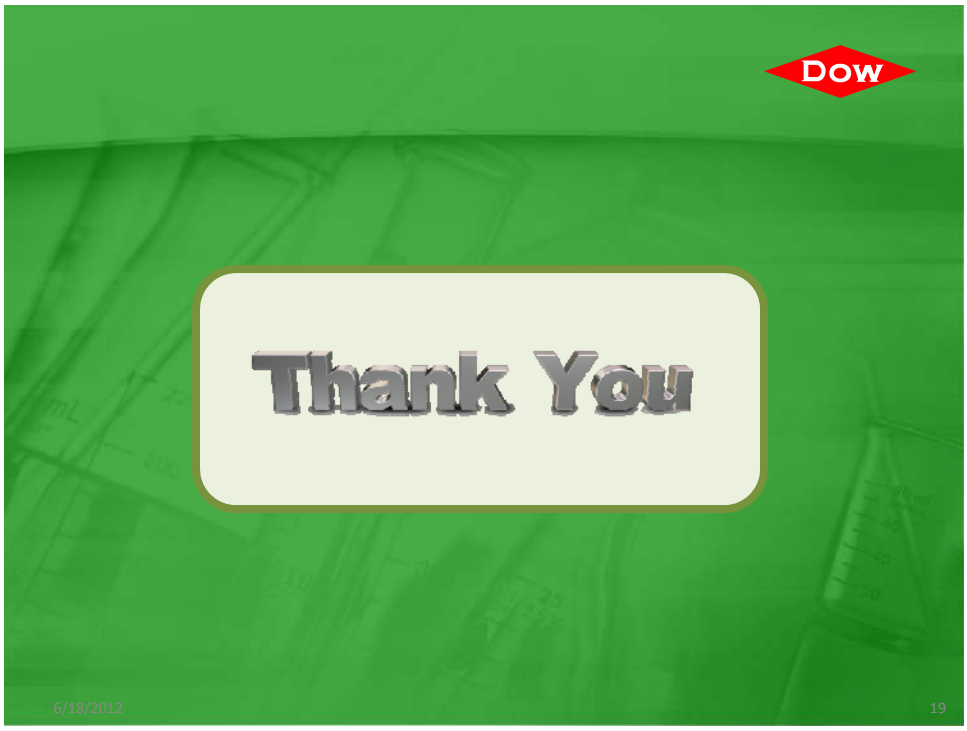


Conclusions

- Too much hype for the possible and not enough focus on the practical
  - Real benefits must be created
  - Incumbent fossil sources set the standard for competition
  - It takes decades to deploy a new technology
  - Scale wins and biomass availability limits biofuels scale
- Requirements of capitalism must be addressed
  - Better alternatives get money
  - Low tolerance for risk, both market and technology
  - Society must be willing to pay more

For a successful technology, reality must take precedence over public relations, for Nature cannot be fooled.

- Richard Feynman


Dow
Thank You
6/18/2012
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