

***Biobased Chemicals Landscape in 2015:
What's the Role of Biochemicals in the
Bioeconomy?***

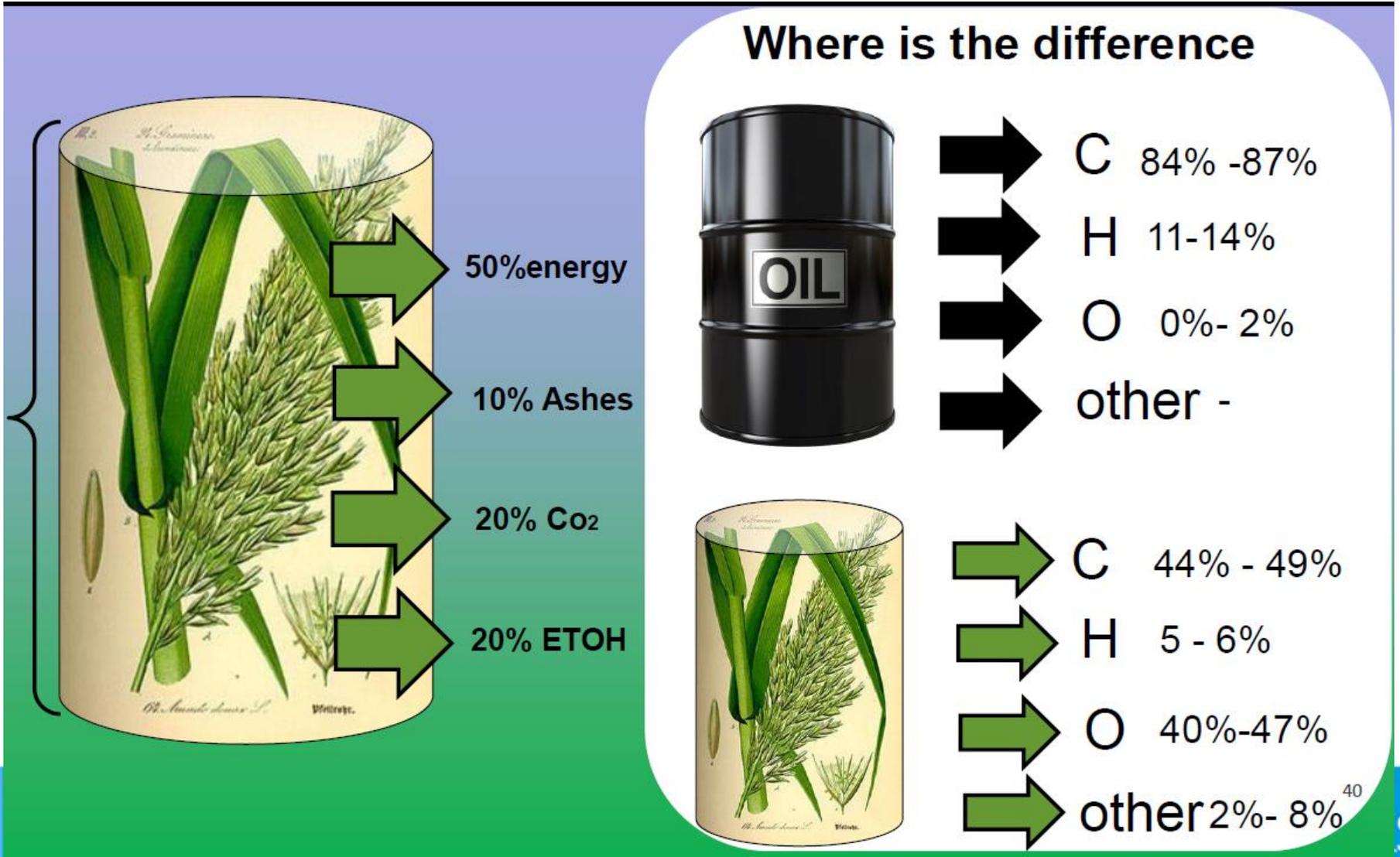
**Ken Williams
June 24, 2015**

**NatureWorks LLC
www.natureworksllc.com**

Advanced Biofuels in 1942



What's wrong with this picture?



Irresistible force meets immovable object...

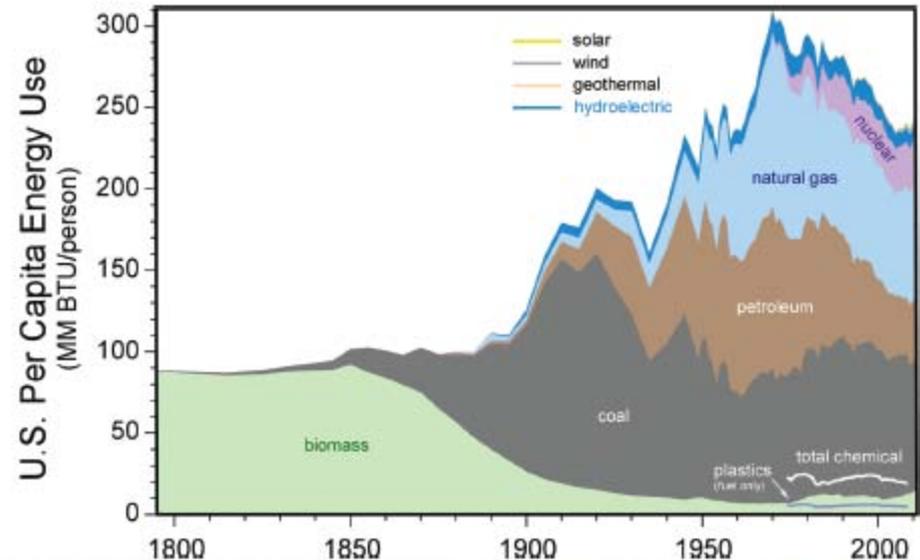
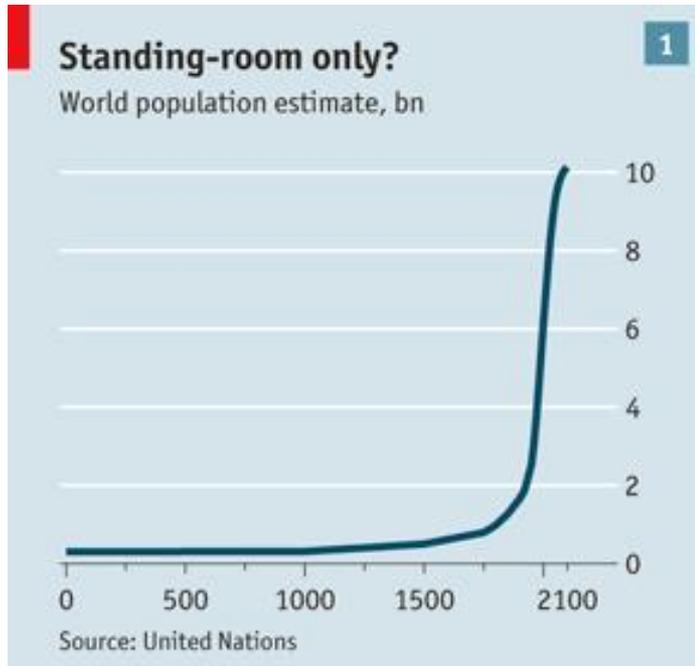
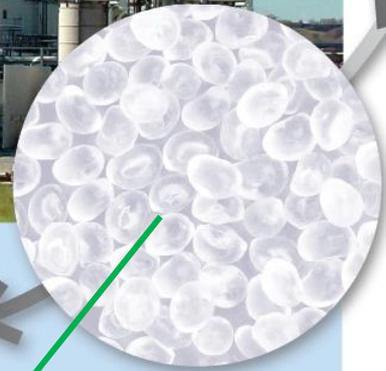


Figure 2. Energy consumption in the U.S. on a per capita basis.

Energy data from EIA annual energy review 2012 and 2009. Chemical data from DOE/EIA 2006 manufacturing energy consumption survey and ACC “updated energy slides incorporating 2008 data”.

The Bioeconomy in the 21st century

- What's technically feasible vs. economically viable?
- What's environmentally sustainable vs. economically sustainable?
- What's the optimum portfolio of products from biomass (vs. from petroleum)?



**1 Billion lb
Milestone**

Who we are

- World's first and largest bioplastics producer
- World-scale plastics facility
- 2002 Winner - Presidential Green Chemistry Challenge
- DOE partner (1998-2008) to develop world-scale biorefinery (over \$18M in DOE support)
- Proprietary portfolio of Ingeo biopolymers & intermediates
- Peer reviewed LCA, strong eco-profile
- Global customer base and product adoption
- Ingeo applications with breadth across markets, geographies, and retail applications

ingenious natural selection

Where are we in the market....



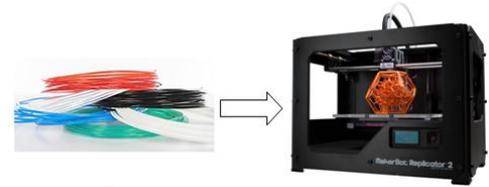
Semi-durables



Single Use



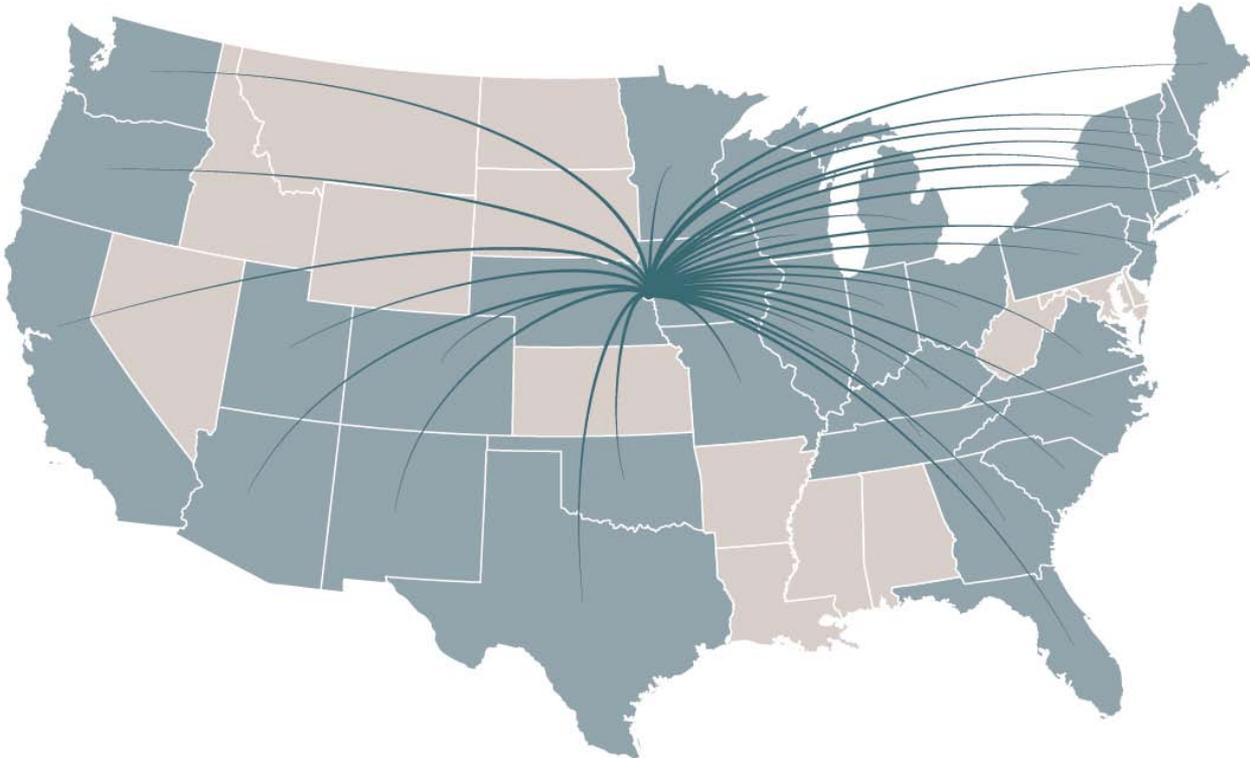
Durables



3D printing



NatureWorks is *fueling* green jobs and innovation in the national bioeconomy



Manufacturers in 36 states produce products using Ingeo and retailers like Walmart & Target feature Ingeo packaging or products in all 50 states

We are committed to feedstock diversification:

Investment in innovation and R&D collaboration to grow our Ingeo feedstock portfolio.

Performance materials made by transforming whatever are the right, abundant, local resources

Q2-2013 R&D Partnership Established

CALYSTA Energy™

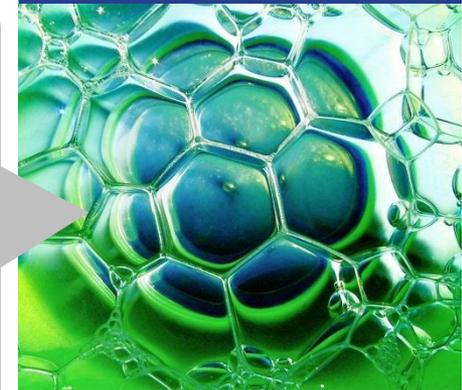
 **NatureWorks**

Calysta Energy™ and NatureWorks Announce an R&D Collaboration to Transform Methane into the Lactic Acid Building Block for Bioplastics

MENLO PARK, Calif., and MINNETONKA, Minn., June 18, 2013 — Calysta

Energy™ and NatureWorks have entered into an exclusive, multi-year collaboration to research and develop a practical, world-scale production process for fermenting methane – a potent greenhouse gas (GHG) – into lactic acid, the building block for ...

Direct Conversion



Next 3-6 years

CO₂ to lactic acid technology?

CH₄ to lactic acid technology



Naturally advanced materials made from locally abundant and sustainable natural resources

Thank you.



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