



The Leader in Feedstock Flexible Ethanol

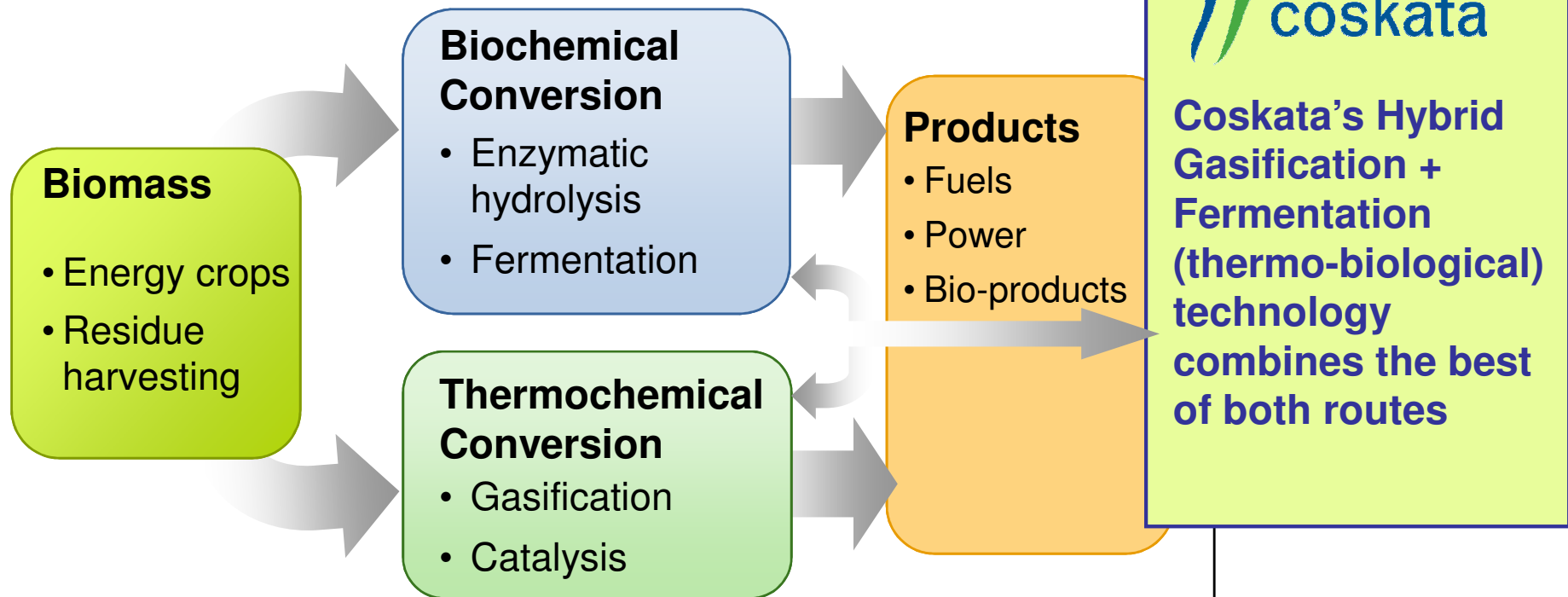
US DOE - Biomass 2009

Bill Roe
President & CEO
Coscata, Inc.

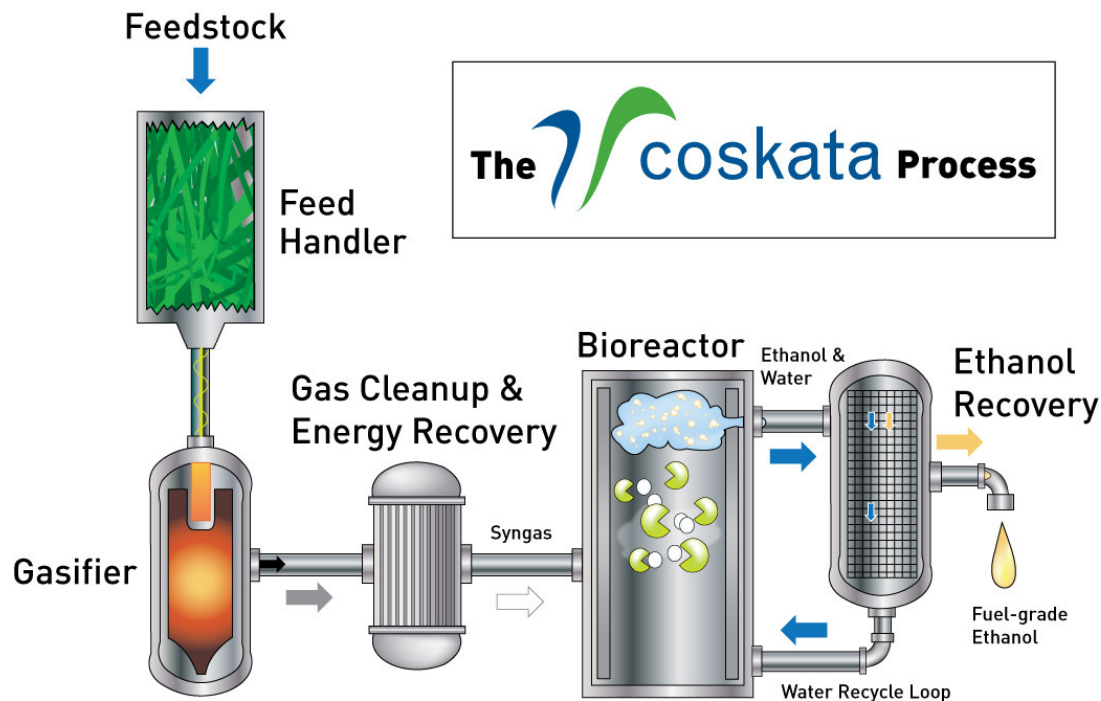
Flex Ethanol will involve several technologies



DOE is targeting 2 major pathways for cellulosic biofuels



Coskata has the leading Flex Ethanol™ technology



Flexible

- Wide variety of feedstocks
- Geographic diversity

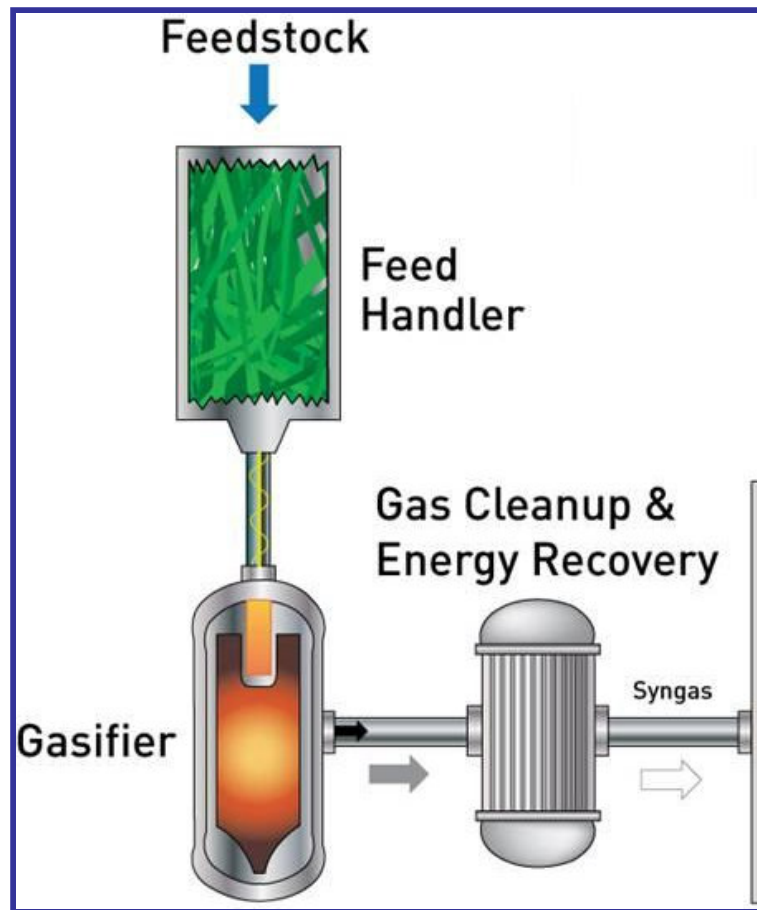
Efficient

- Yields over 100 gal/ton dry biomass
- Produces only fuel grade ethanol

Affordable

- Competitive unsubsidized at oil price of ~\$70/bbl

Coskata's process is feedstock flexible by design



Gasification converts carbonaceous feedstock into syngas:

- **Municipal trash** (construction and demolition waste, hurricane debris, plastic, tires)
- **Ag wastes** (corn stover, bagasse, wheat straw, many more)
- **Wood and wood residues**
- **Sustainable energy crops**

Other gas streams can also be converted to ethanol:

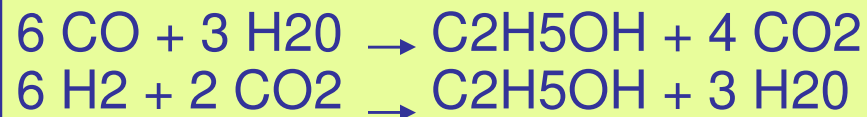
- **Steel mill waste gas**
- **Landfill methane gas**
- **Anaerobic digester gas** (manure, current corn ethanol, waste treatment)

Coskata's proprietary technology drives efficiency

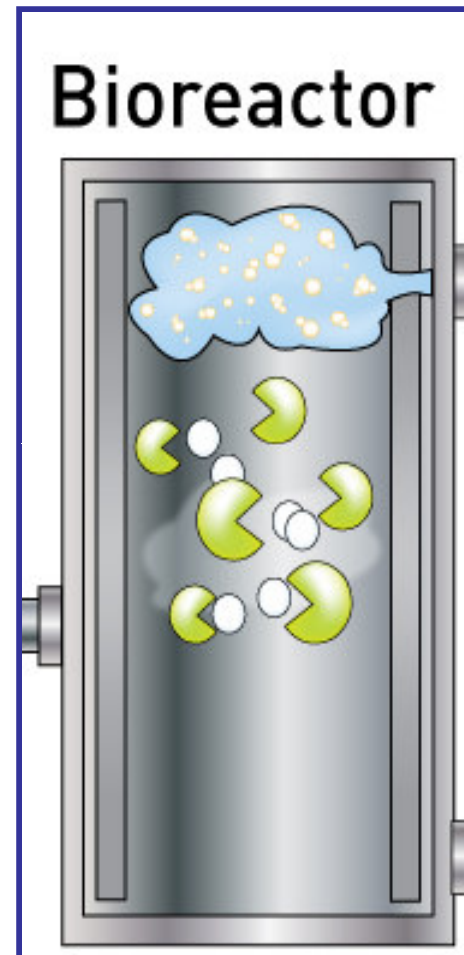


Microorganisms utilize the chemical energy of the syngas to selectively produce ethanol

Proprietary **microorganisms** consume both CO and H₂, allowing efficient conversion across the range of H₂:CO ratios



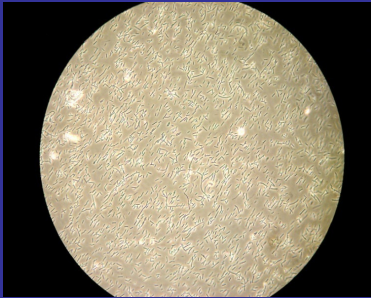
Proprietary **bioreactor designs** encourage maximum productivity



Proprietary microorganisms and bioreactor designs



Microorganisms



- Anaerobic strains of bacteria originally found in nature have been further developed to perform at the productivity, selectivity, and ethanol tolerance levels needed for process commercialization
- Trace nutrients have been identified and minimized through strain development

Bioreactors

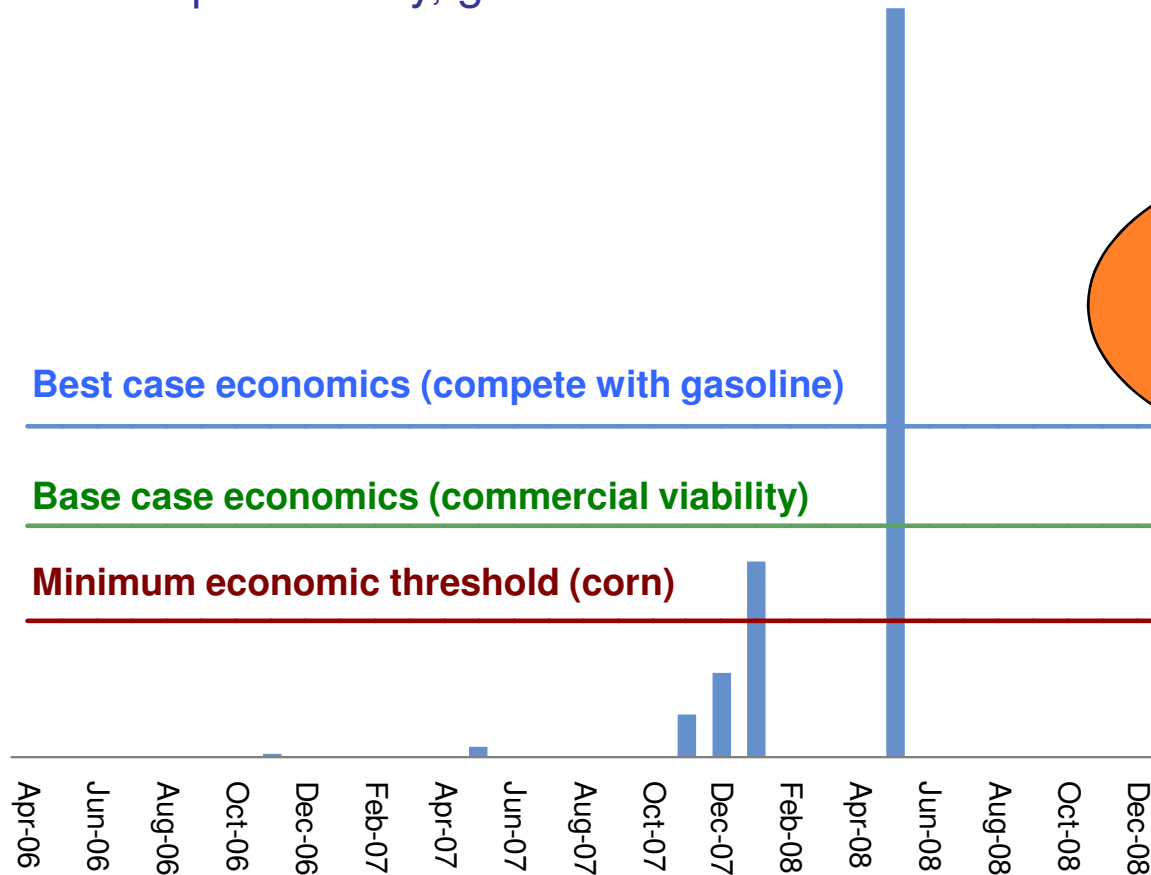


- Several bioreactor designs have been developed that optimize the mass transfer of syngas for conversion
- First commercial plants will employ suspended cell bioreactor designs, while a design employing stationary cells will offer additional advantages in later facilities

Coskata's productivity shows readiness for commercialization



Commercial productivity
Ethanol productivity, g/L/hr



Coskata has achieved target microbe productivity levels

Sandia National Labs study - Key assumptions for biofuels

- Biofuels conversion technologies

Capital cost per gallon capacity

Yield of ethanol per biomass ton input

➔ **Biochemical**

2010: \$6.16/gal
2020: \$3.30/gal

60 gal/dry ton
88 gal/dry ton

➔ **Thermochemical**

2010: \$6.00/gal
2020: \$4.00/gal

75 gal/dry ton
105 gal/dry ton

➔ **Biothermal**

2010: \$5.00/gal
2020: \$3.00/gal

90 gal/dry ton
105 gal/dry ton

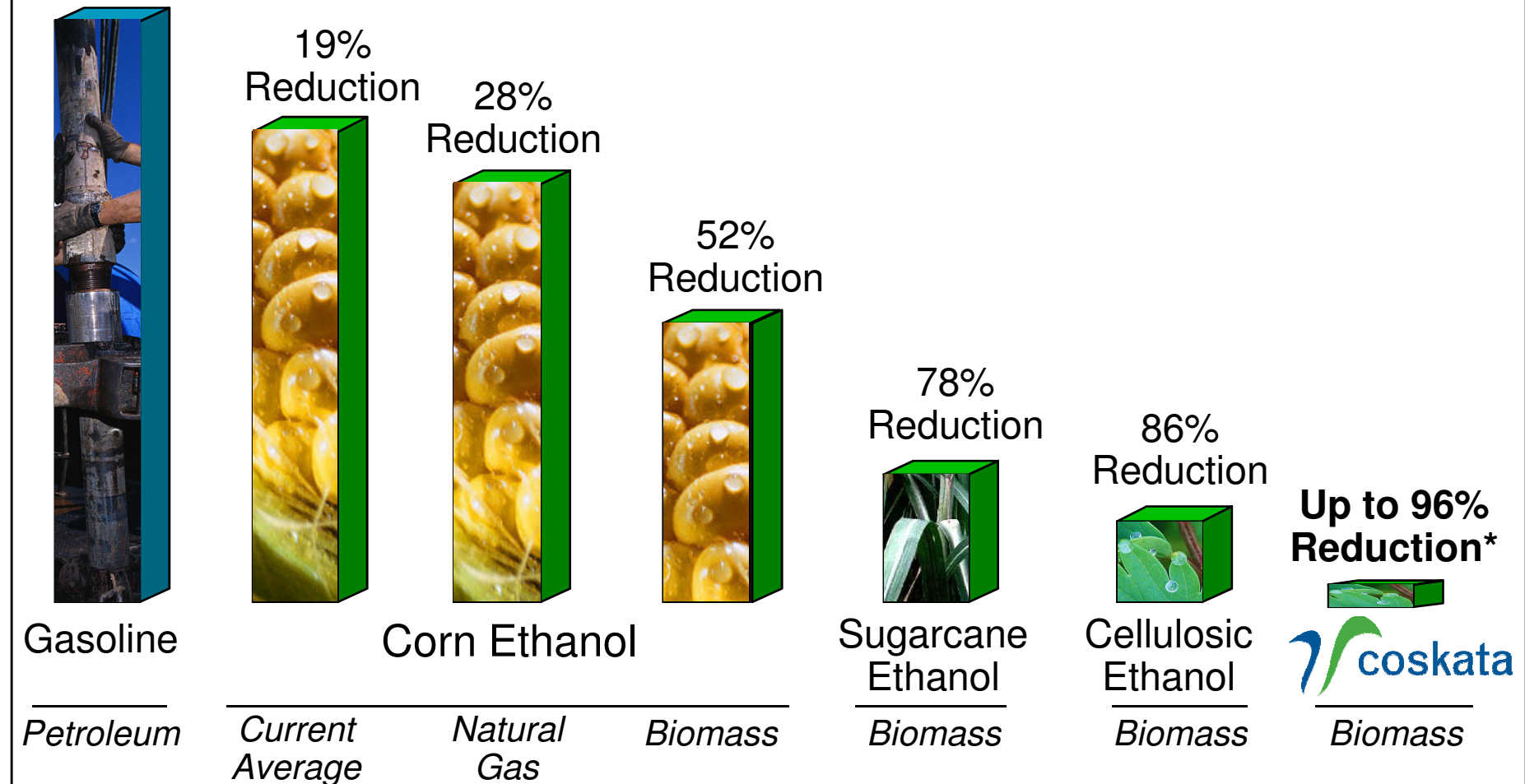
- Continued **R&D** needed to ***improve conversion yields***
- **Commercialization** support could ***shrink timeframes*** to maturity
- Both could ***lower capital costs*** significantly





Cellulosic ethanol reduces GHGs even further

DOE analysis targets GHG reduction from ethanol



* As independently estimated by Michael Wang and Argonne National Labs in a GREET study; Based on forest residuals

Source: Wang et al, Environ. Research Letters, May 2007; Wang et al, Life-Cycle Energy Use and GHG Implications of Brazilian Sugarcane Ethanol Simulated with GREET Model, Dec. 2007. As presented by DOE August 2008

Coskata is aggressively commercializing

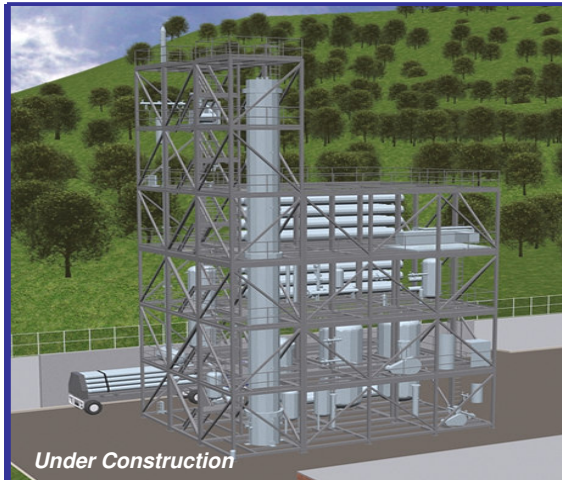


Currently Operating

Horizon (Q1 2008)

Integrated Processing
Warrenville, IL

- Integrated processing system with methane thermal reformer, multiple bioreactor designs, and distillation

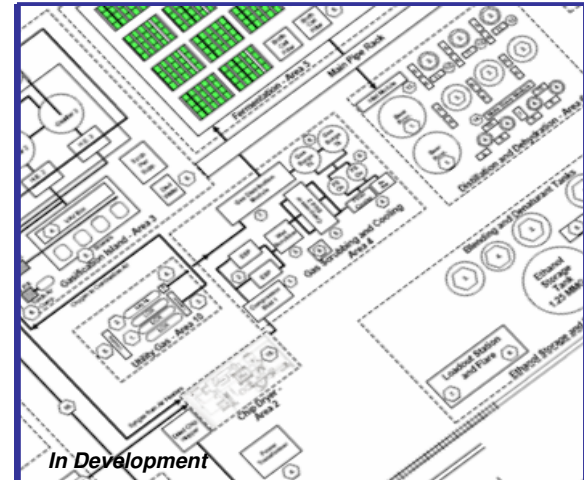


Under Construction

Lighthouse (2009)

Commercial Demonstration
Madison, Pennsylvania

- Minimum engineering scale (linear scale-up to commercial production)
- Front-end biomass gasifier
- Will test multiple commercial-scale bioreactor and separations designs



In Development

Flagship (TBD)

Commercial Production
Location: Southeast US

- Advantaged site selected
- 50-60 MM Gallons / yr
- Multiple gasifiers that process ~1500 dry tons/day of biomass
- Cost competitive with gasoline, unsubsidized, at ~\$70/bbl oil

Semi-scale facility proceeding on schedule



Project Lighthouse

- Semi-scale facility in Pennsylvania
- Will demonstrate integrated operation of The Coskata process with gasification
- Will demonstrate industry leading gal/dry ton conversion with multiple bioreactor and separations designs



Coskata has a flexible commercialization strategy



License

- License technology to development partners including
 - Feedstock suppliers
 - Chemical manufacturers
 - Petroleum companies
 - Ethanol distributors/blenders
 - Project developers
- Enables rapid scale up of technology
- Establishes Coskata as the industry enabler

Own

- Encourages continual process improvements
- Allows Coskata to capture full economic benefits of its technology

Government policy can help jumpstart Flex Ethanol



Make existing programs work

Many programs exist but are not effective in current financial market

- Loan guarantees require **lenders** and limits on review periods and fees
- Cellulosic ethanol tax credits are more effective as refunds or direct payments
- Grants for all scales of commercialization (not just R&D)

Invest in whole supply chain

Investments in up- and down-stream supply chain infrastructure are needed

- Biomass crop supply chains
- Distribution and vehicle infrastructure (including E15, E20 and higher blends)

Enact carbon legislation

Straightforward carbon legislation

- Lifecycle analysis based on sound science and direct, measurable effects
- Credits for all technologies that lower GHG's



The Leader in Flex Ethanol™