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Licensing Cellulosic Biofuel Technology Today

Advanced Biofuels: Commercializing the Efficient Syngas-to-Ethanol Platform

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Coskata envisions being a leader in syngas conversion

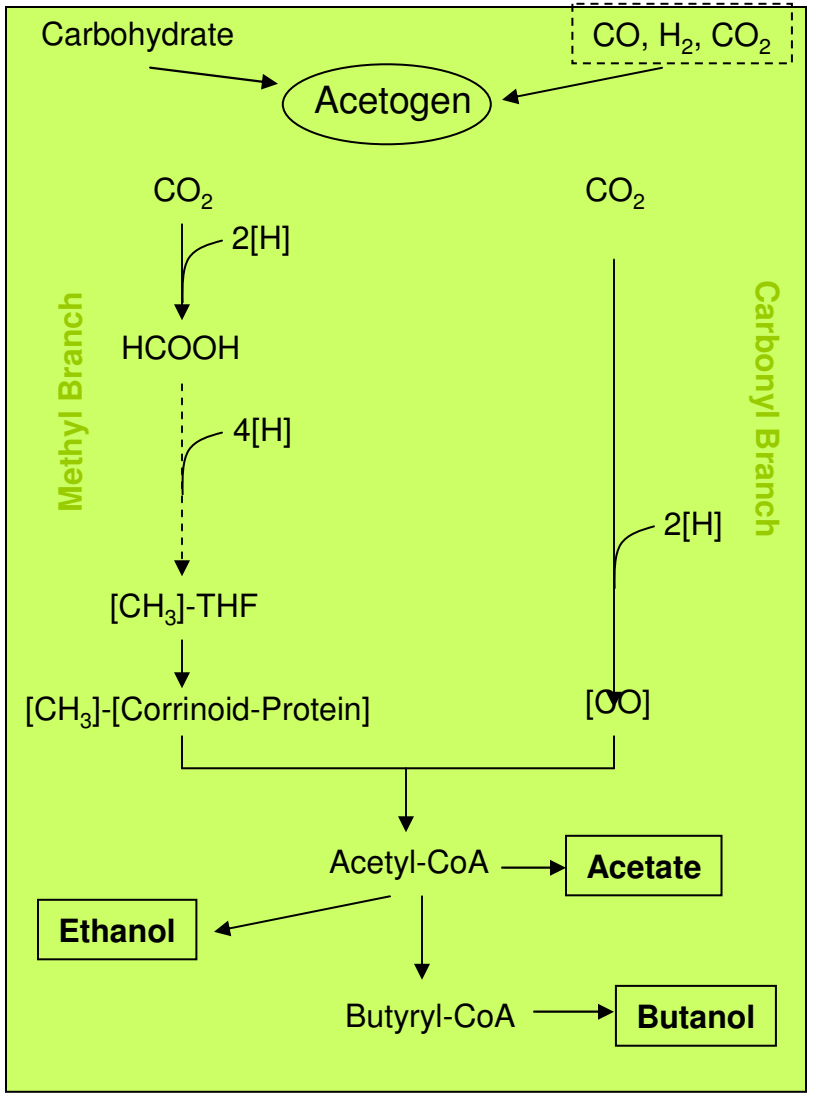
Coskata Vision:
To be the global leader in the **synthesis gas-to-biofuels and chemicals platform**, beginning with cellulosic ethanol

We will achieve this through technology development, licensing as well as owning and operating facilities, and providing onsite products and services

Anaerobic C1 Metabolism: Acetogenesis

Acetogenesis (single organism)

Liquid fuels and chemicals from renewable and alternative feedstocks



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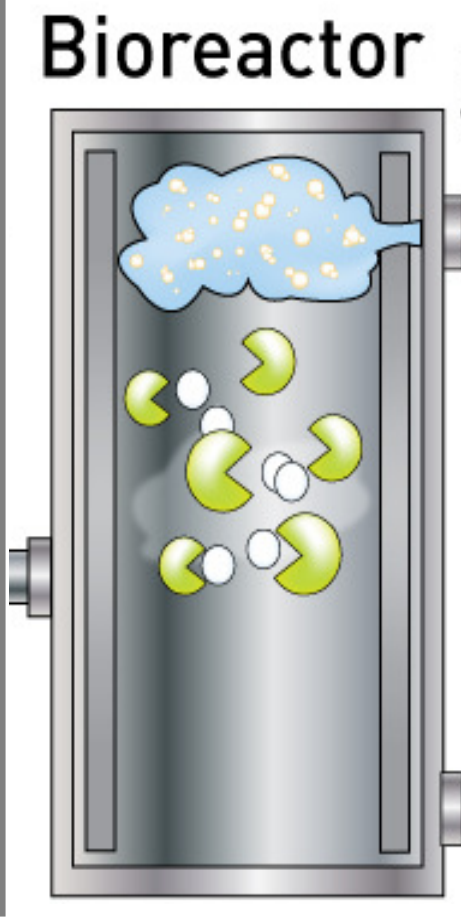
Coskata's proprietary technology drives efficiency

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

Coskata's **anaerobic bacteria** consume both CO and H2, allowing efficient conversion across the range of H2:CO ratios

$6\ CO + 3\ H_2O \rightarrow C_2H_5OH + 4\ CO_2$
$6\ H_2 + 2\ CO_2 \rightarrow C_2H_5OH + 3\ H_2O$

Innovative **bioreactor designs** drive maximum productivity



Coskata has unsurpassed anaerobic research and development capabilities

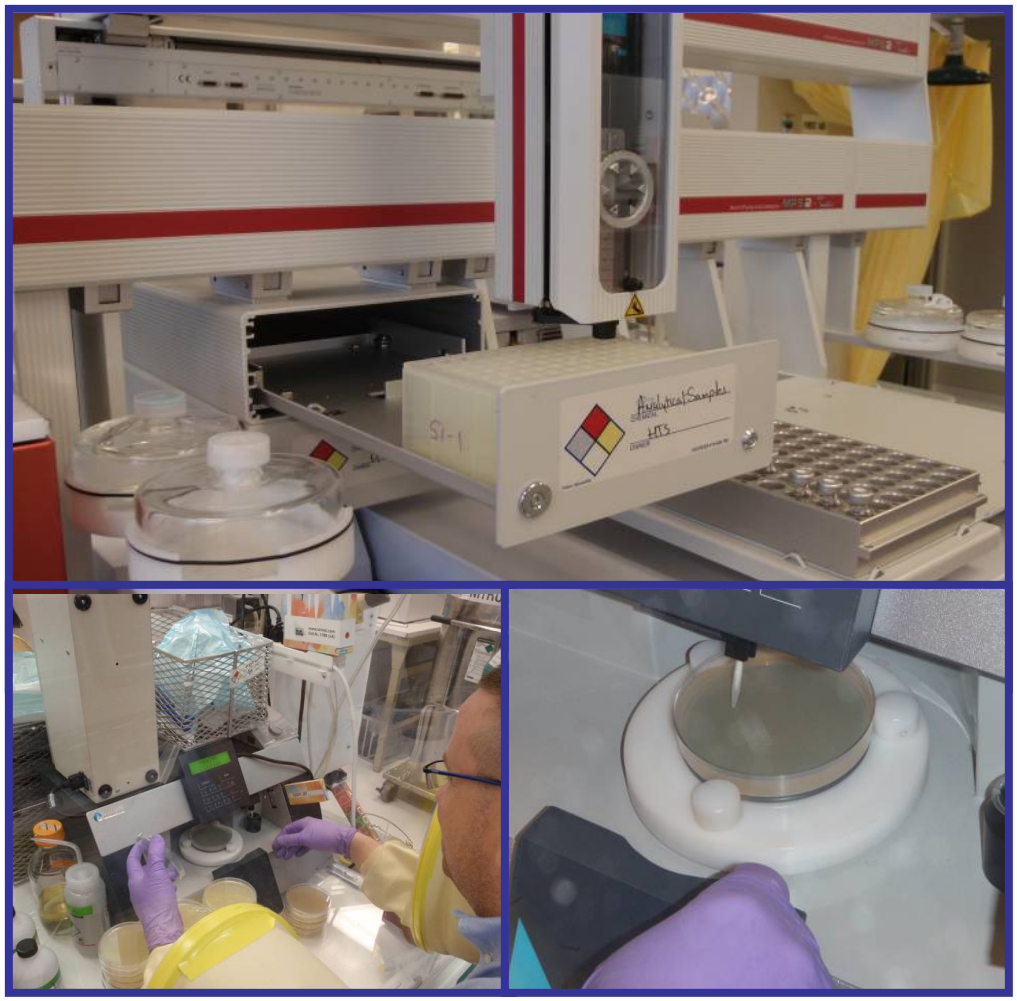
Lab and Pilot Facility

- Complete anaerobic bacteria strain management facility capable of advancing native strains through guided mutation and selection
- New native strains have been isolated and advanced, and patent applications filed
- Nutritional requirements have been discovered, and the commercially viable strains are capable of autotrophic growth.

2 liter fermenter

14 liter fermenter

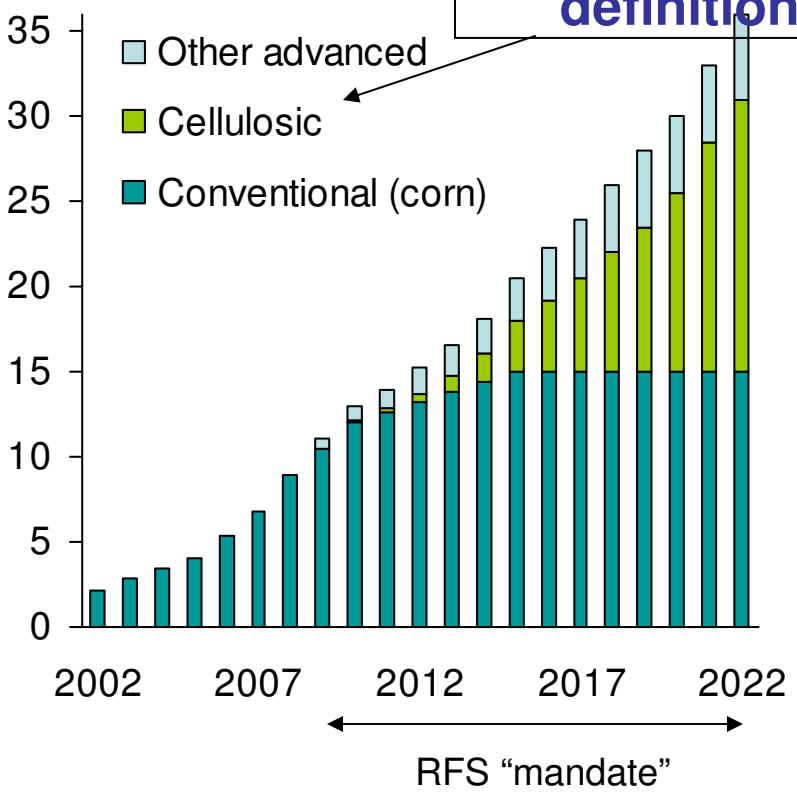
Coskata operates a custom built High Throughput Screening laboratory



- Coskata operates the only anaerobic HTS laboratory in the world.
- Ongoing random mutational work is focused on species novo patents, and continued improvements to the ethanol organisms

Meeting the US Government cellulosic biofuel mandate will take enduring government policy

U.S. biofuel consumption
Billion gallons



- Energy Act of 2007 targets 36 billion gallons, 16 billion of which must be cellulosic
- Meeting cellulosic target is possible but we need to start building TODAY:
  - Takes 2-3 years from today to build a commercial scale facility
  - Scale up to 36 billion gallons is possible based on evidence from 2007-08 corn ethanol capacity growth rate
- Coskata's licensing model can help enable this capacity growth
  - Multiple licensed facilities can proceed in parallel
  - Multiple discussions currently ongoing with licensees
  - Significant uptake in facility construction projected once first commercial plant is completed

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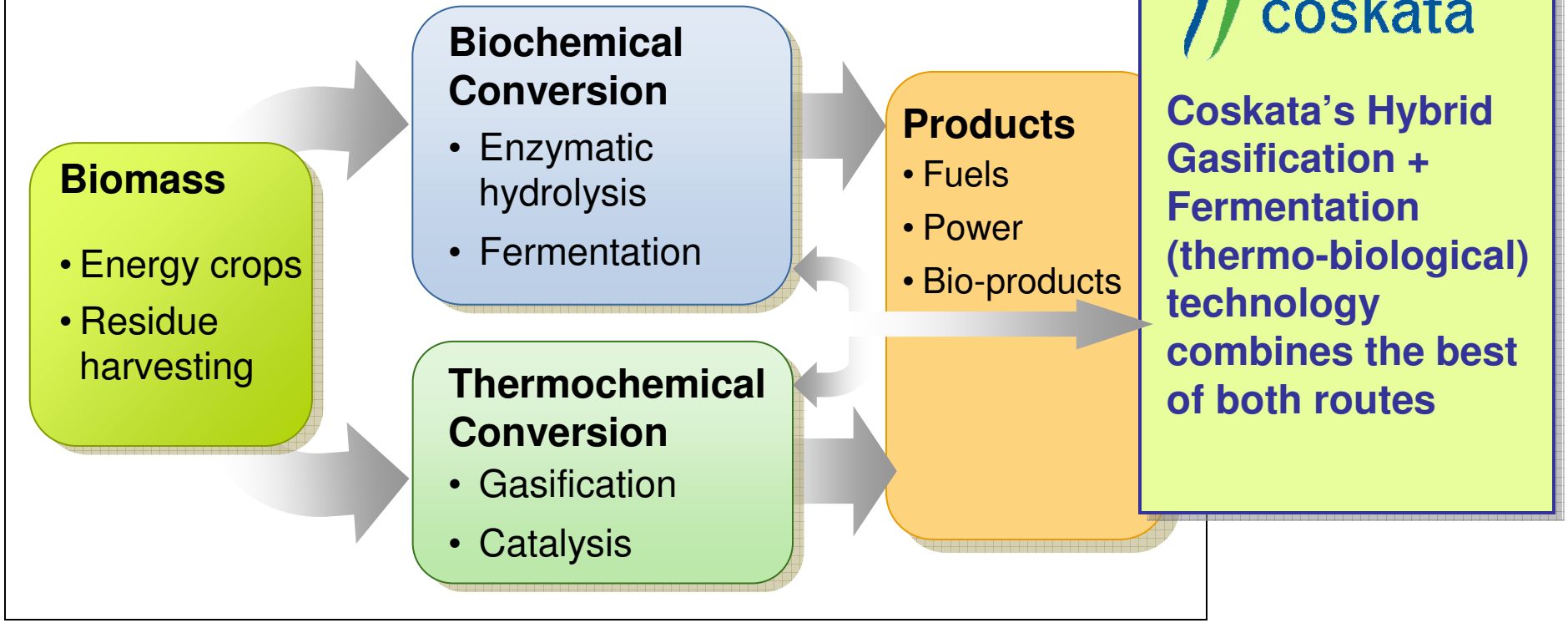
Source: RFA; U.S. Congress

Flex Ethanol will involve several technologies

DOE is targeting 2 major pathways for cellulosic biofuels



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Source: DOE Biomass program presentation to Governor's Ethanol Coalition, Aug. 20, 2008

Advantages over other pathways

		Gasification +	
	Enzymatic	Catalytic	coskata
Feedstock Flexibility	No	Yes	**Yes**
Ethanol Specificity	Yes	No	**Yes**
Yield* (gal/dry ton)	~55-85	76-89**	**~100**

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* Best estimates from publicly available data
** Chemical catalysis yield estimate from 2012 NREL targets (76 for ethanol, 89 for all alcohols)

Source: Press; DOE; Company reports

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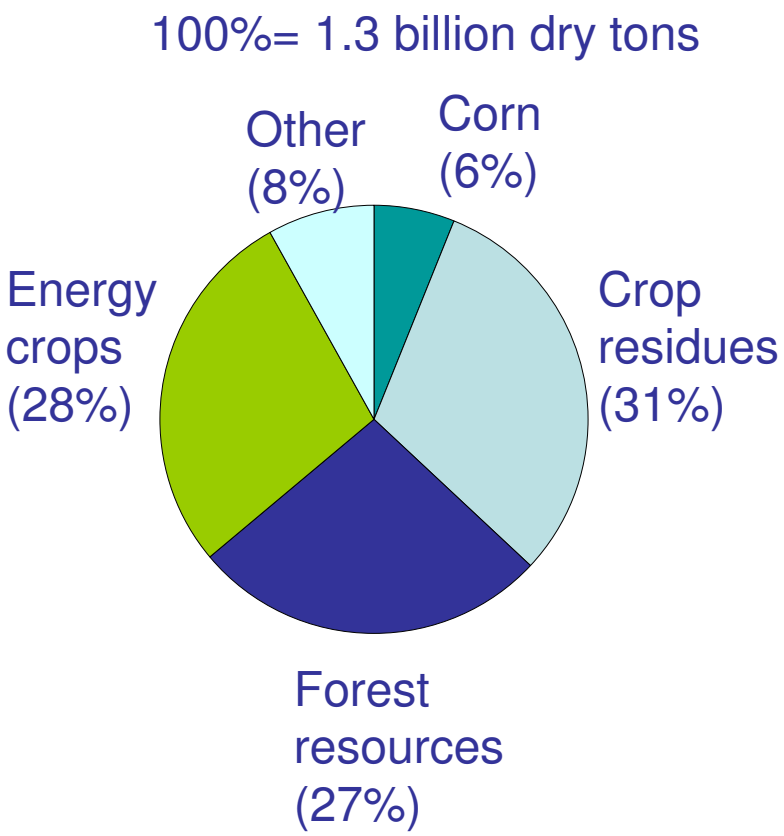
A "Feedstock Flexible" process will help the industry to rapidly grow

Projected biomass sources



Cellulosic ethanol:

- READY TODAY
- Able to be made from any carbon source
- Billion ton report estimates over 1/3rd of gasoline can be replaced
- Use of locally grown resources enhances energy security

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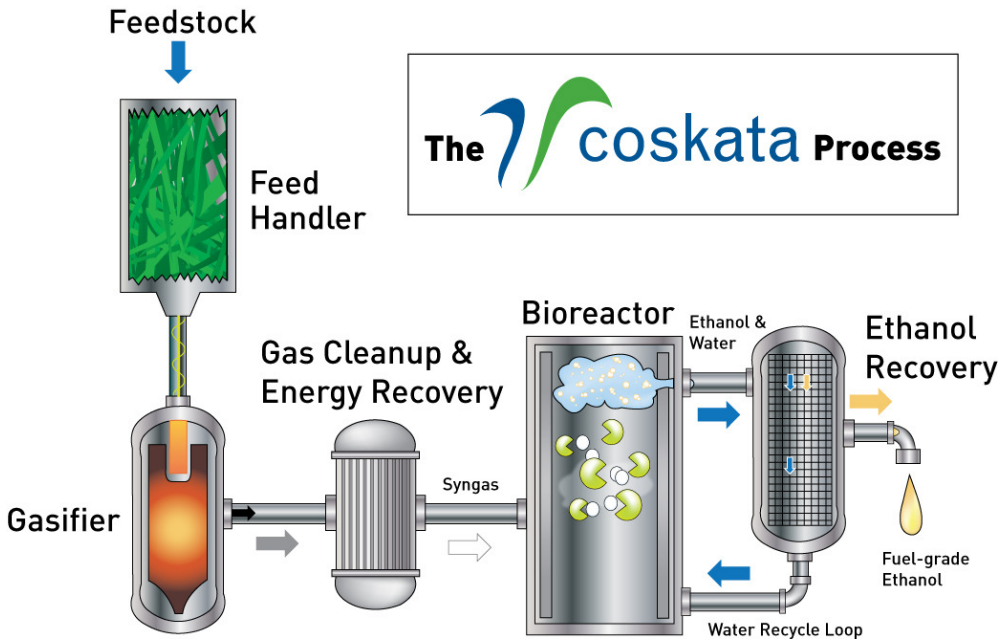
Source: "Biomass as Feedstock for a Bioenergy and Bioproducts Industry: Technical Feasibility of a Billion Ton Annual Supply," 2005, DOE and USDA

Coskata is building facilities and licensing technology

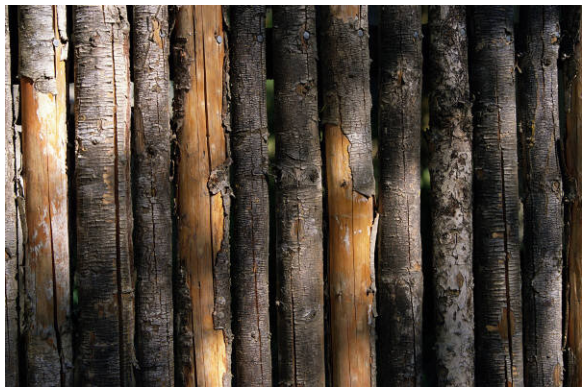
Feedstock and geographic flexibility with gasification

Highest proven conversion efficiency of:
1 ton = ~100 gal.

Cost competitive with gasoline at oil prices today



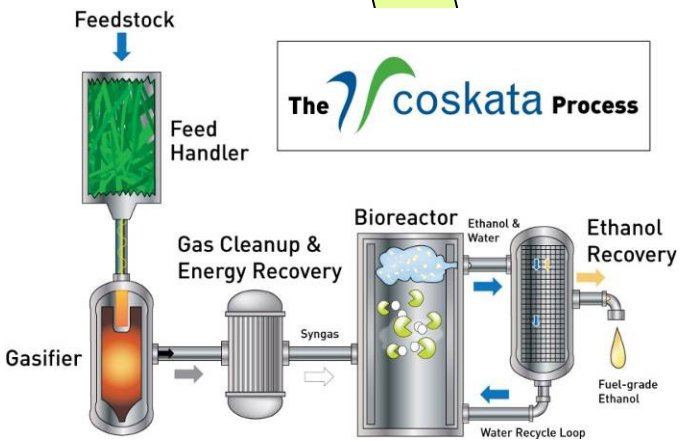
Co-location can result is substantial financial synergies



Raw Materials Procurement

- Corn stover
- Corn fiber
- Wood biomass
- Municipal waste

Excess steam can be shared in the adjacent core process



Shared Infrastructure

- Wastewater Handling & Treatment
- Chemicals Storage
- Utilities
- Road, Rail, etc.

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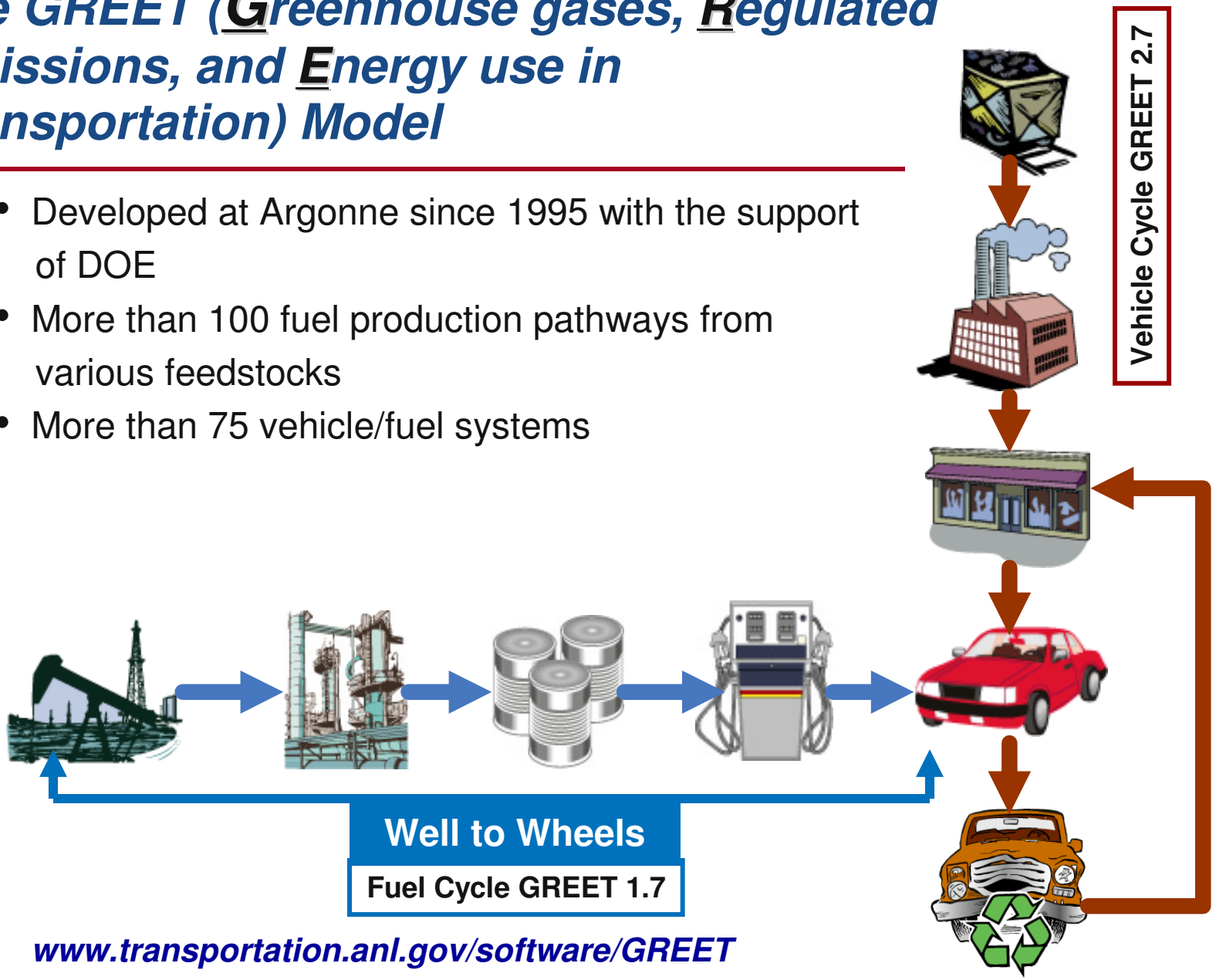
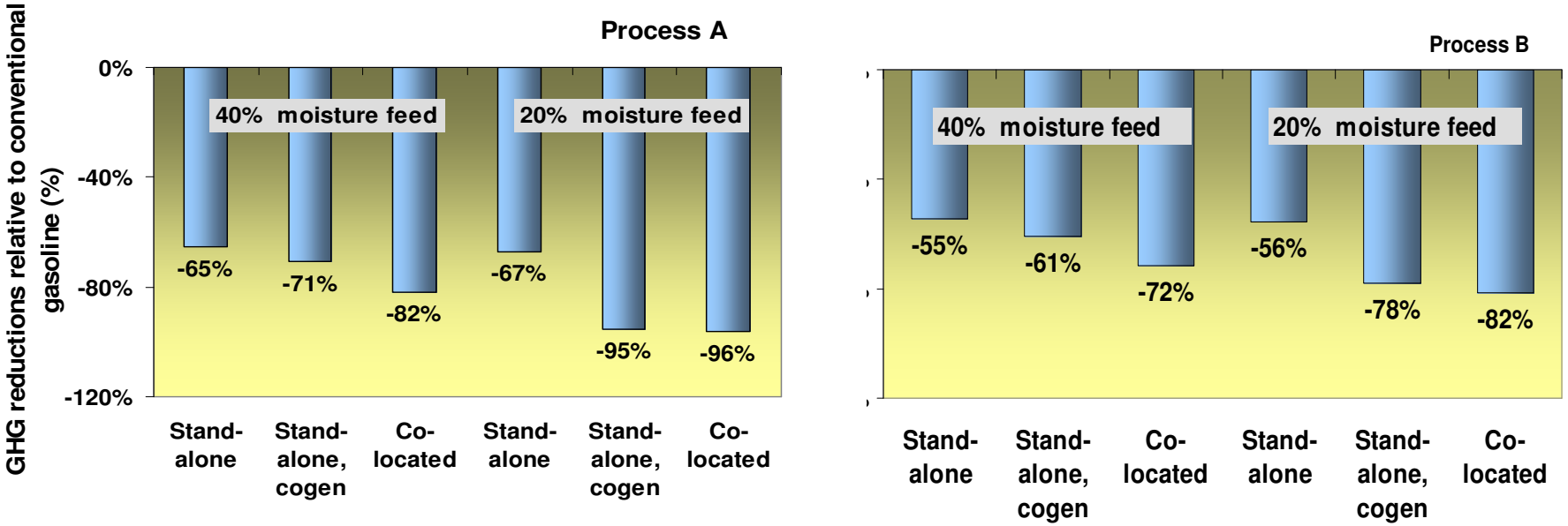
The GREET (Greenhouse gases, Regulated Emissions, and Energy use in Transportation) Model

- Developed at Argonne since 1995 with the support of DOE
- More than 100 fuel production pathways from various feedstocks
- More than 75 vehicle/fuel systems



www.transportation.anl.gov/software/GREET

Electricity Co-Generation and Steam Export Reduce GHG Even Further



Conclusions

- Energy and emission profiles of cellulosic ethanol produced from the Coskata process showed a typical second generation biofuel; it is comparable with other woodchip based biofuel production process

- Both stand-alone / co-gen and co-located / steam export cases can achieve substantial oil and fossil savings from wells to wheels
  - Oil: 71% - 84%
  - Fossil: 73% - 100%

- In comparison with conventional gasoline, cases with power co-gen and steam export can avoid additional greenhouse gas burdens
  - 61% - 82% with wet feed (40% moisture)
  - 78% - 96% with dry feed (20% moisture)

Successful technology roll-out plan

Horizon (2008)

Integrated Processing
Warrenville, IL

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

Lighthouse (2009)

Semi-Commercial
Madison, Pennsylvania

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

Flagship (2012)

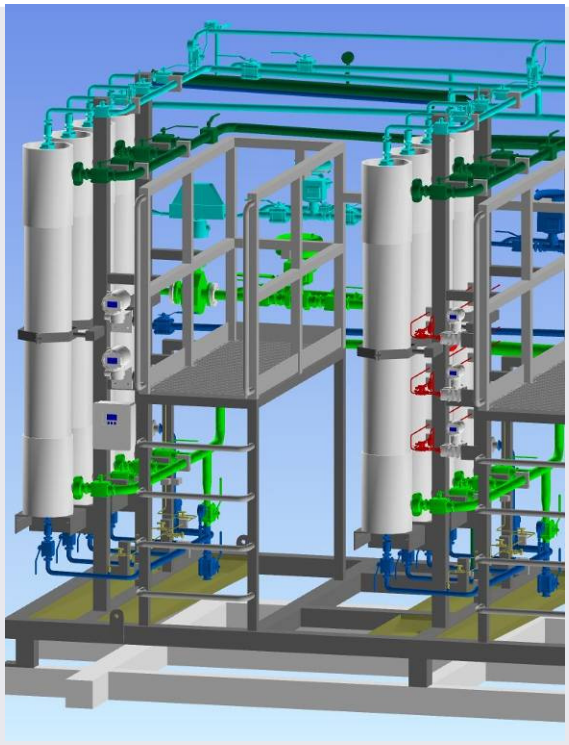
Commercial Production
Location TBA

- 50-60 MM Gallons / yr
- Multiple gasifiers that process ~1500 dry tons/day of biomass
- Cost competitive with gasoline

Integrated Biorefinery demonstrates commercial readiness

- Technology scaled successfully
- Operating results prove Coskata ethanol yield at more than100 gallons/dry ton:
  - Proprietary bioreactors are providing excellent mass transfer of syngas to our proprietary microbes
  - Steady-state ethanol concentrations are sufficiently high to drive the distillation/separation
  - Produces only fuel-grade ethanol
- Completes design details for commercial facilities
- Proves commercial viability on multiple feedstocks, enabling multiple commercial licenses

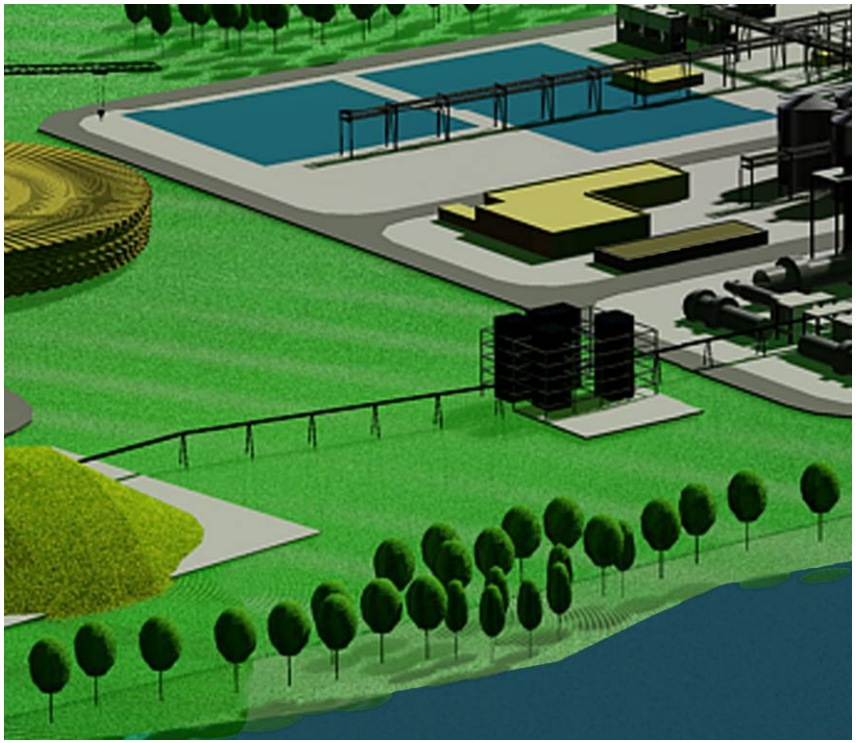
Key Equipment: Bioreactors

Stirred-Tank	Column Type	Membrane
		
Industry Standard	Coskata's proprietary design	Advanced bioreactor design utilizing membranes.

Coskata's first commercial facility

"Project Flagship" will:

- Produce 55 million gallons of fuel-grade ethanol
- Be located in the Southeast United States
- Utilize 1.0-1.2 million green tons of wood biomass*
- Create over 700 direct and indirect green jobs
- Represent the world's first commercially viable, feedstock flexible ethanol plant
- Enable acceleration of licensed facilities



Cutout of Coskata's "Flagship" commercial plant design

Front-end Engineering Design complete

* Green tons refer to total tonnage of biomass including moisture. For wood biomass moisture typically makes up ~50% of the total mass.

Coskata has strong technical team

Over 50 Employees

75% in R&D and Engineering

Over half of R&D staff with PhDs.

Experience from leading industrial companies including Eli Lilly, Abbott Labs, UOP, Dow Chemical, Nalco, and more.

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Coskata technology vetted by strong partners

Commercialization of feedstock flexible ethanol is a boon to the economy

Congressional imperative	Potential impact from 36 billion gallons of biofuels
Jobs	Create more than 1 million new jobs
Economic Growth	Reduce $560 billion in foreign oil dependence
Rural Development	Improve rural economies – a single plant can add >$30 mil to local
Greenhouse gasses	Reduce GHG by 70% -130%*

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* Based onEPA estimates in RFS2 rule

Source: BIO estimates, Coskata estimates on 55 Mil gallon plant, EPA's RFS2 rule

Enduring government policy is required

Tax Incentives

- Biofuel Investment Tax Credits (ITC) must be enacted to spur job creation

Alternative financing mechanisms for technology roll-out:

- USDA and DOE biofuel loan guarantees have a reasonable assurance of payback, and Congress needs to press for the deployment of funds in the near term

Production incentives

- Performance contract that pays for actually delivering the first billion gallons of cellulosic biofuels

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Coskata's integrated biorefinery process