

25x'25: America's Energy Future

Ethanol 2015: Emerging Issues Forum

Omaha, Nebraska

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Ernie Shea- 25x'25 Project Coordinator



Bringing the Vision to Life

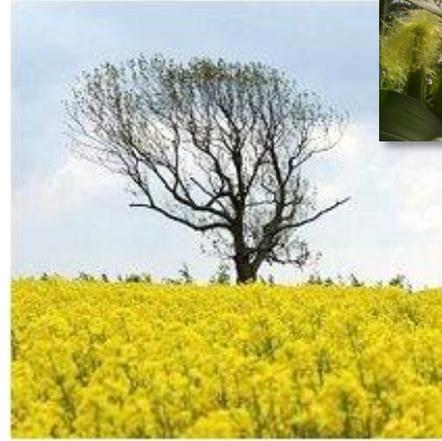
25x'25: A National Alliance

- Post 9/11 initiative
- Formed through a grant from the Energy Future Coalition
- Organized to explore agriculture and forestry's role in America's energy future
- Evolved to now include conservation, environment, business, defense and rural development organizations and leaders



The 25x'25 Vision

By the year 2025,
America's farms,
ranches and forests
will provide 25
percent of the total
energy consumed in
the U.S. while
continuing to produce
safe, abundant and
affordable food, feed
and fiber.



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We will meet this goal by:

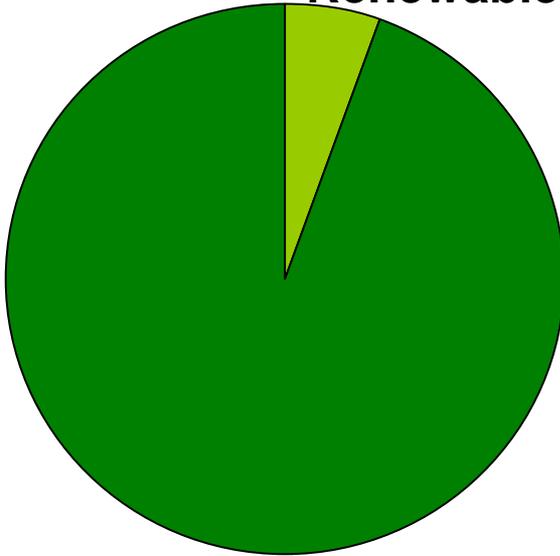
- Producing transportation fuels
- Harnessing wind energy
- Converting biogas emissions
- Capturing solar and hydro energy
- Providing biomass for heat and power



25x'25 is a BIG goal:

2004

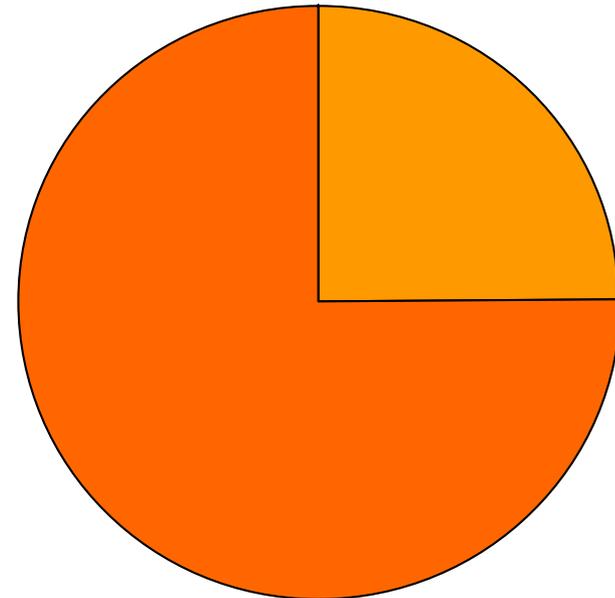
**5.74 Quads
Renewable Energy**



**99.7 Quads
Total Energy
Consumed**

Goal (2025)

**31.7 Quads
Renewable Energy**



**127.0 Quads
Total Energy
Consumed**



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Economic analyses confirm:

- America's farms, forests and ranches can play a significant role in meeting the country's energy needs.
- The 25x'25 goal can be met while continuing to provide safe, abundant and affordable food, feed and fiber.



By 2025, America's farms, forests and ranches can annually produce:

- 86 billion gallons of ethanol
- 1.1 billion gallons of biodiesel
- 932 billion kwh of electricity
- 15.45 quads of energy from biomass

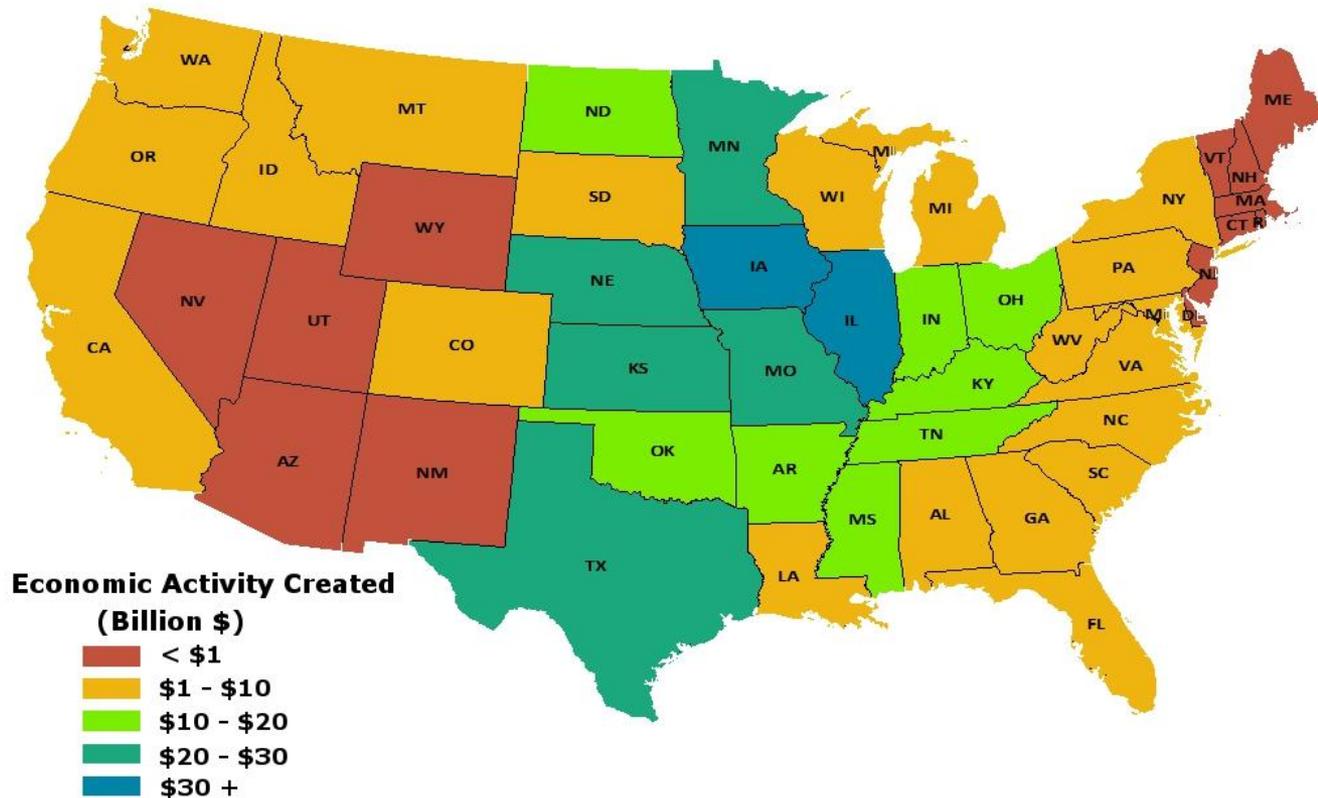


How Big an Impact?

- 27.8 quads of clean energy
- \$640 billion boost to economy
- 4.7 million new jobs
- Solutions that can be delivered from all regions of the country!



Additional Economic Activity: 2025



Estimated Impacts as measured through Added Industry Output and Job Creation as a Result of Meeting the 25x'25 Energy Goal

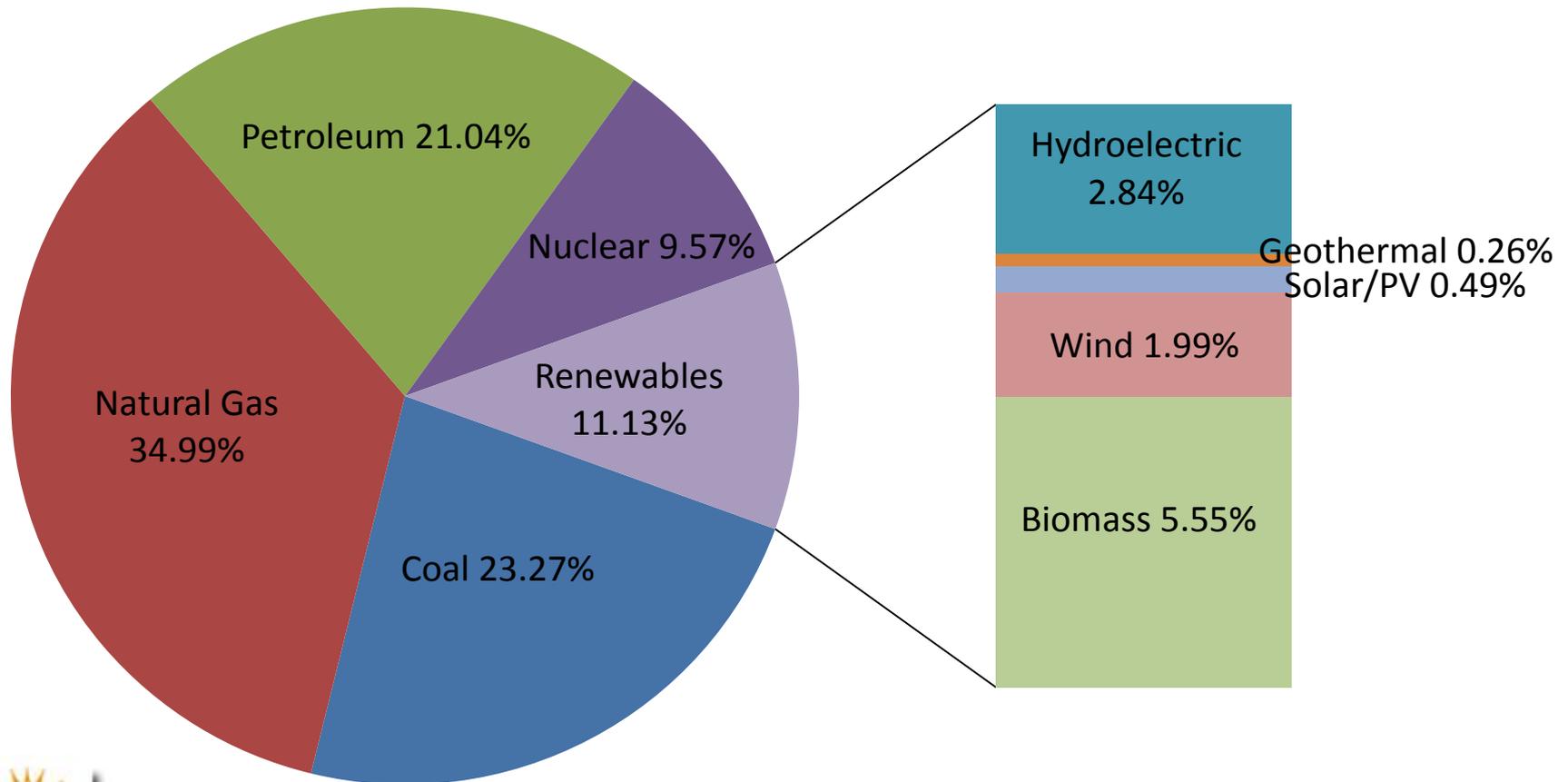
Source: University of Tennessee, Bio-Based Energy Analysis Group, Sept. 2011



Where are we now?

2014 Total Energy Production: 87.04 Quad BTU
2014 Renewable Energy Production: 9.68 Quad BTU

U.S. Primary Energy Production by source, 2014



Source: U.S. Energy Information Administration



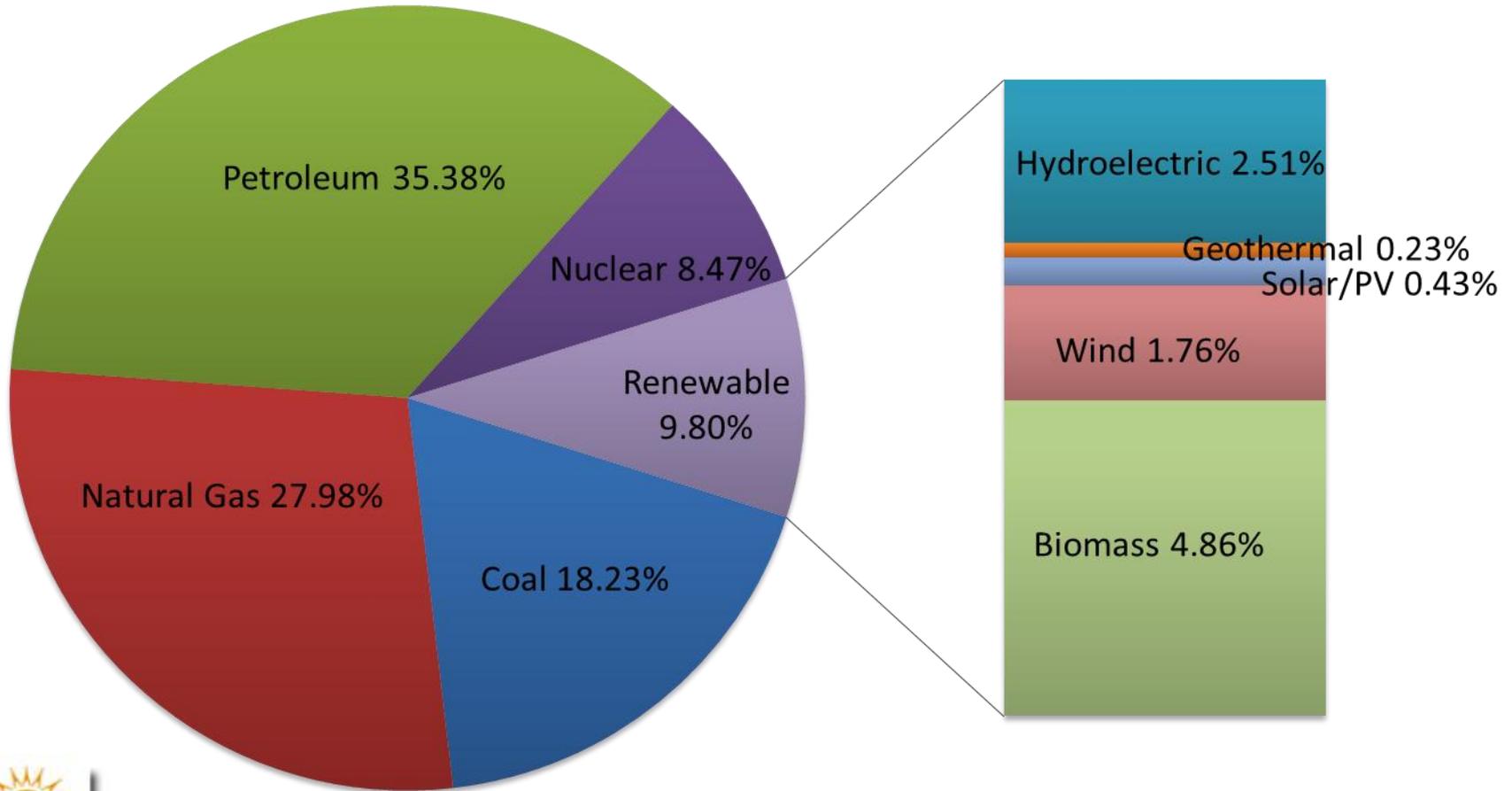
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Where are we now?

2014 Total Energy Consumption: 98.32 Quad BTU

2014 Renewable Energy Consumption: 9.63 Quad BTU

U.S. Primary Energy Consumption by source, 2014



Source: U.S. Energy Information Administration



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America's Mega Challenges

National Security



Economy



Environmental Degradation



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Common Solution: 25x'25 Energy Future

- **Less carbon intensive**
- **More secure**
- **More resilient**
- **More decentralized**
- **More participatory**



Ethanol Solutions

- **Economic**- reduced gasoline prices
- **National security**- reduced dependence on oil
- **Efficiency**- improved vehicle performance
- **Environmental**- reduced GHG emissions
- **Public health**- reduced toxic emissions from gasoline



Ag-Auto-Ethanol Work Group

- a self-directed, ephemeral alliance of collaborating biofuel feedstock and producer groups, agribusiness partners, automobile manufacturers, infrastructure providers, and technical and academic experts who are working together to develop strategies and action plans to accelerate the transition of transportation fuels to higher octane/lower carbon blends for use in the light duty vehicle fleet.



AAE Participants

- NCGA, state corn boards, Growmark, Deere & Monsanto
- GM, Ford, FCA, Toyota, VW and Mercedes
- RFA, Growth, ACE, ICM, ADM and Poet
- Oak Ridge, Argonne and NREL
- GBC, CFDC, EESI and EFC
- Wayne Fueling, Gilbarco/Veeder Root
- Thortons and ALA Chapters

(25x'25- facilitator and secretariat)



Steering Committee Role:

- enhance communication, cooperation and collaboration among Work Group members;
- appoint and support action teams;
- provide a forum for sharing and building consensus on ideas and proposals raised by members; and
- enable the effective functioning of the Work Group.



4 Action Teams:

- **Octane**
- **FFV Incentives**
- **Infrastructure**
- **Engine and vehicle testing**



Octane Team:

- *develop recommendations for a minimum octane rating that will help auto manufacturers meet the new federal CAFE/GHG standards.*



FFV Team:

- *develop recommendations and a strategy for establishing meaningful automobile manufacturer incentives for producing flexible fuel vehicles (FFVs) that will meet federal greenhouse gas emission and corporate average fuel economy standards beyond 2016.*



Infrastructure:

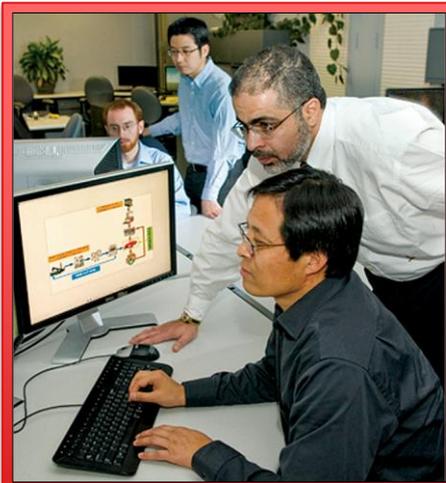
- *evaluate and recommend potential pathways towards a fueling infrastructure adequate for supplying mid-level blends to gasoline consumers and a fueling infrastructure adequate for serving FFV vehicles.*



Engine and Vehicle Testing:

- *facilitate communication, collaboration and coordination among current test programs; identify gaps where additional leadership/work is needed; and develop recommendations, for the consideration of the AAEWG, for ways new engine and vehicle technologies and designs can further accelerate the transition of transportation fuels to higher ethanol blends for use in the light duty fleet.”*

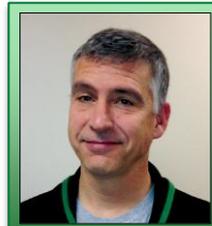
Renewable Super Premium Fuel Study... a 3-Lab Collaboration



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Shean Huff



Mike Kass



Paul Leiby



Debo Oladosu



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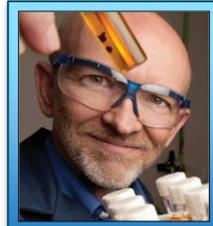
John Thomas



Gina Chupka



Caley Johnson



Bob McCormick



Kristi Moriarty



Emily Newses



Brian West



Rocio Uria-Martinez

Transportation Industry Faces Unprecedented Challenges

RENEWABLE FUEL STANDARD

36 billion gallons by 2022
(EISA 2007)



FUEL ECONOMY STANDARDS

2025 CAFE Standards
(U.S. EPA and U.S. NHTSA standards)



EMISSIONS REGULATIONS

↓ 70% NO_x & PM, 85% NMOG
< 10 ppm sulfur in gasoline
(U.S. EPA Tier 3 regulations)



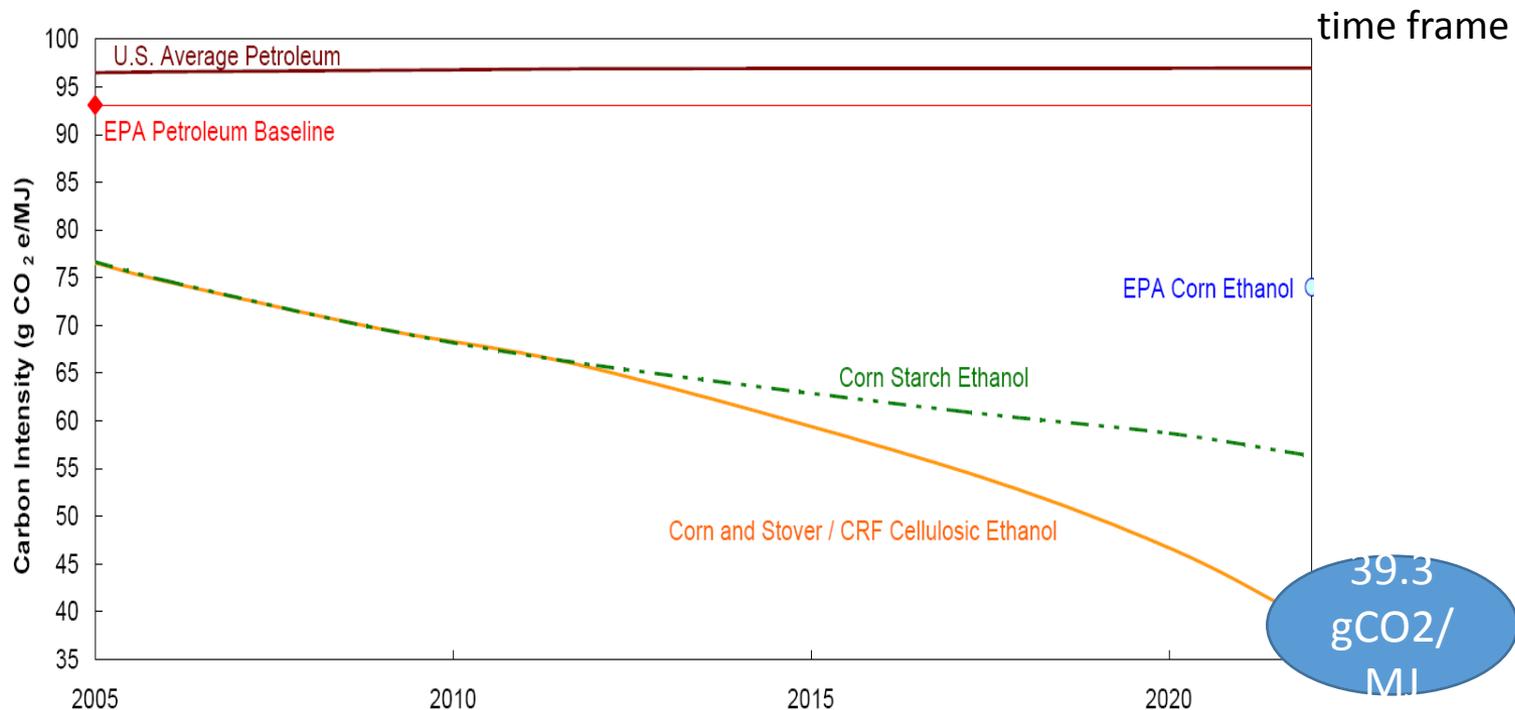
- Renewable Super Premium (RSP) can create additional demand for large amounts of ethanol & enable improved fuel economy in **dedicated vehicles** (supports biofuels & automobile industries)
- Existing project is “scoping study” to address barriers, quantify benefits and determine if additional R&D is warranted

Provisional Results To Date Are Encouraging ...

- ✓ Ethanol is a significant enabler for high octane fuels
- ✓ Potential vehicle efficiency gains significant (5-10% feasible)
- ✓ Significant reductions in GHG (~30% with cellulosic ethanol)
- ✓ Little decrease in overall US refinery efficiency, even at very high demands
- ✓ Ethanol offers higher volume of HOF and additional GHG benefits not achievable with E10 HOF
- ✓ Provides opportunities for refineries to export gasoline products
- ✓ Immediately usable in legacy FFVs (17M)
- ✓ Reasonable path forward in infrastructure
- ✓ Significant market share for dedicated RSP vehicles using different market scenarios
- ✓ Significant increase in ethanol demand (~18-58 BGY ethanol)
- ✓ With *equal* decreases in petroleum!

Implementing Latest Data Sets: | CI of gasoline and corn-based ethanol mix consumed in the U.S. over time

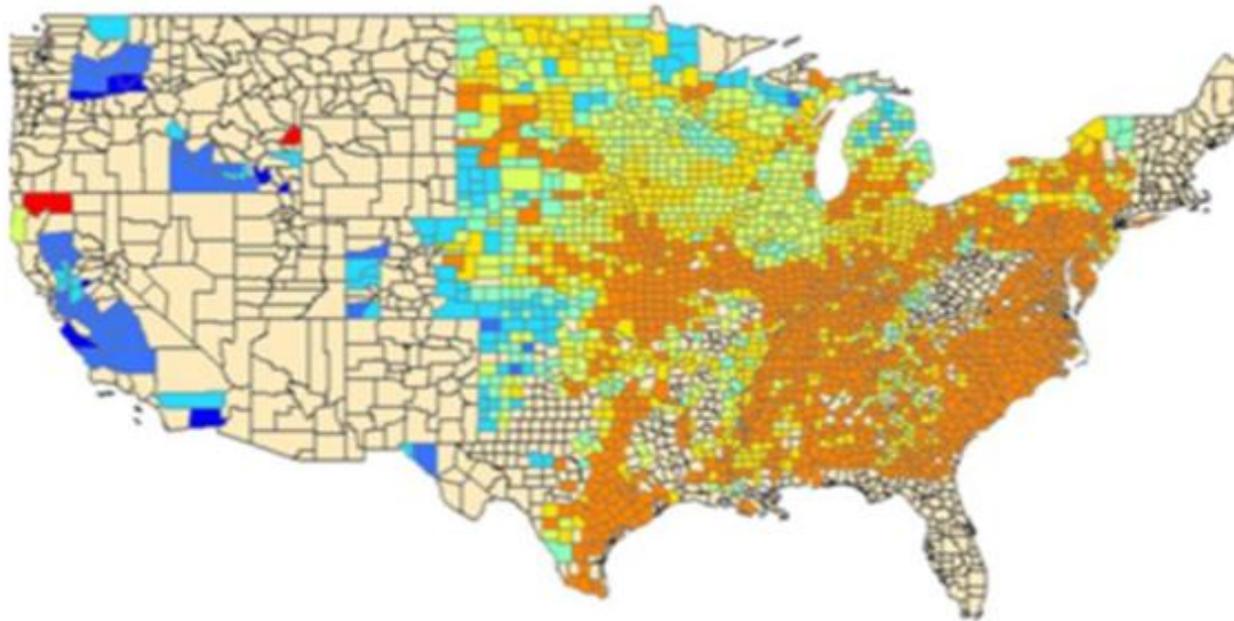
- Modeling runs using
 - latest LCA boundary science for the co-product treatment of corn stover (as supply of corn replacement feed & cellulosic ethanol production) and
 - assumed blending requirements set by the RFS2 for corn and cellulosic ethanol
 - will result in CI of corn based fuels of 39.3 gCO₂e/MJ by 2022. This includes iLUC assumptions of 9 gCO₂e/MJ assessed with CCLUB



Source: Susan Boland, Stefan Unnasch; “Carbon Intensity of Marginal Petroleum and Corn Ethanol Fuels”; Life Cycle Associates, 2014.

Soil Carbon Sequestration

Soil Carbon Stock Changes
Land Transitions from Mixed Production Agriculture to Corn-Corn Rotations
Source: CCLUB GREET





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