A Clean Fuels Policy for the Midwest

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The Midwestern Clean Fuels Policy Initiative

Governor's Council on Biofuels

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WHAT IS A CLEAN FUEL POLICY?

- Designed to be technology-neutral.
- Sets a standard for reducing the carbon intensity of all fuels, compensates any clean fuel or low carbon fuel provider that can achieve a lower CI than the policy requires.
- Supports a portfolio of clean fuels and compensates fuel producers based on their actual carbon performance without discriminating against or disproportionately favoring any fuel.
- Encourages a competitive marketplace in clean fuels and offers incentives to support access to the market.
- Supports development of a variety of clean fuel types, including but not limited to biofuels, electricity, and hydrogen.

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2020 vs 2010 – changing perceptions about LCFS/Clean Fuel Policy

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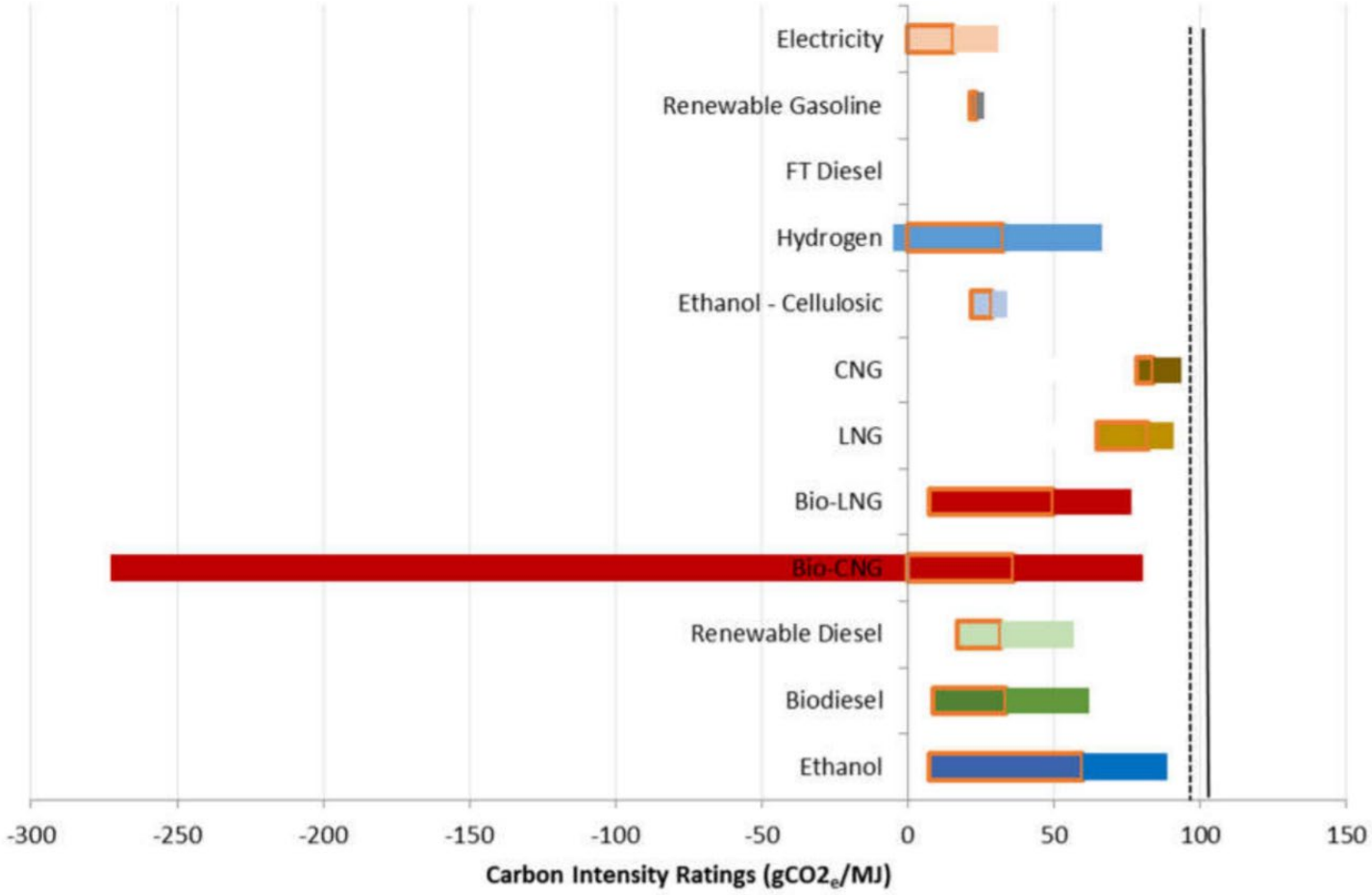
Clean Fuel Policy/LCFS Background

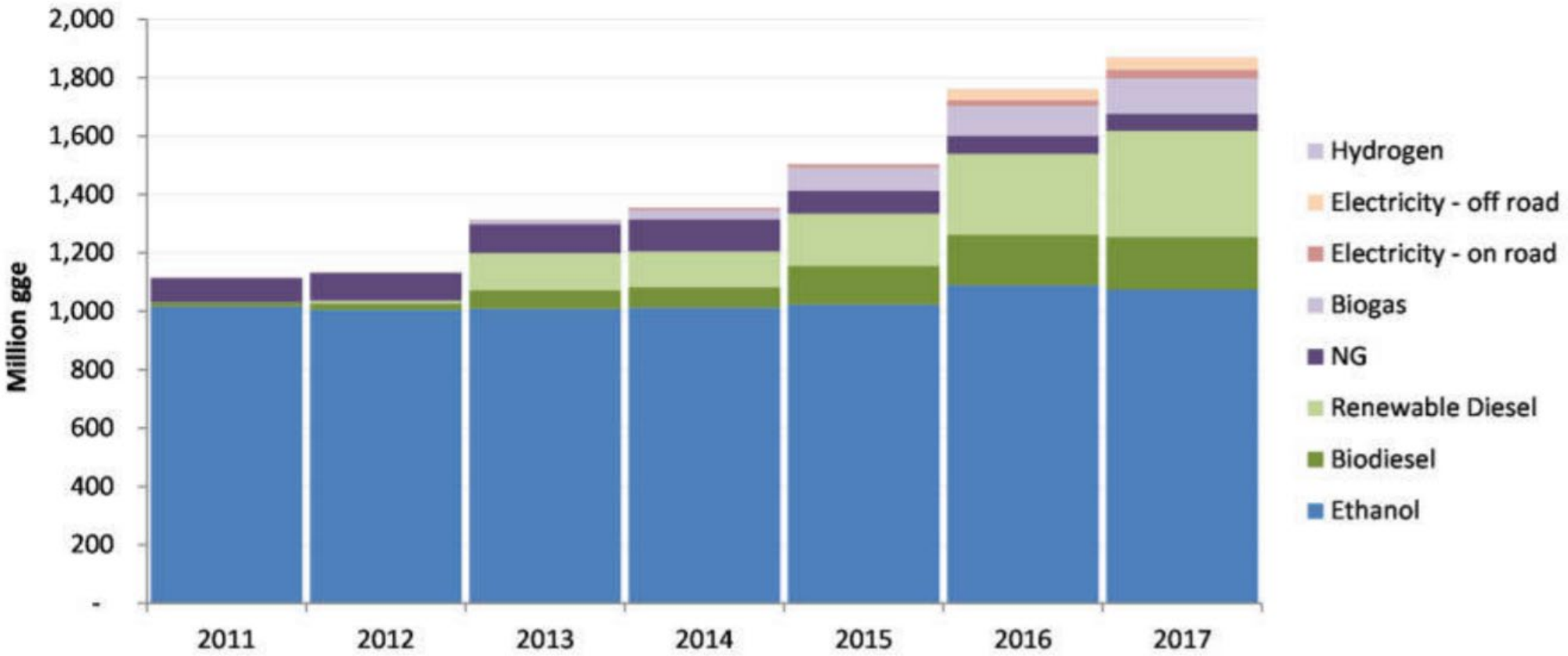
- Require average carbon intensity reductions for all transportation fuels
  - Higher carbon fuels pay
  - Lower carbon fuels receive payment
- More and more jurisdictions – CA, OR, WA, CO, NY, Canada, Brazil, EU, UK
- VS RFS:
  - “Technology-neutral” policy
  - Portfolio approach (ethanol, biodiesel, RNG, EVs, etc)
  - Carbon intensity reductions (not just volumes)
  - Incentives for innovation by all fuel producers
  - All facilities have a unique “score”.

California fuel pathways



Source: UC Davis Institute of Transportation Studies. “Status Review of California’s Low Carbon Fuel Standard, 2011-2018. September 2018.

CA Low Carbon Fuels



Source: UC Davis Institute of Transportation Studies. “Status Review of California’s Low Carbon Fuel Standard, 2011-2018. September 2018.

Midwestern Clean Fuel Stakeholder Process

- Participation: ethanol, biodiesel, ag. commodity, NGO, state government, auto, EV, electric utility, RNG
- Modeling:
  - Compliance – what fuels benefit from the program?
  - Economic impact – who benefits?
  - Case studies – how do individual use cases fare?
- Stakeholder engagement
  - Policy recommendations for a Midwestern approach
  - Consensus whitepaper released January 2020

MIDWESTERN CLEAN FUEL POLICY STAKEHOLDER PARTICIPANTS

- Alternative Fuels Council
- American Coalition for Ethanol
- Center for Energy and Environment
- ChargePoint
- Christianson PLLP
- Coalition for Renewable Natural Gas
- Conservation Districts of Iowa
- Conservation Minnesota
- Environmental Law and Policy Center
- EcoEngineers
- Fresh Energy
- Governors' Biofuel Coalition
- Guardian Energy
- Highwater Ethanol, LLC
- Iowa Environmental Council
- Iowa Soybean Association
- Iowa State University Bioeconomy Institute
- Kansas Corn
- Low Carbon Fuel Coalition
- Minnesota Bio-Fuels Association
- National Biodiesel Board
- National Corn Growers Association
- Partnership on Waste & Energy (Hennepin, Ramsey & Washington Counties)
- Renewable Fuels Association
- Renewable Products Marketing Group
- South Dakota Corn
- Sustainable Farming Corporation
- Union of Concerned Scientists
- Urban Air Initiative
- Xcel Energy
- ZEF Energy

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VISION FOR A CLEAN FUELS POLICY FOR THE MIDWEST

- Contribute to meeting and **exceeding existing goals and policies** at the state level
- Support a **portfolio of clean fuels**, including biofuels, low and zero-carbon electricity for transportation, and other clean fuel options.
- **Make the economic prize bigger** by expanding the clean fuels market and avoid pitting different clean fuels against each other.
- **Create a backstop** if federal policy supporting clean fuels is undermined.
- Create broad **rural and urban economic development**, benefits for communities, consumers, and agriculture, and increased **energy security** from increased reliance on clean fuels produced in the Midwest.
- Achieve additional GHG reductions through **increased renewable content** in transportation fuels over time.
- Support existing **farmer-led efforts** to adopt agricultural practices that benefit **soil health and water quality** while contributing to GHG reductions.
- Contribute to **electricity sector decarbonization**, increased use of renewable electricity, and benefits for electricity customers as managed EV charging enables efficient renewable electricity integration and puts downward pressure on electric rates.
- Improve **air quality and public health**.

PRINCIPLES FOR A MIDWESTERN CLEAN FUELS POLICY

- Design a market-based approach while remaining fuel and technology neutral, relying on a portfolio of clean fuels including biodiesel, ethanol, renewable natural gas, electricity as a transportation fuel, hydrogen, and other renewable and low-carbon fuels.
- Design the policy based on the lifecycle assessment (LCA) of fuels. Lifecycle assessments should be consistent for all fuel types, science- and engineering-based, up to date, incorporate upstream emissions, and reflect differences in vehicle fuel efficiency with different drive trains.
- The latest Argonne GREET model should be used as a basis for conducting lifecycle assessments.
- Consider regional factors in the Midwest, including the impact of renewable electricity development on the electric grid, current production practices at biofuel facilities, adoption of farming practices that impact soil organic carbon and nitrous oxide emissions, and current and aspirational biofuel blending levels.

PRINCIPLES FOR A MIDWESTERN CLEAN FUELS POLICY

- Build on existing state policies rather than replacing those policies.
- Reinforce and complement existing efforts by the agricultural sector to increase the adoption of practices that improve soil health and water quality.
- While recognizing state autonomy in policy making, states should collaborate and seek to create a uniform regional approach where possible.

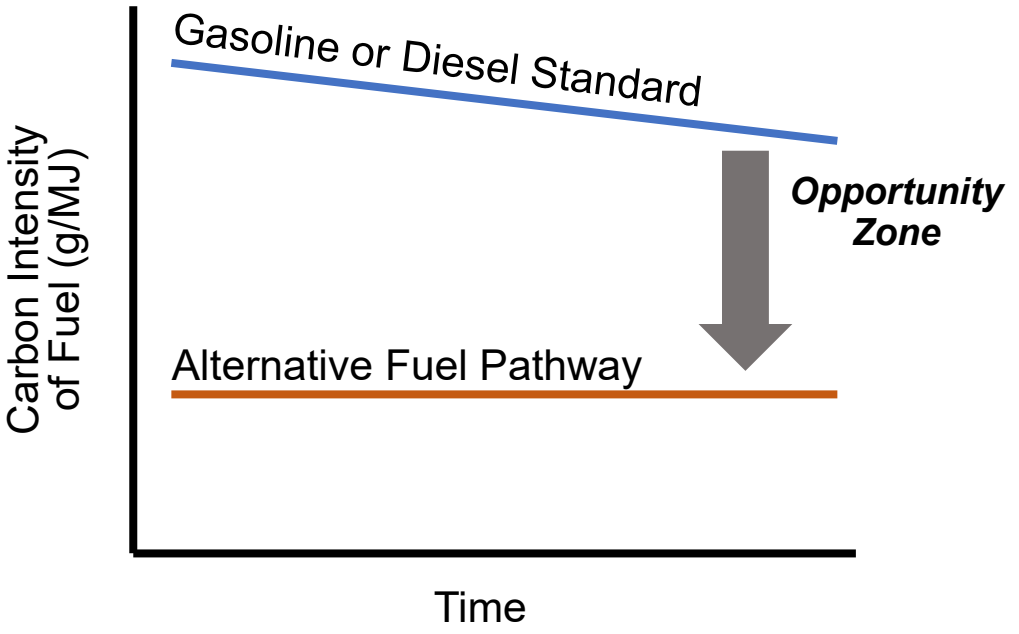
ALTERNATIVE FUEL PATHWAY CASE STUDIES

- Carbon intensity (CI) or fuel intensity is a score calculated for each fuel – measured in grams per Megajoule (g/MJ)

- "Well-to-wheel" factors included in calculation:
  - Alternative fuel feedstock
  - Soil Organic Carbon
  - Field practices
    - Nutrient management
    - Tillage
    - Carbon management
    - Transportation fuels
  - Fuel refining
  - Fuel use or combustion

- Using existing LCA tools, studied a series of five alternative fuel categories

CFP Market Logic



- **All results found consistent positive opportunity for credit generation and revenue across fuel types**

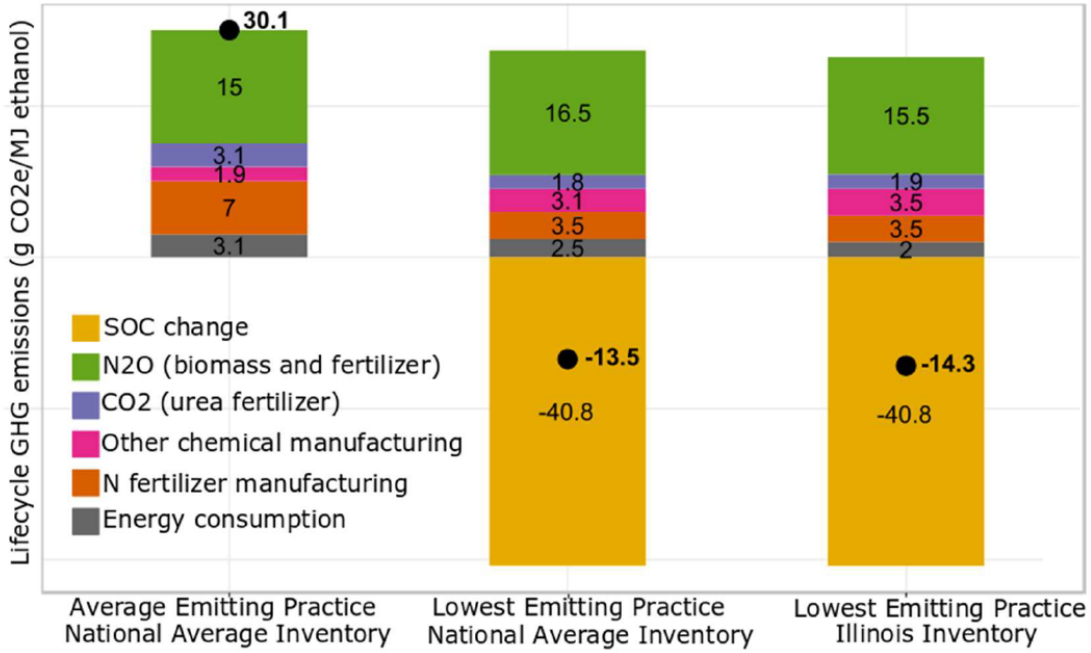
ALTERNATIVE FUEL PATHWAY CASE STUDIES

DRAFT CASE STUDY RESULTS

- **Ethanol**
  - Processing electricity scenarios
  - Field practices (tillage, nutrient management, soil carbon management)
  - ILUC assumptions
  - Flex-fuel hybrid / electric
- **Electricity**
  - Generation mix scenarios
  - Vehicle applications: passenger, freight, forklift, school bus, transit bus
  - Charging station applications: level 2 chargers, DCFC
- **Compressed Natural Gas (CNG)**
  - Renewable CNG (RNG)
  - Feedstock options: manure, organics, landfill gas
- **Renewable Diesel**
  - Feedstock options: existing average, wood-based exclusive
  - Industry insights
- **Biodiesel**
  - Processing electricity scenarios
  - Feedstock options: UCO, soy
  - ILUC assumptions

Potential for farming practices to lower CI

State-level corn ethanol LCA plus SOC



- Best practice: yield increase, rye and vetch CC (with N credit), no till, 100% stover return, manure application, N inhibitor application, improved genetic corn
- N_2O emission has contributed to 50% of the cradle-to-farm gate GHG emissions
- The best practice can result in 40.8 g CO_2e sequestration in the form of SOC

Source: Argonne National Laboratory

CARBON CAPTURE COALITION

STATE CARBON CAPTURE WORK GROUP

REGIONAL CARBON CAPTURE DEPLOYMENT INITIATIVE

CARBON CAPTURE COALITION

Unprecedented National Coalition in U.S. Energy & Climate Policy

70+ members, including industry, NGO and labor interests. Established in 2011.

Climate, jobs and energy/industrial benefits unite very diverse interests in a common purpose.

Supports innovation and deployment across all energy resources and industry sectors.

Goal: achieve economywide deployment of carbon capture to reduce emissions, foster domestic energy and industrial production, and support jobs.

Participants

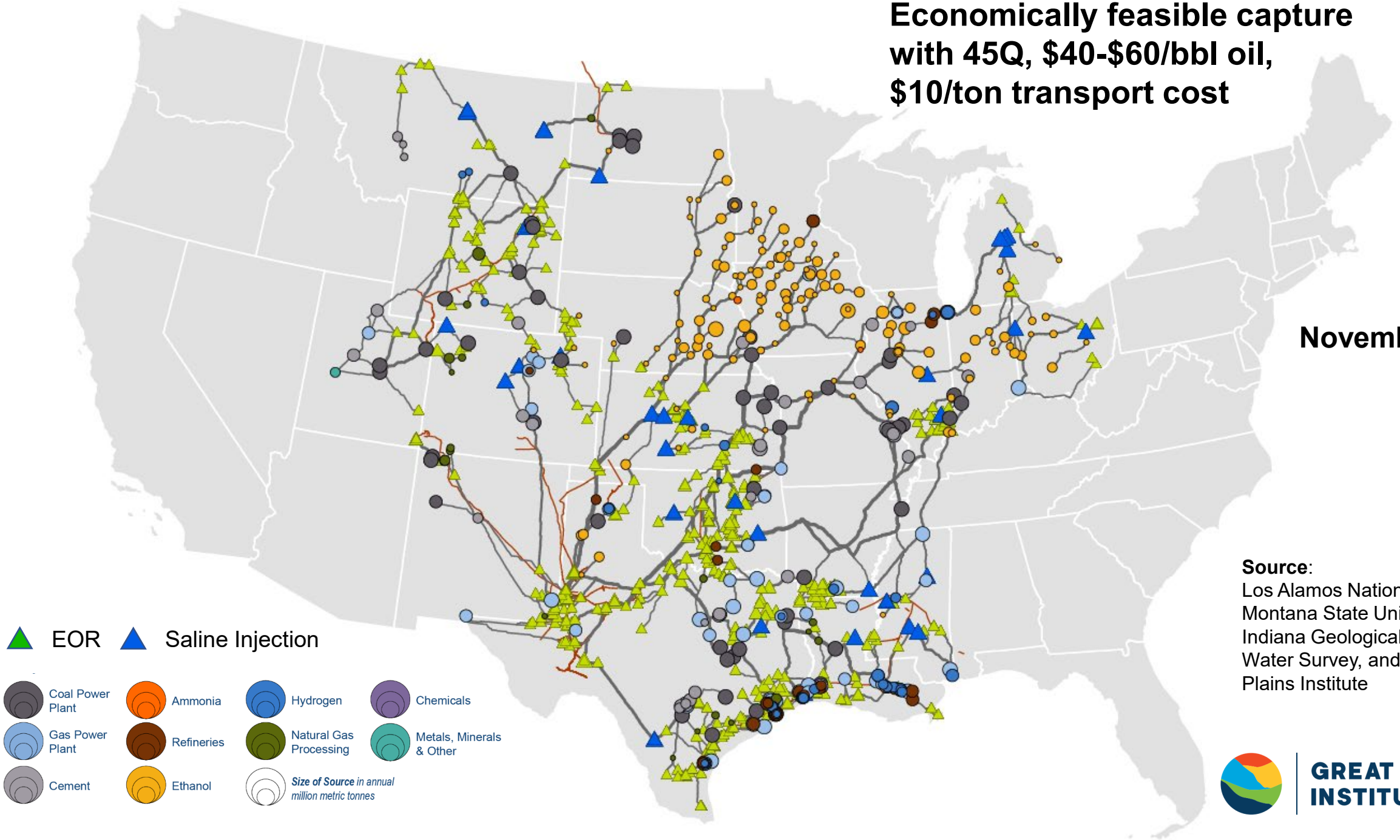
- Accelergy
- AFL-CIO
- Air Liquide
- Air Products
- AK Steel
- American Carbon Registry
- ArcelorMittal
- Arch Coal
- Archer Daniels Midland Co.
- Baker Hughes, a GE Company
- Bipartisan Policy Center
- Carbon180
- Carbon Wrangler LLC
- Center for Climate and Energy Solutions
- Citizens for Responsible Energy Solutions Forum
- Clean Air Task Force
- ClearPath Foundation
- Cloud Peak Energy
- Conestoga Energy Partners
- Core Energy LLC
- EBR Development LLC
- EnergyBlue Project
- Energy Innovation Reform Project
- Glenrock Petroleum
- Great River Energy
- Greene Street Capital
- Impact Natural Resources LLC
- ION Engineering LLC
- International Brotherhood of Boilermakers
- International Brotherhood of Electrical Workers
- Jackson Hole Center for Global Affairs
- Jupiter Oxygen Corporation
- Lake Charles Methanol
- LanzaTech
- Linde LLC
- Mitsubishi Heavy Industries America, Inc.
- National Audubon Society
- National Farmers Union
- National Wildlife Federation
- NET Power
- New Steel International, Inc.
- NRG Energy
- Occidental Petroleum Corporation
- Pacific Ethanol
- Peabody
- Prairie State Generating Company
- Praxair, Inc.
- Renewable Fuels Association
- Shell
- SMART Transportation Division (of the Sheet Metal, Air, Rail and Transportation Workers)
- Summit Power Group
- Tenaska Energy
- The Nature Conservancy
- Third Way
- Thunderbolt Clean Energy LLC
- United Mine Workers of America
- United Steel Workers
- Utility Workers Union of America
- White Energy
- Wyoming Outdoor Council

Observers

- Algae Biomass Organization
- Biomass Power Association
- Carbon Engineering
- Carbon Utilization Research Council
- Cornerpost CO2 LLC
- Enhanced Oil Recovery Institute, University of Wyoming
- Environmental Defense Fund
- Growth Energy
- Institute of Clean Air Companies
- Melzer Consulting
- Tellus Operating Group
- World Resources Institute

To learn more and view our complete membership list, visit www.carboncapturecoalition.org.

Economically feasible capture with 45Q, $40-$60/bbl oil, $10/ton transport cost



November 2019

Source:
Los Alamos National Lab, Montana State University, Indiana Geological and Water Survey, and Great Plains Institute

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Carbon Capture is Cost-Effective: Preliminary Revised Estimates of Capture Costs Compare Favorably to Other Low and Zero-Carbon Options

Capture Category (CO2% is molar concentration)	Main Equipment Needed	Industrial Application	US$ per MT Captured/Compressed
Pure CO_2 emissions	Compression & Dehydration only	Ethanol, Natural Gas Processing, Ammonia	$15-29
CO_2 emissions @ **16-50%** concentration	Amine CO_2 separation equipment plus Compression	Hydrogen Plants, Cement, Fluidized Catalytic Cracking Unit (Refineries), Blast Furnace Gas Combustion (Steel)	$40-60
CO_2 emissions @ **~13-15%** concentration		Pulverized Coal Power Plants	$55-65
CO_2 emissions @ **~4%**		Natural Gas Combined Cycle Power Plants	$65-75

Source: Jeff Brown, Stanford University. These figures above are broad category summaries, and individual projects costs vary widely.
Key price assumptions: $50/MWh for electricity, $3.50/MMBtu natural gas, 10% Capital Recovery Factor.
Capture plant size: For amine solvent carbon capture systems cited above (all at 85% capacity factor) capture plant size for hydrogen is 350k MTPA (metric tons per annum), cement 1 million MTPA, FCCU 500k MTPA, Blast Furnace 3 million MTPA, Pulverized Coal Power 3 million MTPA, NGCC, 1.5 million MTPA. Pure emissions have compression/dehydration only.
Power and steam supply: Coal power plants and NGCCs can supply parasitic electric and steam loads from the power plants themselves, or can buy grid electricity and build separate steam boilers. The exact impact of this supply decision depends on power plant value, fuel costs, and the local grid.

COMPLIANCE MODELING

	Current (2018) Conditions	10% Carbon Intensity Reduction	15% Carbon Intensity Reduction	20% Carbon Intensity Reduction
Biofuel Blending				
Ethanol	Average blend rate: 12.5% in MN and 11.5% in IA	15% blend exclusive of CI improvements.	20% blend Low CI improvements through agronomic practices and production improvements.	20% blend Aggressive CI improvements through agronomic practices and production improvements.
Biodiesel	Average blend rate: 11.3% in MN and 8.8% in Iowa	15% blend No CI improvements	20% blend No CI improvements	20% blend CI improvements through agronomic practices and production improvements.
Renewable diesel	0% renewable diesel blend in Midwestern states	5% blend	5% blend	10% blend

COMPLIANCE MODELING

	Current (2018) Conditions	10% Carbon Intensity Reduction	15% Carbon Intensity Reduction	20% Carbon Intensity Reduction
Vehicle Replacement				
Light-duty EVs	<1% of fleet in MN and IA.	5% of fleet by 2030 8.9% of sales by 2030 Low adoption of carbon-free electricity	10% of fleet by 2030 16.6% of sales by 2030 Moderate adoption of carbon-free electricity	15% of fleet by 2030 24.3% of sales by 2030 Higher adoption of carbon-free electricity
Medium- and heavy-duty EVs	<1% of fleet in MN and IA.	1% fleet EV by 2030 Low adoption of carbon-free electricity	5% of fleet EV by 2030 Moderately carbon-free electricity	10% of fleet by 2030 Higher adoption of carbon-free electricity
Natural gas & Renewable natural gas (RNG) vehicles	De minimus use of RNG in Minnesota and Iowa.	12% of fleet by 2030 95% RNG blend 100% MSWL	12% of fleet by 2030 95% RNG blend 50% MSWL—50% manure	12% of fleet by 2030 95% RNG blend 15% MSWL—85% manure

ECONOMIC IMPACTS

What do we know?

- Net positive impacts for the Midwest region
- Opportunities for a portfolio of fuels – a whole variety of pathways were modeled

What remains uncertain?

- Distributional impacts – how do we design policy to ensure credit revenue ends up in the right place, ex. Between refiners and producers, between producers and farmers, and with benefits for consumers?
- Impacts on air quality – we know the impact is large and beneficial, but we are not ready to assign a number to the benefit.
- Impacts on water quality – we knew the program offers potential for water quality benefits through investment in agricultural conservation practices, but have not modelled the magnitude of the benefit.

ECONOMIC IMPACTS

What do we know?

- 4 economic impact scenarios
  - Every scenario found net-positive economic impacts for region
  - Distributional impacts for different sectors varied
- Following sectors saw benefits, varying in different scenarios:
  - Fuel Producers:
    - Farming
    - Biofuel production (e.g. ethanol, biodiesel, renewable diesel, RNG)
    - Electricity sales
  - Fuel consumers
    - Trucking
    - Gasoline consumers (households)
  - Scenarios divided benefit differently between producers and consumers of fuels, but positive for both under reasonable modeling assumptions
- Opportunities for a portfolio of fuels

Next Steps

- **Policy Design:**
  - EV Credit Generation
  - Farm-level carbon accounting
  - Point of obligation
  - Cost-containment
- **Outreach:**
  - Fuel-specific webinar series
  - Policymaker education

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Conclusions

- Growing coalition supports Clean Fuels Policy in the Midwest
- Technology-neutral, performance-based policy supporting environmental improvement, economic benefit, energy security
- Clean Fuels Policy offers economic opportunity for the region
- Innovation policy supporting existing and emerging clean fuels

www.betterenergy.org/cleanfuelspaper

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THANK YOU

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