Governor's Council on Biofuels

April 29, 2020 Meeting

10:00 a.m. to 12:00 p.m. noon
Webex Teleconference

Agenda

10:00 a.m.

Welcome and introductions
Commissioner Thom Petersen, Minnesota Department of Agriculture (MDA)

10:05 a.m.

Overview of agenda and introduction of panel
Bob Patton, Energy and Environment Supervisor, MDA

10:10 a.m.

Panel: A Clean Fuels Policy for the Midwest

- Brendan Jordan, Great Plains Institute
- Chris Bliley, Growth Energy
- Matt Herman, Biotechnology Innovation Organization (BIO)
- Brian Jennings, American Coalition for Ethanol
- Sam Wade, Coalition for Renewable Natural Gas

11:40 a.m.

Overview of upcoming meetings
Bob Patton

11:45 a.m.

Public comment and questions

12:00 p.m.

Adjourn

A Clean Fuels Policy for the Midwest

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The Midwestern Clean Fuels Policy Initiative

Governor's Council on Biofuels

April 29, 2020

Brendan Jordan, Vice President of the Great Plains Institute

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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.

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

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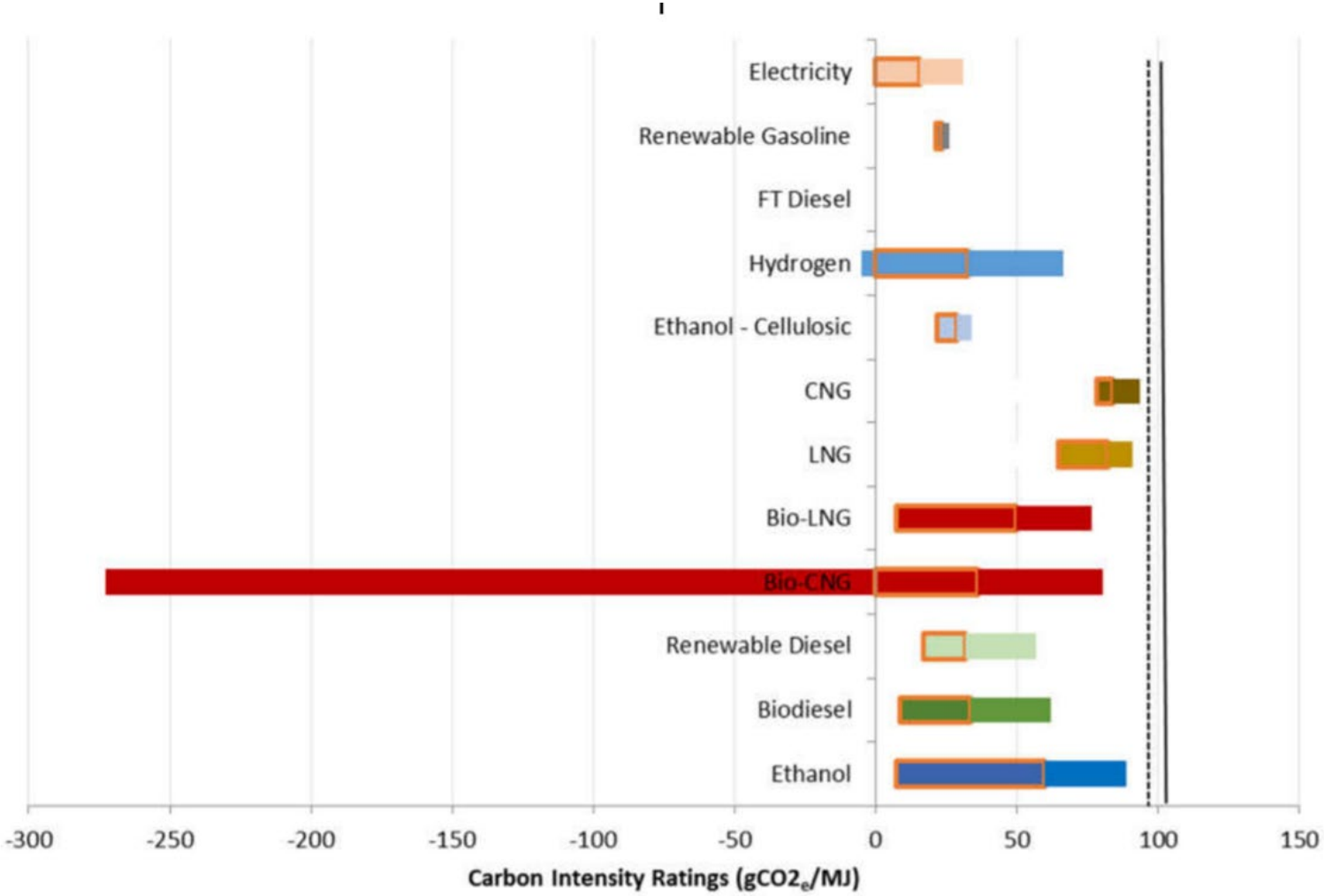
Clean Fuel Policy/LCFS Background

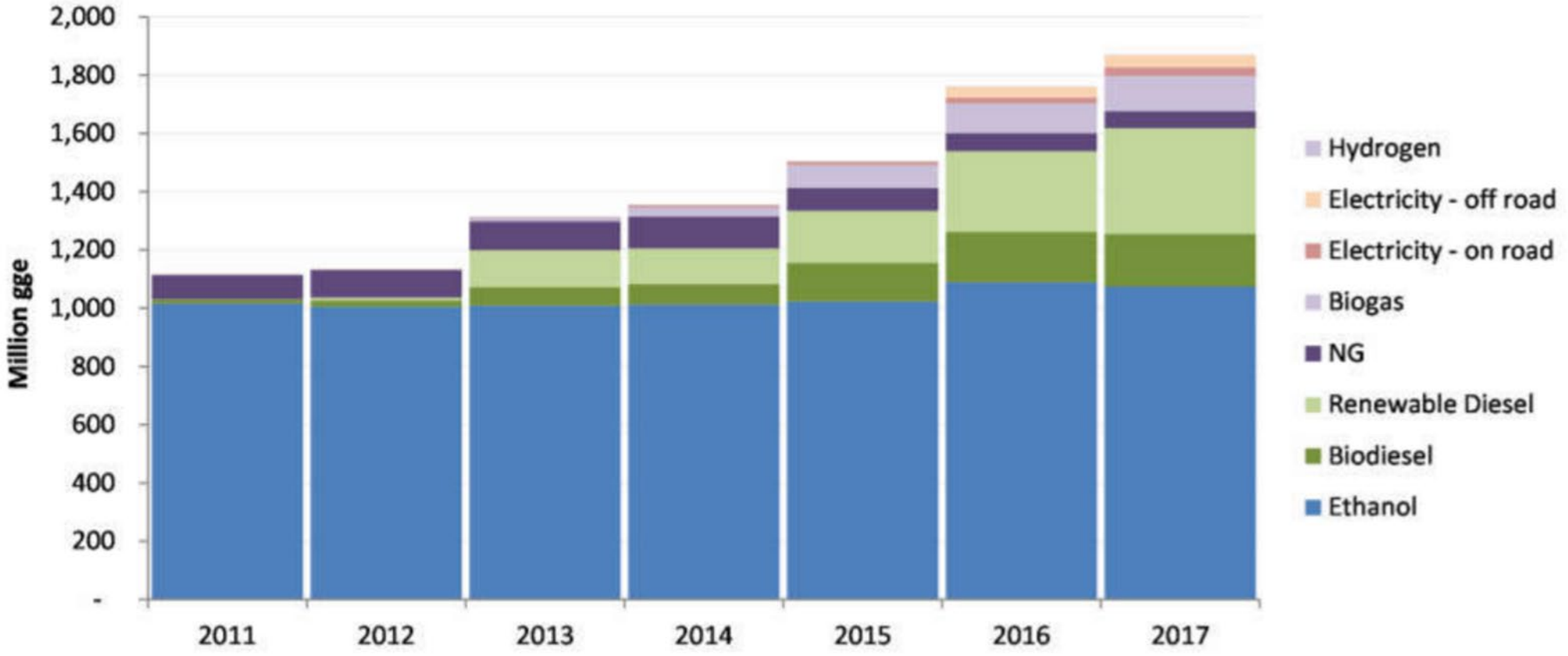
- Require average carbon intensity reductions for all transportation fuels
  - Higher carbon fuels pay
  - Lower carbon fuels receive payment
- More and more jurisdictions – CA, OR, WA, CO, NY, Canada, Brazil, EU, UK
- VS RFS:
  - “Technology-neutral” policy
  - Portfolio approach (ethanol, biodiesel, 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

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.

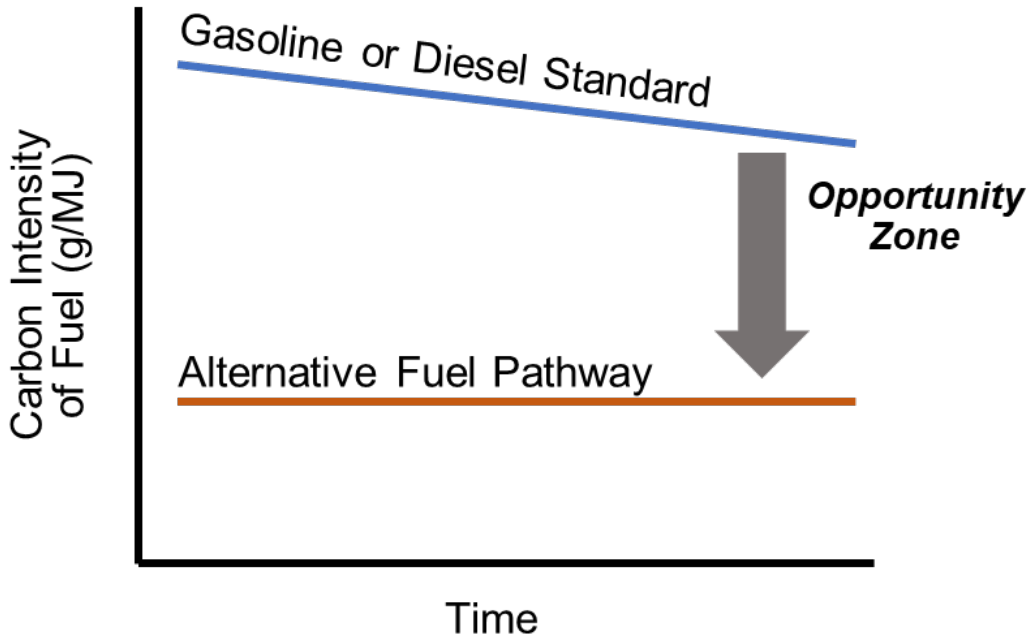
ALTERNATIVE FUEL PATHWAY CASE STUDIES

- 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**

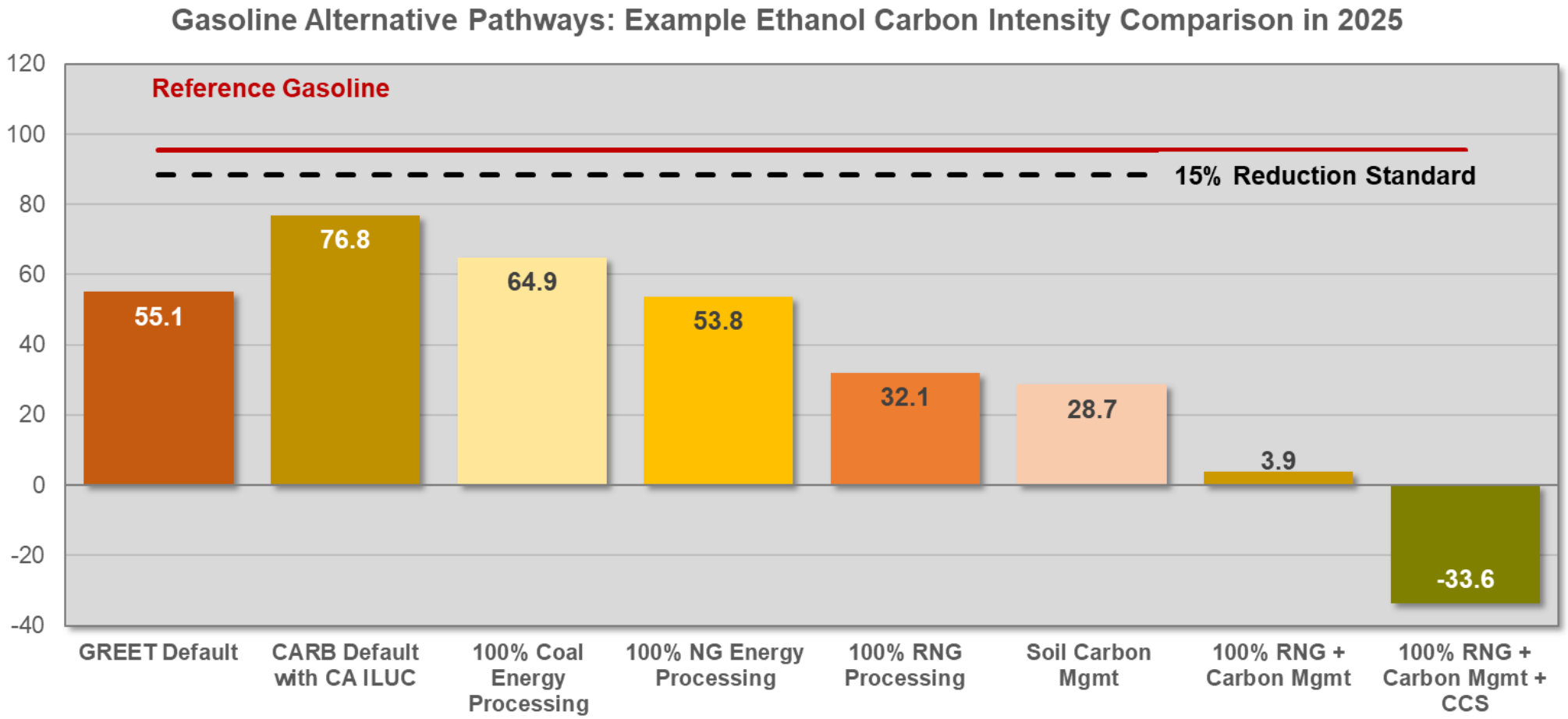
ALTERNATIVE FUEL PATHWAY CASE STUDIES 2

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

CASE STUDIES:
GASOLINE ALTERNATIVES

DRAFT CASE STUDY RESULTS

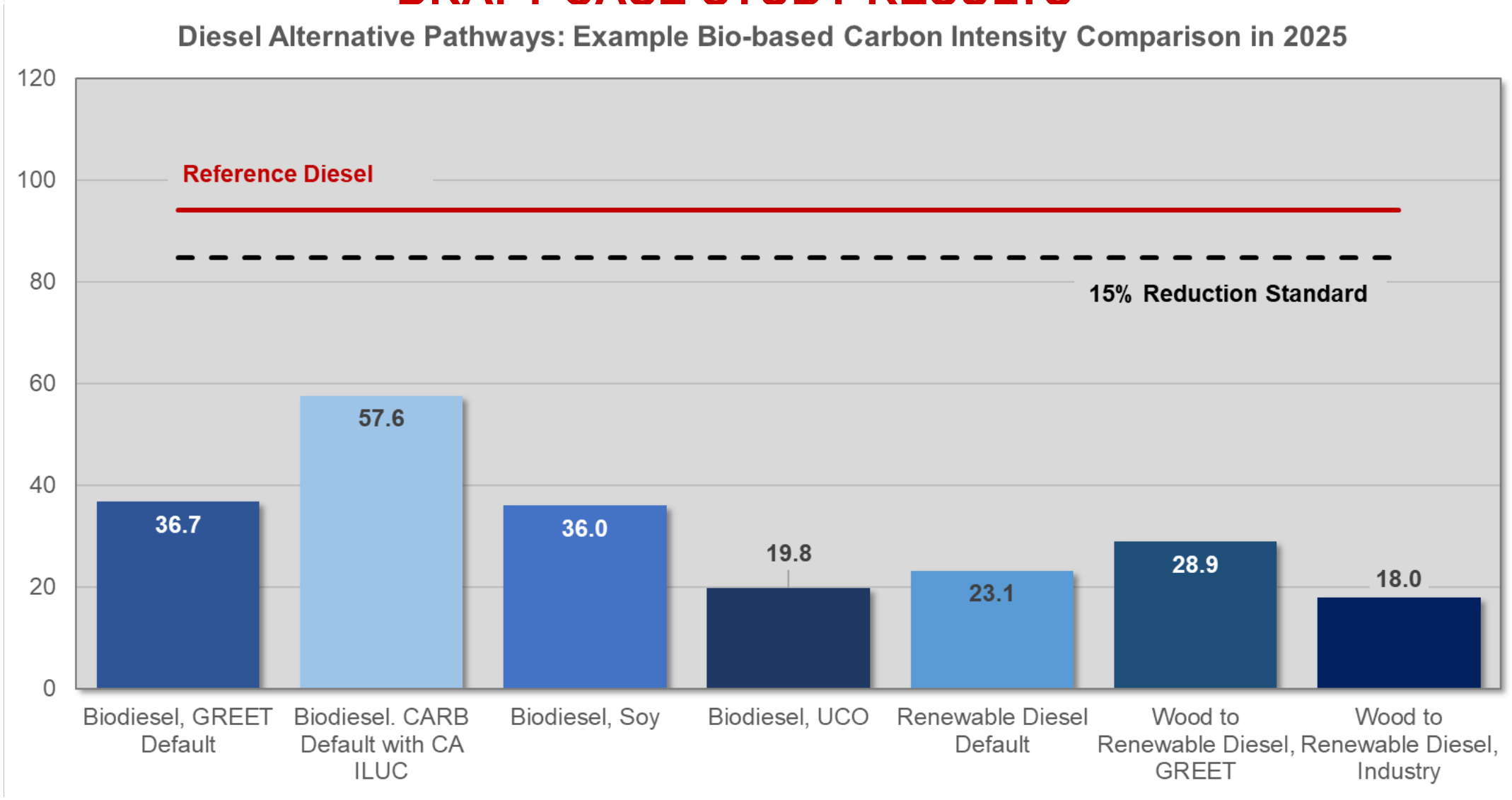


Individual fuel producers can submit updated LCAs to reflect efficiency improvements and other significant changes that result in lower CIs over time

Note: All ethanol values include indirect land use change (ILUC) as calculated by Argonne National Lab, except where noted. Similarly, energy processing is assumed to be the regional average, MRO, except where noted.

CASE STUDIES:
DIESEL ALTERNATIVES

DRAFT CASE STUDY RESULTS



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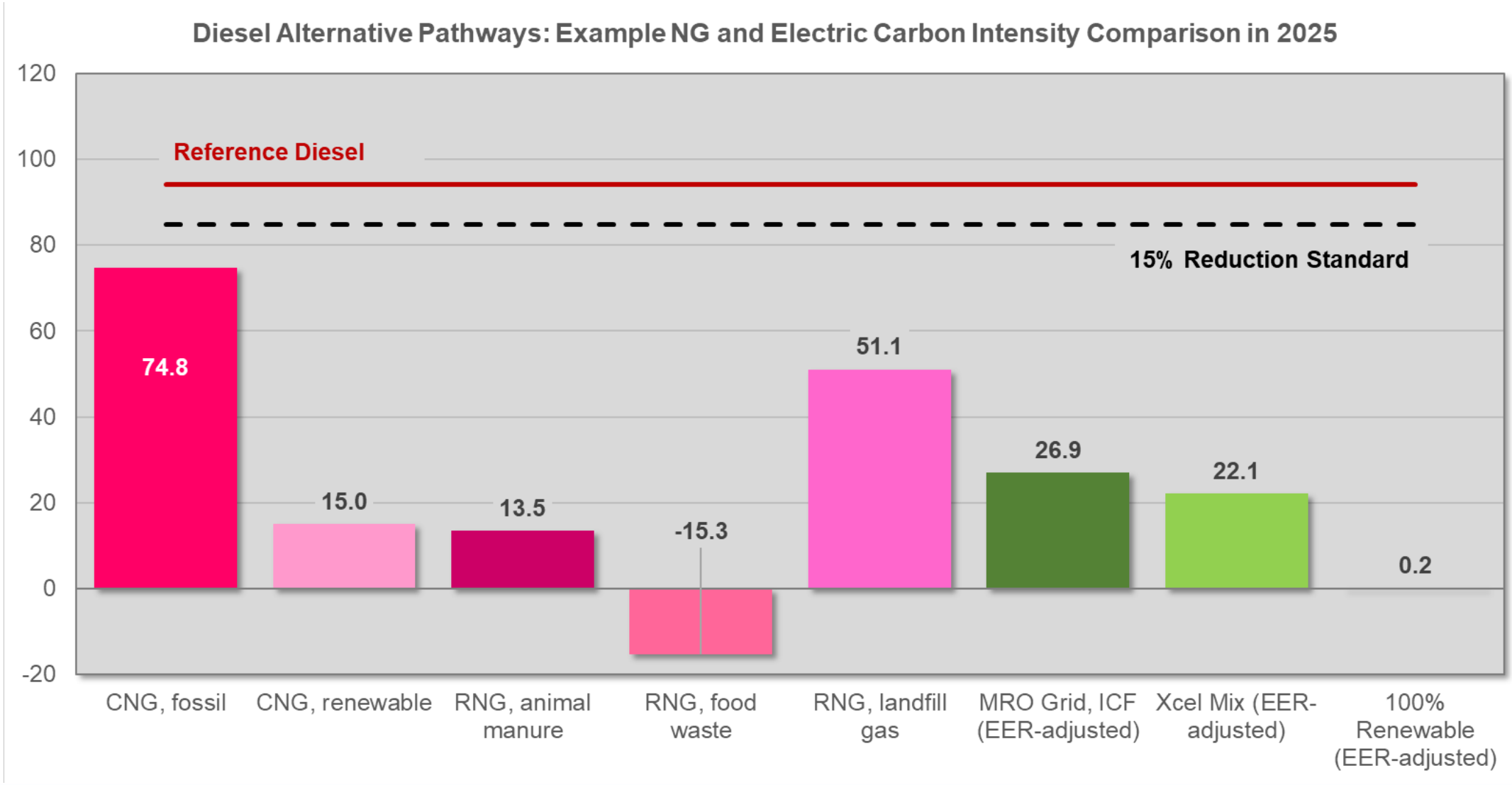
Note: All biodiesel and renewable diesel values include indirect land use change (ILUC) as calculated by Argonne National Lab, except where noted.

CASE STUDIES: DIESEL ALTERNATIVES 2

DRAFT CASE STUDY RESULTS



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Note: All carbon intensity scores for electricity fuel pathways shown here are EER-adjusted to be used as a diesel substitute (EER for diesel alternative = 4)

ETHANOL: CREDIT REVENUE

Typical Carbon Intensity (Examples)

Pathway	Example CI Score
Reference Gasoline	**95.3 g/MJ**
Eth, GREET Default with Argonne ILUC	55.1 g/MJ
Eth, CARB Default with CA ILUC	76.8 g/MJ
Eth, 100% Coal Energy Processing	64.9 g/MJ
Eth, 100% NG Energy Processing	53.8 g/MJ
Eth, 100% RNG Processing	32.1 g/MJ
Eth, Soil Carbon Mgmt	28.7 g/MJ
Eth, 100% RNG + Soil Carbon Mgmt	3.9 g/MJ
Eth, 100% RNG + Soil Carbon Mgmt + CCS	-33.6 g/MJ
*PHEV - E85 - MRO**	31 g/MJ
*PHEV - E85 - Xcel**	28.1 g/MJ
*PHEV - E85 - 100% Renewable**	13.7 g/MJ

Credit Revenue in 2025

At $100 / ton	At $200 / ton
$0.27 / gal	$0.54 / gal
$0.09 / gal	$0.19 / gal
$0.09 / gal	$0.18 / gal
$0.28 / gal	$0.56 / gal
$0.46 / gal	$0.92 / gal
$0.49 / gal	$0.97 / gal
$0.69 / gal	$1.38 / gal
$1.00 / gal	$1.99 / gal
$0.01 / mile	$0.03 / mile
$0.01 / mile	$0.03 / mile
$0.02 / mile	$0.03 / mile

Opportunities to provide compliance volumes and generate credit revenue across Midwestern biofuels production pathways.

**Credit revenue in a typical year 2025 when the gasoline policy standard CI is set at 88.5 g/MJ (15% compliance scenario)*

COMPLIANCE MODELING

Biofuel Blending	Current (2018) Conditions	10% Carbon Intensity Reduction	15% Carbon Intensity Reduction	20% Carbon Intensity Reduction
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 2

Vehicle Replacement	Current (2018) Conditions	10% Carbon Intensity Reduction	15% Carbon Intensity Reduction	20% Carbon Intensity Reduction
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 – a whole variety of pathways were modeled

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

Does a Clean Fuels Policy accomplish the goals of the Governor's Council on Biofuels?

- ✓ Accelerate achievement of petroleum replacement goals
- ✓ Advance and invest in carbon efficiency improvements of biofuel plants and sources of feedstocks
- ✓ Utilize biofuels to help MN achieve GHG reduction goals


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THANK YOU

Brendan Jordan, Vice President

bjordan@gpisd.net

612-278-7152