

Effects of U.S. Federal Policy Changes on Biofuels Production

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Agenda

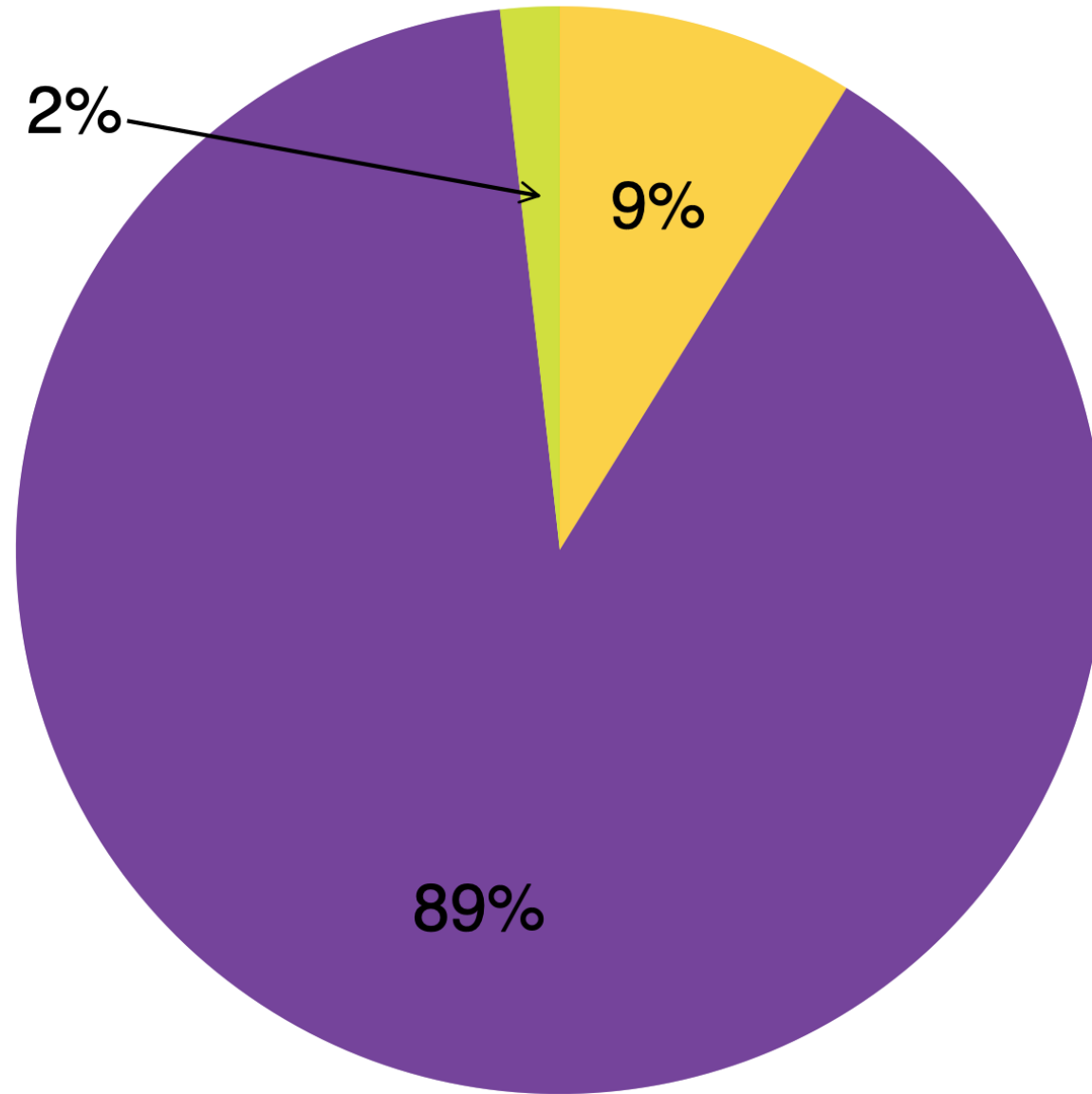
- Introduction
- 45Z Clean Fuels Production Tax Credit
- U.S. Biofuels Policy Changes
- Methods
- Results
- Conclusions
- Next Steps

Introduction

Louisiana

- Biofuels production in Louisiana accounts for **4.2% of total primary energy** produced in the state
 - Ranks **#7 nationally** – zero production of corn ethanol or biodiesel.
- Leading producer of **renewable diesel**
 - Refineries co-process biomass feedstocks
 - Also produces **densified biomass fuel** (DBF) and **renewable natural gas** (RNG)
- Announcements for future production have the potential to increase biofuels **share of primary energy production to ~9.2%**.
 - Specific focus on **SAF production**.
 - Questions about **financial viability** are key in a **changing incentive landscape**.

Biofuel Production Capacity in Louisiana, by Fuel Type



Densified Biomass Fuel

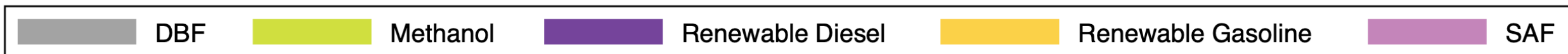
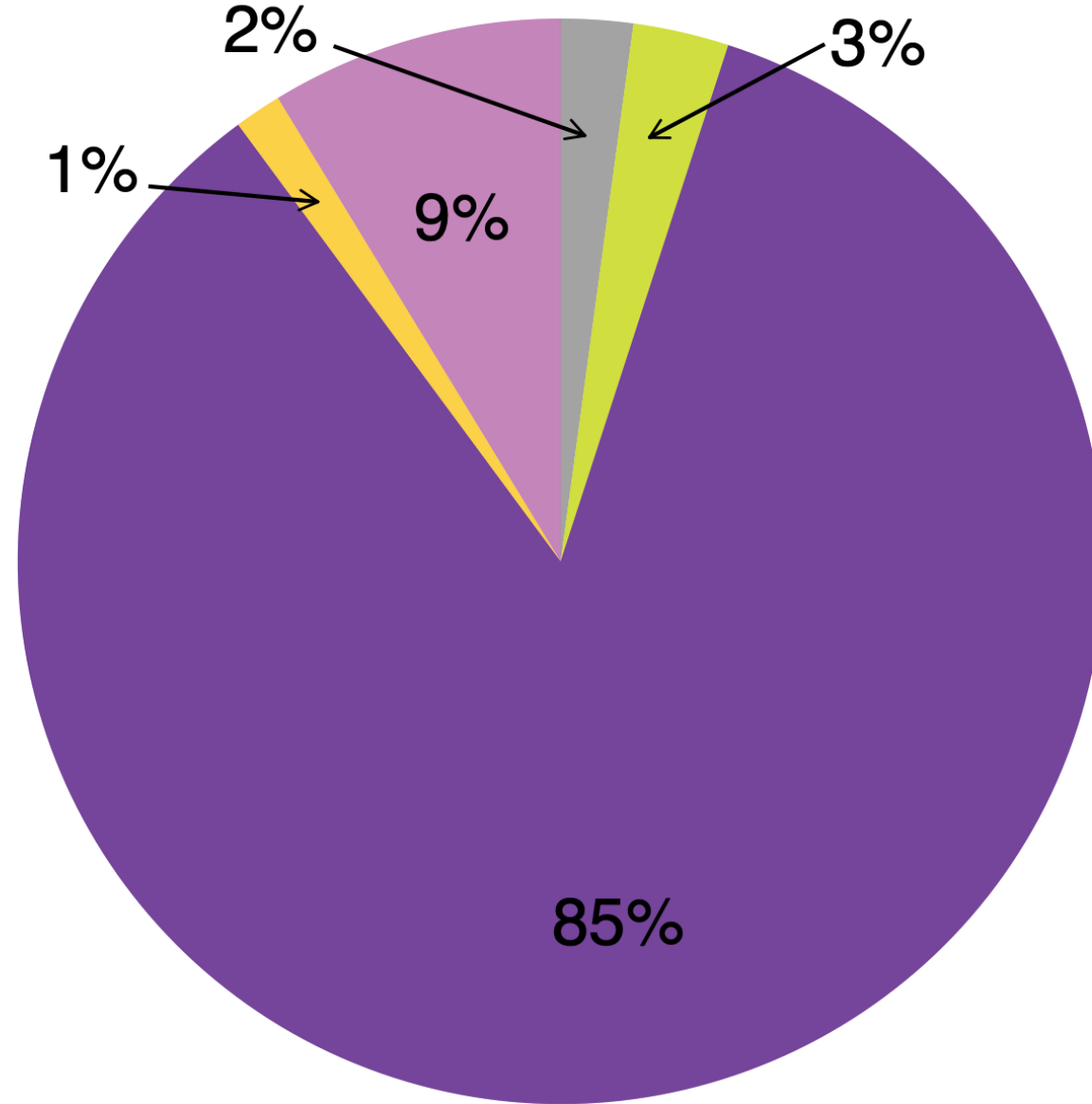


Renewable Diesel



Renewable Natural Gas

Announced New Biofuel Capacity in Louisiana, by Fuel Type



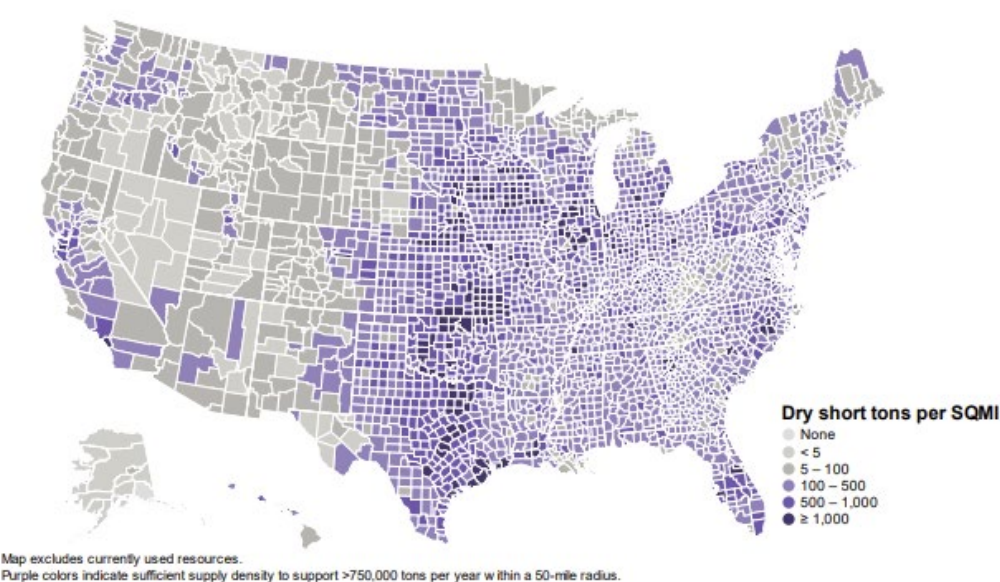
Introduction

Oak Ridge National Laboratory led study quantifying biomass resources in the United States

Billion Ton Study: 1 billion tons of biomass can be sustainably harvested in the US (ca. **2005**)

Most recent update is called the **BT23** (ca. **2024**)

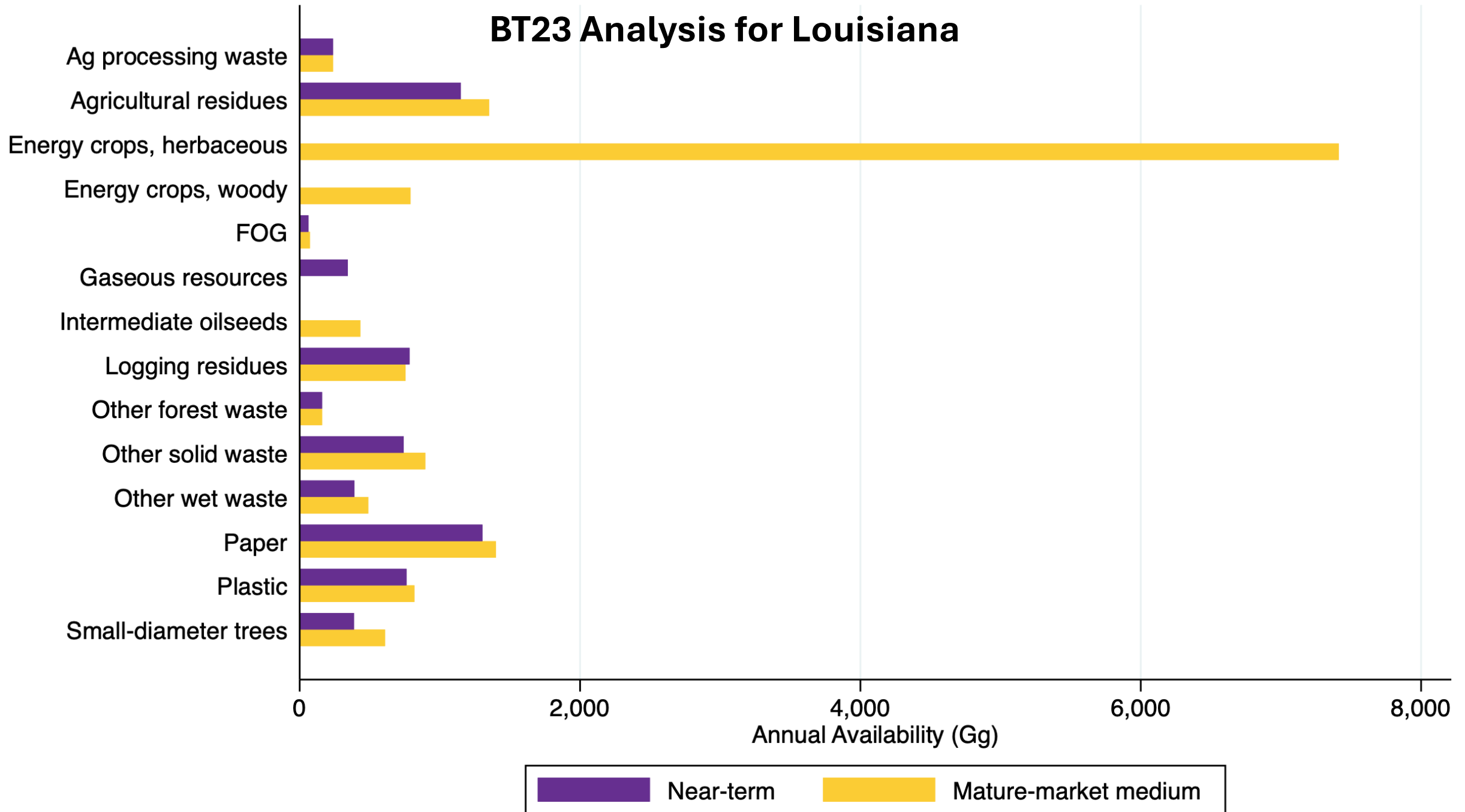
Analysis considers five market scenarios (besides current uses of biomass energy)



Market Scenario	Characterization
Current	Current uses of biomass for energy (i.e., power and fuels) and coproducts.
Near-term	Resources that are completely unused currently and can be used in the next 5–10 years, in addition to current uses.
Mature-market low	Low market pull, low supply push: business-as-usual (BAU) projections for the agriculture, forestry, and waste sectors, and no purpose-grown energy crop yield improvements, in addition to current uses.
Mature-market medium	Moderate market pull, moderate supply push: BAU projections and moderate (1%) purpose-grown energy crop yield improvements, in addition to current uses.
Mature-market high	High market pull and high supply push: 3% improvements of purpose-grown energy crops; conventional crop yields improve 1.5 times the USDA trend; BAU waste projections with higher waste demand increase waste prices, in addition to current uses.
Evolving and emerging resources	Potential future production of microalgae, macroalgae, and capture of point-source waste CO ₂ . These resources are considered as prospectively available, contingent upon future innovations, in addition to the mature-market high scenario.

US Department of Energy. 2023 Billion-Ton Report (2024)

BT23 Analysis for Louisiana



Introduction

Focus on Sustainable Aviation Fuel (SAF)

SAF Grand Challenge Roadmap: MoU between **USDA**, **USDoE** and **USDoT** to identify ways of decarbonizing the aviation industry

Targets:

- Achieve **at least 50% reduction** in life-cycle greenhouse gas emissions by **2030**
- Production of **35 billion gallons of SAF by 2050** (which is projected consumption of jet fuel by aviation sector)

45Z tax credit is likely a key tool in realizing these goals



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45Z Clean Fuels Production Tax Credit

Definition

- The **45Z tax credit** is available for certain fuels that are suitable for use in a highway vehicle or aircraft **produced domestically after Dec. 31, 2024, and sold prior to Jan. 1, 2030.**
- The 45Z tax credit is equal to the product of (A) **the applicable amount per gallon** (or gallon equivalent) of a transportation fuel produced at a qualifying facility and (B) **the emissions factor for such fuel.**
- Changes between the **IRA-era** and **OBBBA-era 45Z tax credits** are likely important.

Goals

- Model **SAF production costs (MSP, \$/gal)** as a function of **policy changes**.
- Input **CI scores** derived from **GREET** simulations into **MSP calculations**.
- Assess impact of indirect land use change (**ILUC**) on **SAF project economics**.

Methods

Life Cycle Analysis

- 45Z-CF-GREET
 - 2025 version
 - 2026 version

HEFA

Mixed Oils
Tallow
Soybean Oil
Used Cooking Oil
Camelina
Pennycress

Gas-FT

Corn Stover, without CCS
Corn Stover, with CCS

Methods

Technoeconomic Assessment:

- MSP calculation using spreadsheet models
- Incorporate 45Z credit values from LCA

Parameter	HEFA	Gas - FT
Feedstock	Vegetable Oil	Agricultural Residues
Feedstock Price	\$1,005 per ton	\$125/ton
Feedstock Scale	2,717 tons per day	17,164 tons per day
Jet Fuel	55%	40%
Diesel	26%	40%
Naphtha	8%	20%
Propane	11%	
Total Distillate Yield	0.83 wt/wt	0.14 wt/wt

Methods

Policy – assess impacts to IRR from changes to 45Z tax credits under Inflation Reduction Act (IRA) and One Big Beautiful Bill Act (OBBBA)

Under OBBBA:

- SAF credit brought to parity with other fuels under OBBBA
- Tax credit timeline extended to 2029

Scenario	Expires	Extended	Full Stack	Credit Value
IRA	2027	Project Lifetime	Federal + State	\$1.75/gal
OBBBA	2029	Project Lifetime	Federal + State	\$1.00/gal

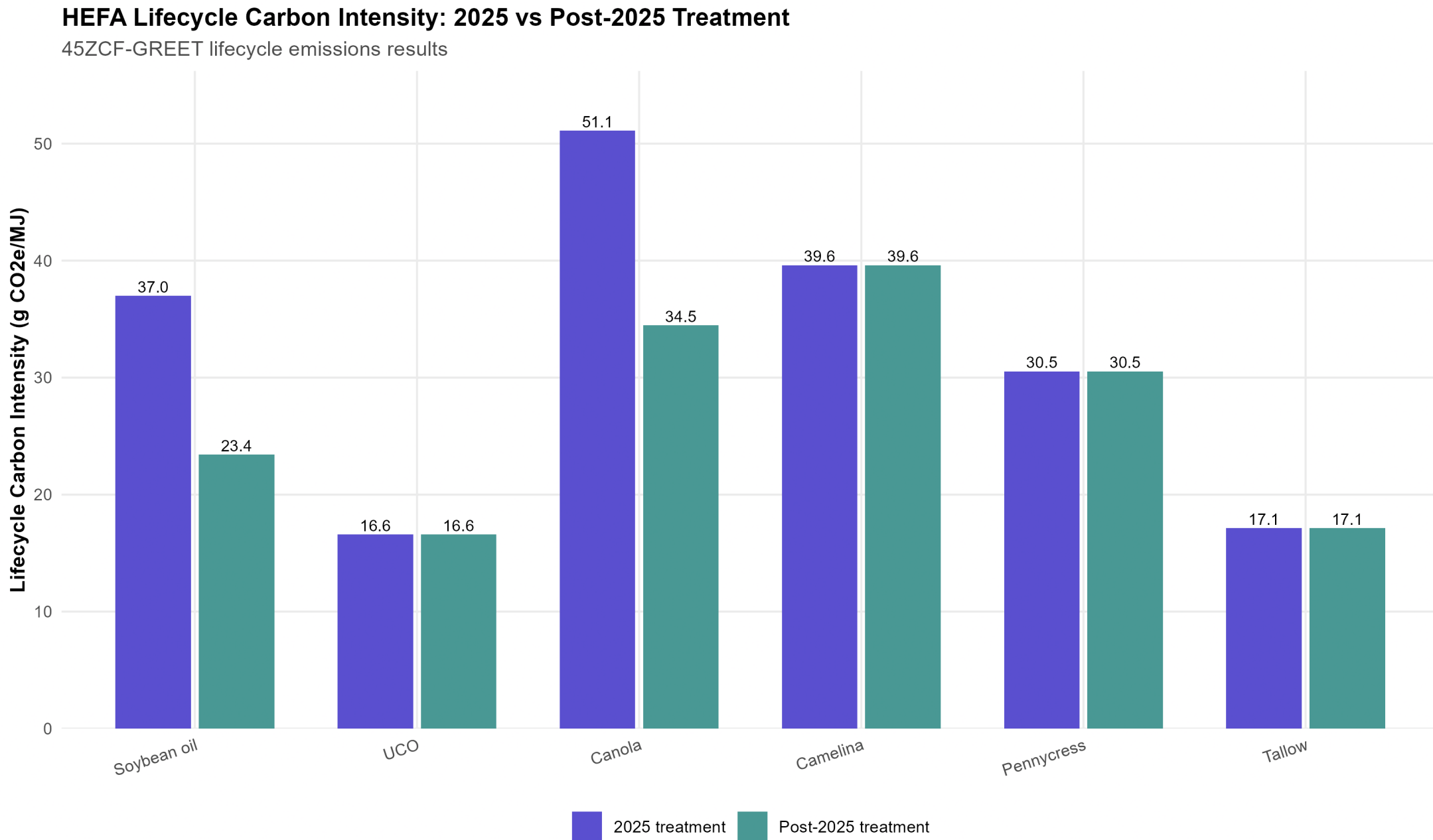
Results

GREET Analysis: Impact of ILUC removal

Pathway	In 2025	After 2025	% Change
HEFA SAF Mixed Oils	36.99	23.42	36.7
HEFA SAF Tallow	17.14	17.14	0.0
HEFA SAF Soybean Oil	36.99	23.42	36.7
HEFA SAF UCO	16.60	16.60	0.0
HEFA SAF Canola	51.10	34.46	32.6
HEFA SAF Camelina	39.60	39.60	0.0
HEFA SAF Pennycress	30.54	30.54	0.0
Gas_F-T Corn Stover w/o CCS	6.32	6.32	0.0
Gas_F-T Corn Stover with CCS	6.32	6.32	0.0
ATJ-E SAF	60.74	60.74	0.0

Preliminary

Results



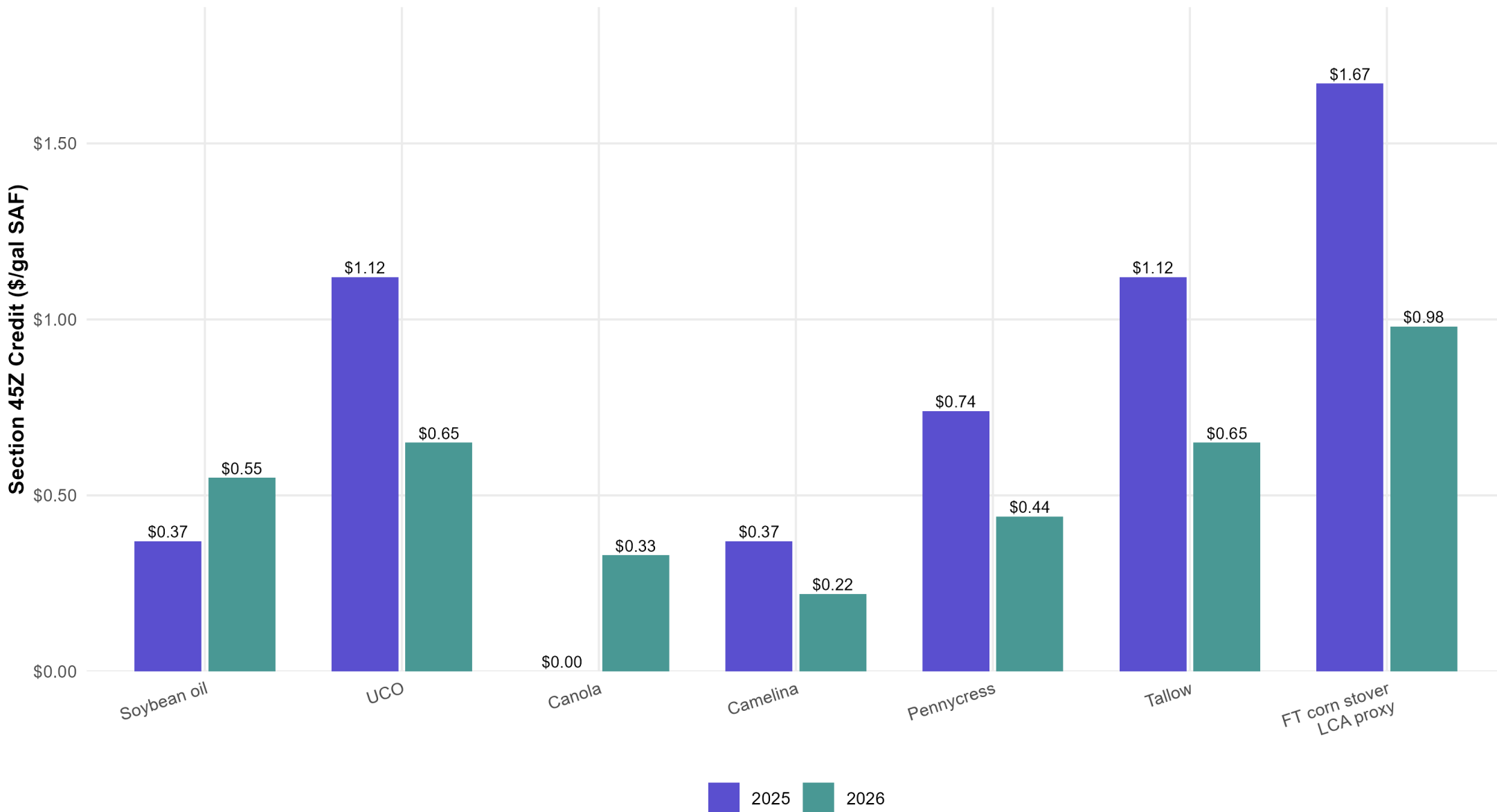
ILUC exclusion lowers modeled carbon intensity for soybean- and canola-based HEFA.

Preliminary

Results

Section 45Z SAF Credit by Pathway

2025 SAF applicable amount = \$1.86/gal; 2026 applicable amount = \$1.09/gal



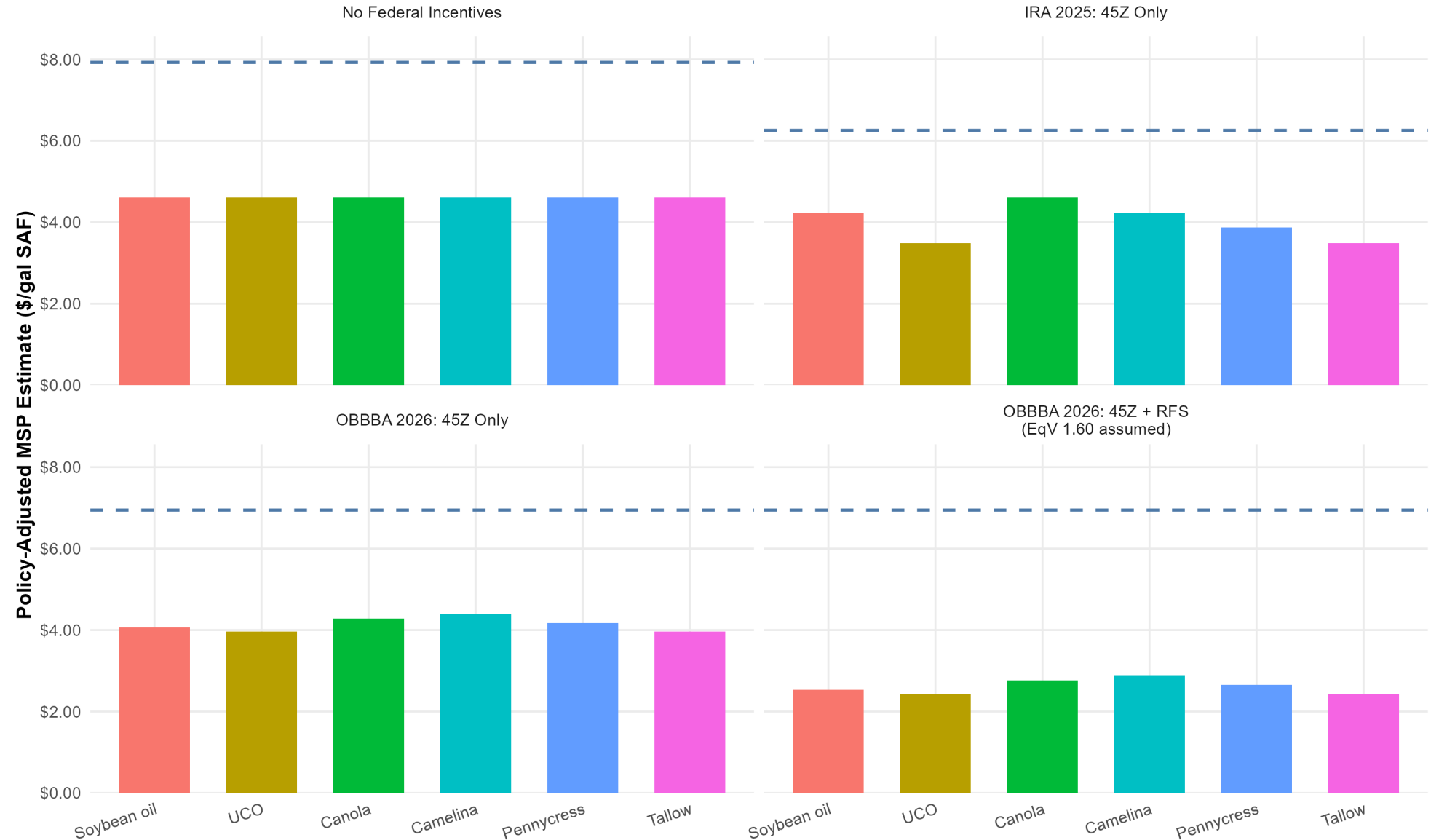
Canola becomes eligible for Section 45Z under the post-2025 emissions rate.

Preliminary

Results

Policy-Adjusted SAF MSP Estimates by HEFA Feedstock

Dashed line indicates FT under the same policy scenario



Common TEA basis across HEFA cases; feedstock differences reflect GREET-based policy values.
FT uses forest-residue economics with the corn-stover FT GREET case for lifecycle emissions.

Preliminary

Results

- **Baseline TEA remains favorable to HEFA** before either federal incentive is applied:
 - \$4.61/gal for HEFA, compared with
 - \$7.93/gal for FT
- **Under the 2025 Section 45Z treatment:**
 - HEFA policy-adjusted MSP estimates range from \$3.49 to \$4.61/gal
 - The FT estimate falls to \$6.26/gal
- **Under the 2026 Section 45Z treatment:**
 - HEFA range is \$3.96 to \$4.39/gal
 - The FT estimate is \$6.95/gal

Results

Treatment	HEFA MSP	FT MSP
Baseline	\$4.61/gal	\$7.93
2025 45Z	\$3.49 - \$4.61/gal	\$6.26/gal
2026 45Z	\$3.96 - \$4.39/gal	\$6.95/gal

Conclusions

- Two different effects occur simultaneously due to 45Z policy changes
 - **Deletion of ILUC** in 45Z-CF-GREET makes **some pathways more attractive**, economically.
 - **Reduction of overall SAF credit value** makes **SAF production less attractive** as a whole.
 - In our analysis, **HEFA fares better overall in comparison to Gasification – FT.**
- **Removal of ILUC** considerations in SAF LCA modeling has **meaningful impacts on CI**, and therefore, **45Z credit**.
 - For example, **HEFA canola oil previously did not qualify for a 45Z credit** but does qualify when ILUC is not considered.
 - **Canola oil based HEFA** similarly gets a **larger 45Z credit** than before.

Next Steps

- Extend analysis to **additional GREET-enabled pathways**.
- Compare CI and costs associated with **pyrolysis of agricultural residues from Louisiana**.
- Test model sensitivities to likely impactful variables:
 - Feedstock price
 - Transportation distance
 - Others
- Expand analyses to **de-risk SAF production** pathways.



Louisiana Bio-Electric Fuel Incubator

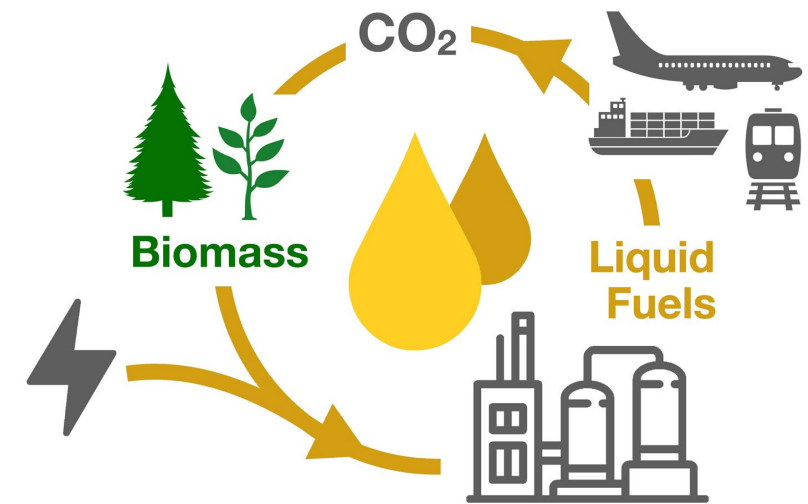
Liquid Transportation Fuels from Agricultural Residues

Objectives:

- Focused research: fast pyrolysis, electrochemistry, simulations, TEA/LCA
- Associated workforce development & outreach to industry and stakeholders
- Establish accessible infrastructure within Louisiana
- Grow initiative beyond initial “incubator” award
- **I lead the TEA/LCA/Supply Chains subgroup**

Overview:

- Collaboration of 6 institutions in Louisiana
- 17 Senior Personnel
- \$7M over 4 years from NSF E-RISE RII
 (“EPSCoR Research Incubators for STEM Excellence”)



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