

FAA CENTER OF EXCELLENCE FOR ALTERNATIVE JET FUELS & ENVIRONMENT

# Policy Support for SAF

## Project A01

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Project manager: Prem Lobo, FAA

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## Policy support for SAF

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### Research Approach:

- Legislation monitoring – federal, state and international
- Interpretation of laws, regulations, and policies
- Estimation of incentive values
- Development of Policy Decision Support Tool
- Validation
- Analysis of policy impact on key indicators
- Compile information on law and policy landscape and impact for industry partners, government bodies, academia, non-government organizations

### Objective:

1. Monitor legislation for direct and indirect SAF support mechanisms
2. Synthesize legislation with a quantifiable approach through policy tool
3. Estimate policy impact on critical financial indicators for development and deployment of SAF projects

### Project Benefits:

Regularly updated law & policy information at federal and state level

Consolidation of policy documentation

Estimation of incentive values for products, green H<sub>2</sub>, carbon storage & utilization.

### Major Accomplishments (to date):

- Compilation of US policies impacting SAF
- Development of a policy tool
- Initial analysis of policy impacts

### Future Work / Schedule:

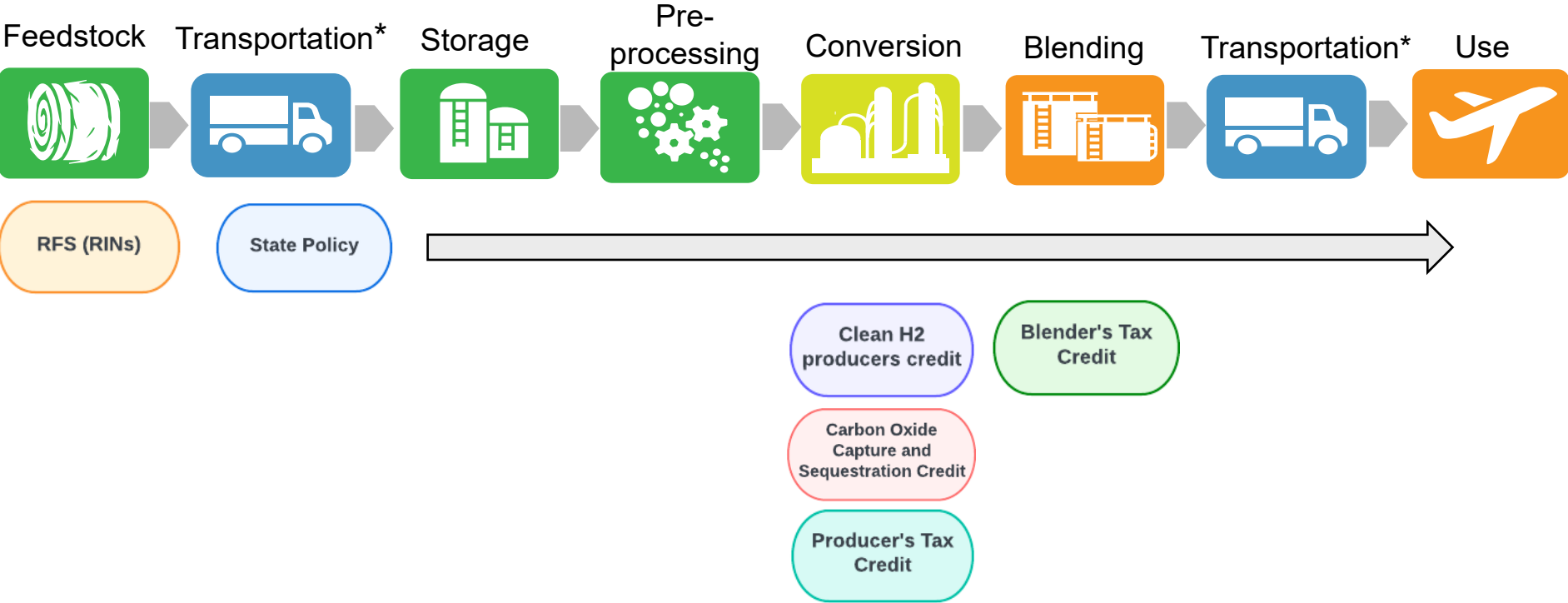
- Continued monitoring and interpretation of new legislation
- Policy Decision Support Tool:
  - Additional feedstock and conversion pathways
  - Publish as open-source
  - Inclusion of new state policies into policy tool
  - Use of tool in upcoming publications

# Outline



- Quick sketch of legal, regulatory, and policy environment for SAF
- Outline of policy decision support tool
- Case studies

# Law & policy impacts the SAF supply chain



U.S. commitments under ICAO's Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

<https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx>

# Summary of the Policies

## RFS (RINs)

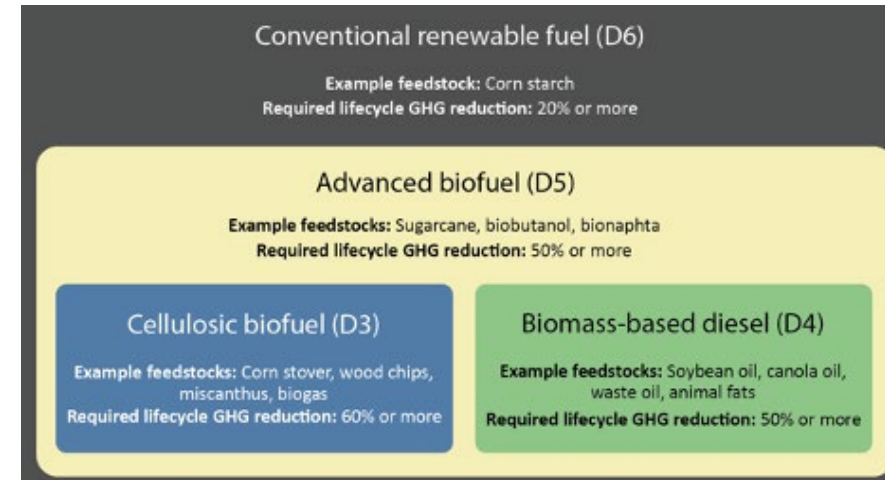
### U.S. Renewable Fuel Standard

- Provides RINs for renewable fuels produced in a year. SAF is eligible for D3, 4, 5, 6, and 7 RINs depending on the feedstock, conversion technology, and product.
- Equivalence value (EV)
  - SAF EV of 1.6
  - Renewable diesel EV of 1.7

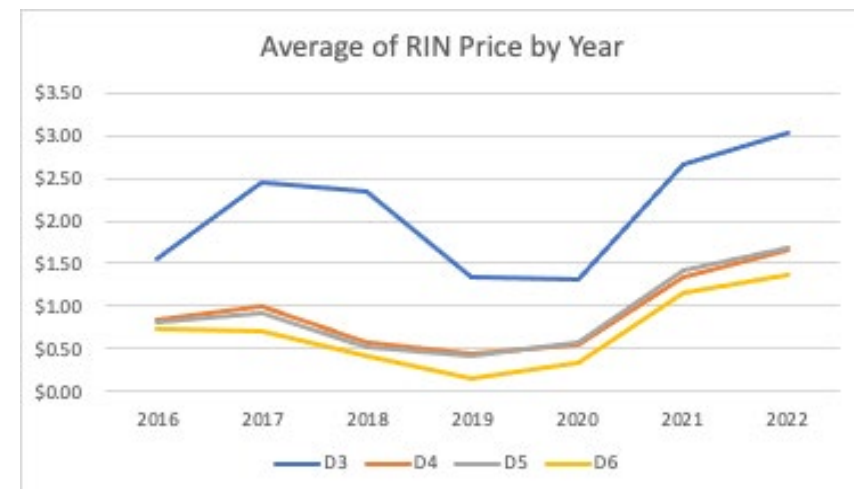
## Blender's Tax Credit

### Internal Revenue Code (IRC) § 40B

- Provides \$1.25 per gallon of SAF in the blending process. SAF must
  - achieve at least a 50% GHG reduction.
  - meet requirements ASTM D7566 or FT ASTM A1655 A1.
  - Not derived from coprocessing.
  - Not derived from Palm fatty acid distillates or petroleum.
- Supplementary amount of \$0.01 for each % by which GHG reduction exceeds 50%.
- Max. limit of \$0.50 for supplementary payment.
- Effective Jan. 2, 2023; expires on Dec. 31, 2024.



<https://www.epa.gov/renewable-fuel-standard-program/renewable-fuel-annual-standards>



<https://www.epa.gov/fuels-registration-reporting-and-compliance-help/rin-trades-and-price-information>

# Summary of the Policies (Inflation Reduction Act-IRA)

## Producer's Tax Credit (IRC § 45Z)

- Provides production credits for clean transportation fuels, including SAF.
- Credit amount for SAF: up to \$0.35/gal or \$1.75/gal for SAF produced in a facility that meets prevailing wage requirements and apprenticeship requirements.
- Inflation adjustment factor to credits.
- Clean fuels and SAF must be produced in the U.S.
- Threshold to qualify for the credit is 50 kg CO<sub>2</sub>e/MMBtu.
- Effective in 2025 through 2027.

## Clean H<sub>2</sub> producers credit (IRC § 45V)

- Provides up to \$0.60 (based on CI) per kg of clean hydrogen for 10 years.
  - Up to \$3 for clean hydrogen produced in a facility that meets prevailing wage requirements & apprenticeship requirements.
- Credit amount depends on CI of hydrogen, which may not be greater than 4 kg CO<sub>2</sub>e/kgH<sub>2</sub>.
- Inflation adjustment
- Projects must be located in the U.S.
- Construction must have begun before January 1, 2033.

## Carbon Oxide Capture and Sequestration Credit (IRC § 45Q)

- IRA modified and extended Section 45Q credit.
  - Extended facility operation start date window to 2033.
  - Significantly lowered tonnage capture thresholds.
- Program provides credits for carbon capture and sequestration (CCS) for 12 years from start of project operation.
- Credit amount depends on when qualifying capture equipment is placed in service.
- Inflation adjustment.
- Projects must be located in the U.S.

- **California Low Carbon Fuel Standard (LCFS)**
  - Credits for SAF production based on carbon intensity (CI) score.
  - CARB considering eliminating exemption for intrastate aviation fuel from LCFS program. If adopted, using fossil jet fuel would generate deficits as other fossil transportation fuels.
- **Oregon Clean Fuels Program (CFP) and Washington Clean Fuel Standard (CFS)**
  - Followed in CA's footsteps by providing credit for SAF production
  - Fuels used for aviation are exempt under each program.
- **Washington Business & Occupation (B&O) tax credit**
  - \$1-\$2/gal of SAF with at least 50% reduction in CI, \$0.02 for each 1% reduction past 50%
  - Requires a minimum quantity of SAF in WA, must be produced or blended in WA
  - In rulemaking
- **Illinois SAF Purchase Credit (SAFPC)**
  - Available from July 1, 2023 through December 31, 2032.
  - SAF must achieve 50% lifecycle GHG reduction.
  - For SAF sold for use or used by air common carrier in Illinois.
  - Credit is given only to airlines operating in state that buy fuel, not to fuel producers.
  - Credit is \$1.50 per gal purchased. Applied toward 6.25% state sales or use tax liability on aviation fuel purchase.
- **Minnesota SAF Credit**
  - \$1.50 per gal for SAF produced or blended in Minnesota and sold for use in planes departing Minnesota airports. (Minn. Stat. § 41A.30).
  - Effective after December 31, 2023, for SAF sold after June 30, 2024, and before July 1, 2030.
  - Limited budget of \$11.6 million.

# California's New Emission Disclosure Requirements

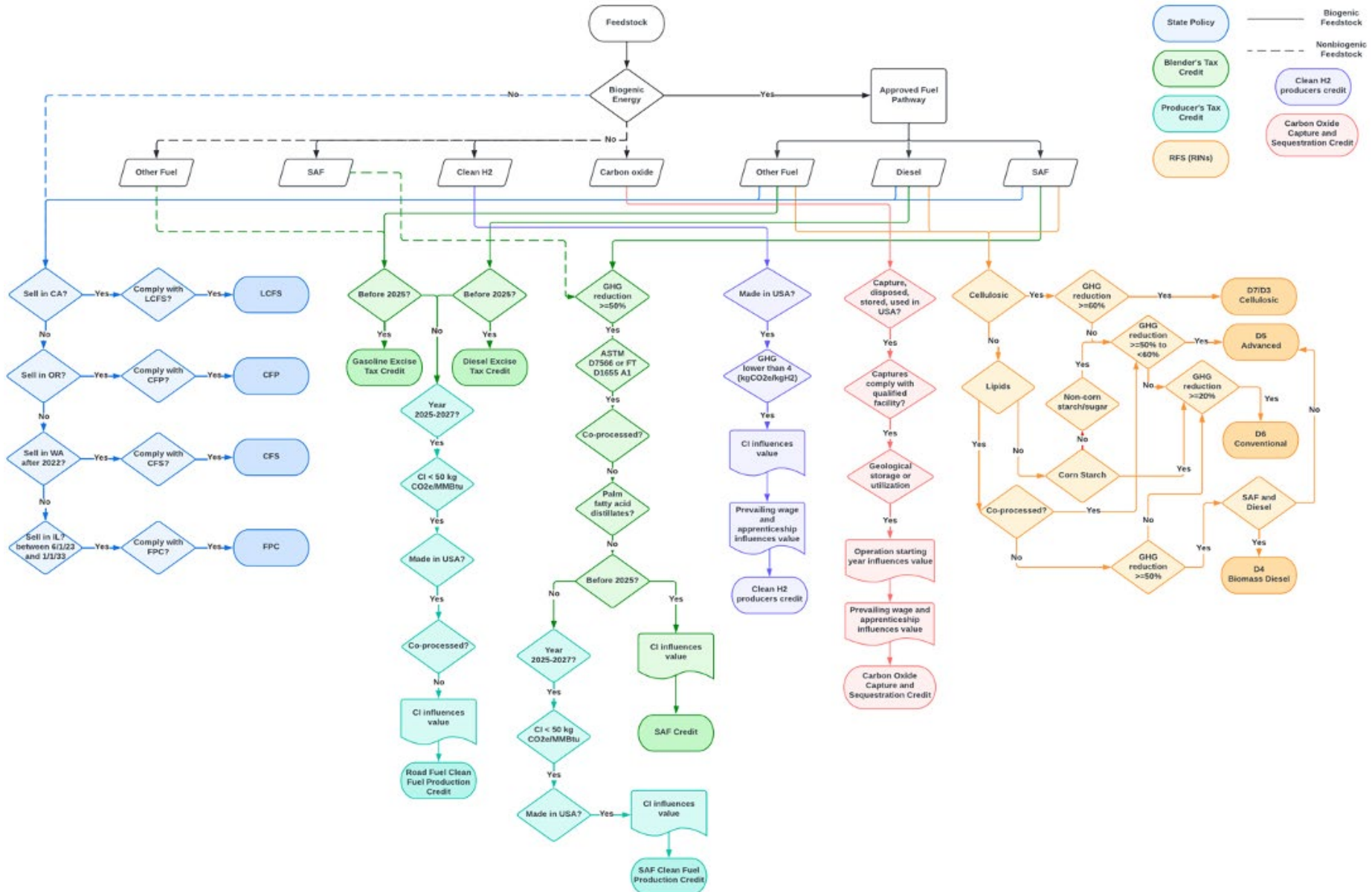


## Senate Bill (SB) 253 Climate Corporate Data Accountability Act

- Companies doing business in CA with a total revenue of \$1 billion+ will be required to publicly report their annual GHG emissions to "emission reporting organization" to be created by end of 2024.
  - Emissions reporting organization will create a digital platform to house public disclosures
- Requirements reflect the emissions disclosure standards in the GHG Protocol developed by the World Resources Institute and the World Business Council for Sustainable Development.
- Beginning in 2026, companies to disclose direct GHG emissions from operations (Scope 1 emissions) and indirect GHG emissions from energy use (Scope 2 emissions) on an annual basis.
- Beginning in 2027, companies must report indirect upstream and downstream supply-chain emissions (Scope 3 emissions) from prior fiscal year.
  - Scope 3 emissions are associated with purchased goods and services, employee commuting, and processing or use of company's sold products by third parties.



# US Policy Flow Chart



- Excel tool
  - Easy to share among SAF stakeholders
  - User friendly
- Multiple tabs for precise descriptions of calculations and sources
- Policy values
  - Calculated values (e.g., BTC, PTC, IL, H<sub>2</sub>, CCUS)
  - Historical values (e.g., RINs, LCFS, CFP):
    - Selection of values periods
    - Selection of statistical central tendency methods, minimum and maximum.
- Technology
  - HEFA (standalone and co-processing), ATJ, ETJ, FT
- Feedstock
  - Tallow, used cooking oil (UCO), vegetable oils, municipal solid waste (MSW), forest and agricultural residues, ethanol, isobutanol, etc.

# Inputs and Assumptions



## Inputs

PRODUCTION/USE DETAILS	
Technology	HEFA
Feedstock	UCO
Production Year	2025
Production Month	August
Fuel Production Location	USA
Feedstock Origin	USA
US State Fuel Use Location	OR
Fuel Blending Location	USA
SINGLE OR MULTIPLE CI VALUES	
	single
SINGLE CI VALUE	
Use CORSIA Default CI?	yes
MULTIPLE CI VALUES (including ILUC)	
	Skip multiple CI value section.
POLICY DETAILS	
HYDROGEN	
Hydrogen CI	0.44
Meet IRA wage and apprenticeship requirements?	yes
CARBON OXIDE CAPTURE	
Capture, disposal, use, utilization in US or US possession?	yes
Geologic storage or utilization?	utilization
Carbon oxide source	direct air capture
Meet IRA wage and apprenticeship requirements?	yes

## Assumptions

- The value of D7 RIN is assumed to be the same as D3 RIN
- Propane does not have a defined CI reduction each year for CA and OR. Regardless of the years selected, a single value is used for the reduction calculation.

# Tool Outputs



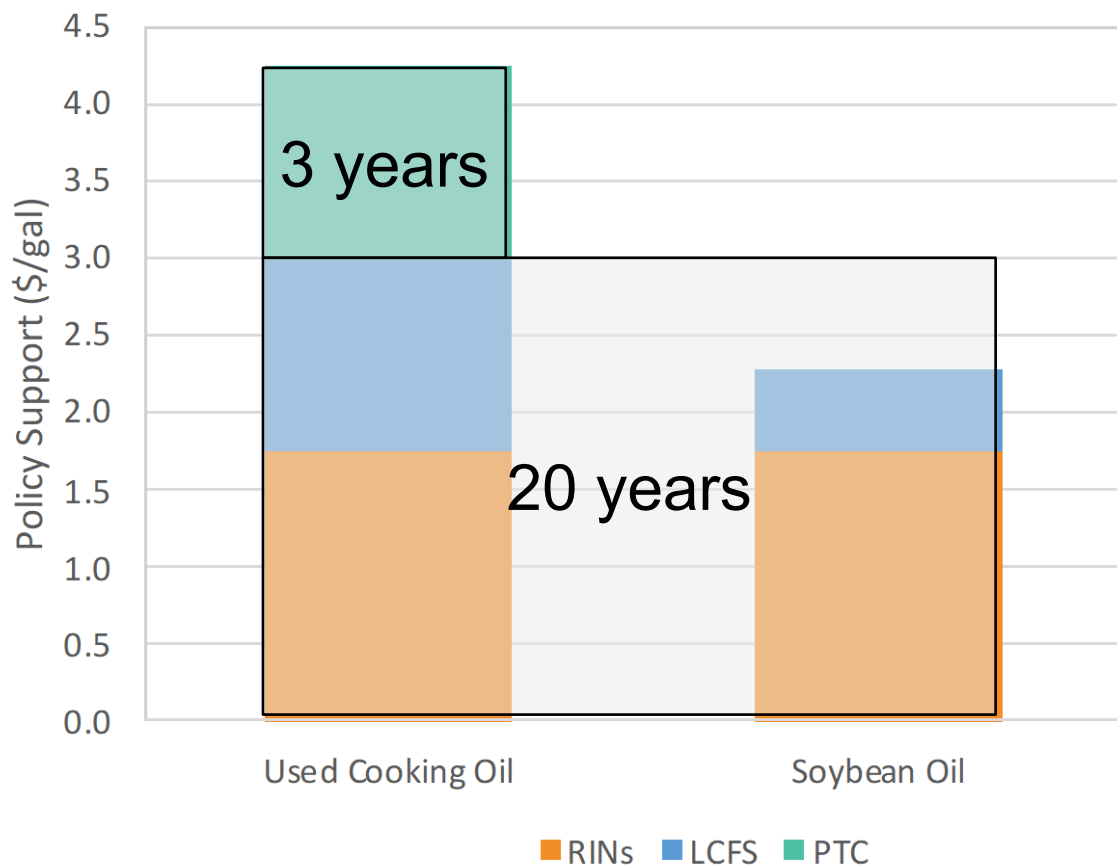
values provided:	average	selected summary statistic from cell B33 on Inputs tab							
			Estimated Value (\$/gal)						
Policy	Fuel Eligibility	Fuel/Location Eligibility	SAF	diesel	naphtha	propane	gasoline		
<b>Federal</b>									
RFS, classification	yes	NA	D4	D4	D5	D5	D5		
RFS, value	yes	NA	1.61	1.71	1.60	1.17	1.60		
Blender's Tax Credit*	no	NA	0	0	0	0	0		
Clean Fuel Production Credit	yes	NA	0.18	0.10	0.10	0.10	0.10		
<b>State</b>									
LCFS (California)	yes	yes	0.84	0.86	0.78	0.75	0.78		
CFP (Oregon)	yes	no	0	0	0	0	0		
CFS (Washington)**	yes	no	0	0	0	0	0		
SAF fuel purchase credit (Illinois)	yes	no	0	0	0	0	0		
			<b>Estimated Value (\$/L)</b>						
Policy	Fuel Eligibility	Fuel/Location Eligibility	SAF	diesel	naphtha	propane	gasoline		
<b>Federal</b>									
RFS, classification	yes	NA	D4	D4	D4	D4	D4		
RFS, value	yes	NA	0.43	0.45	0.42	0.31	0.42		
Federal BTC*	no	NA	0	0	0	0	0		
Clean Fuel Production Credit	yes	NA	0.05	0.03	0.03	0.03	0.03		
<b>State</b>									
LCFS (California)	yes	yes	0.22	0.23	0.21	0.20	0.21		
CFP (Oregon)	yes	no	0	0	0	0	0		
CFS (Washington)**	yes	no	0	0	0	0	0		
SAF fuel purchase credit (Illinois)	yes	no	0	0	0	0	0		
<b>Hydrogen</b>									
Policy	Eligible	Estimated Value (\$/kg H2)							
Credit for production of clean hydrogen	yes	3.245							
<b>Carbon Oxide Capture</b>									
Policy	Eligible	Estimated Value (\$/t carbon oxide)							
Credit for carbon oxide capture	yes	180							

Use a combination of the **Policy Decision Support Tool**, deterministic **TEAs** and **System Dynamics Approach** to:

- Quantify the impact on minimum selling price (MSP)
- Quantify the impact of policy on financial metrics
  - Annualized net present value (NPV) at the end of the plant lifetime (cumulative present value at the 20<sup>th</sup> year of production)
  - Risk of investment quantified as NPV at the end of the plant life
  - A positive NPV is achieved for pathways with higher financial feasibility

Note: Policy-specific CI scores (LCFS, RFS) are used when available, otherwise the CORSIA default values are used

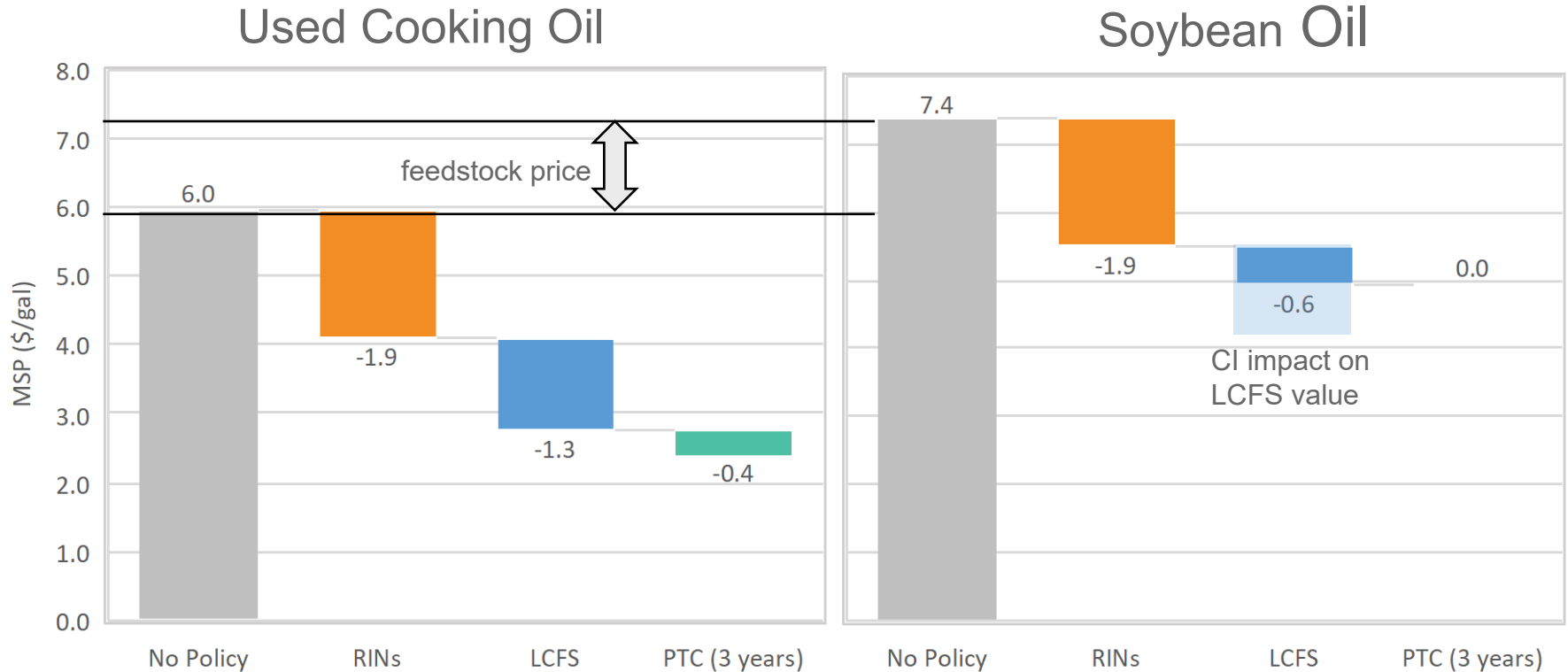
# Impact of Stacking Policies – Soybean Oil vs. UCO



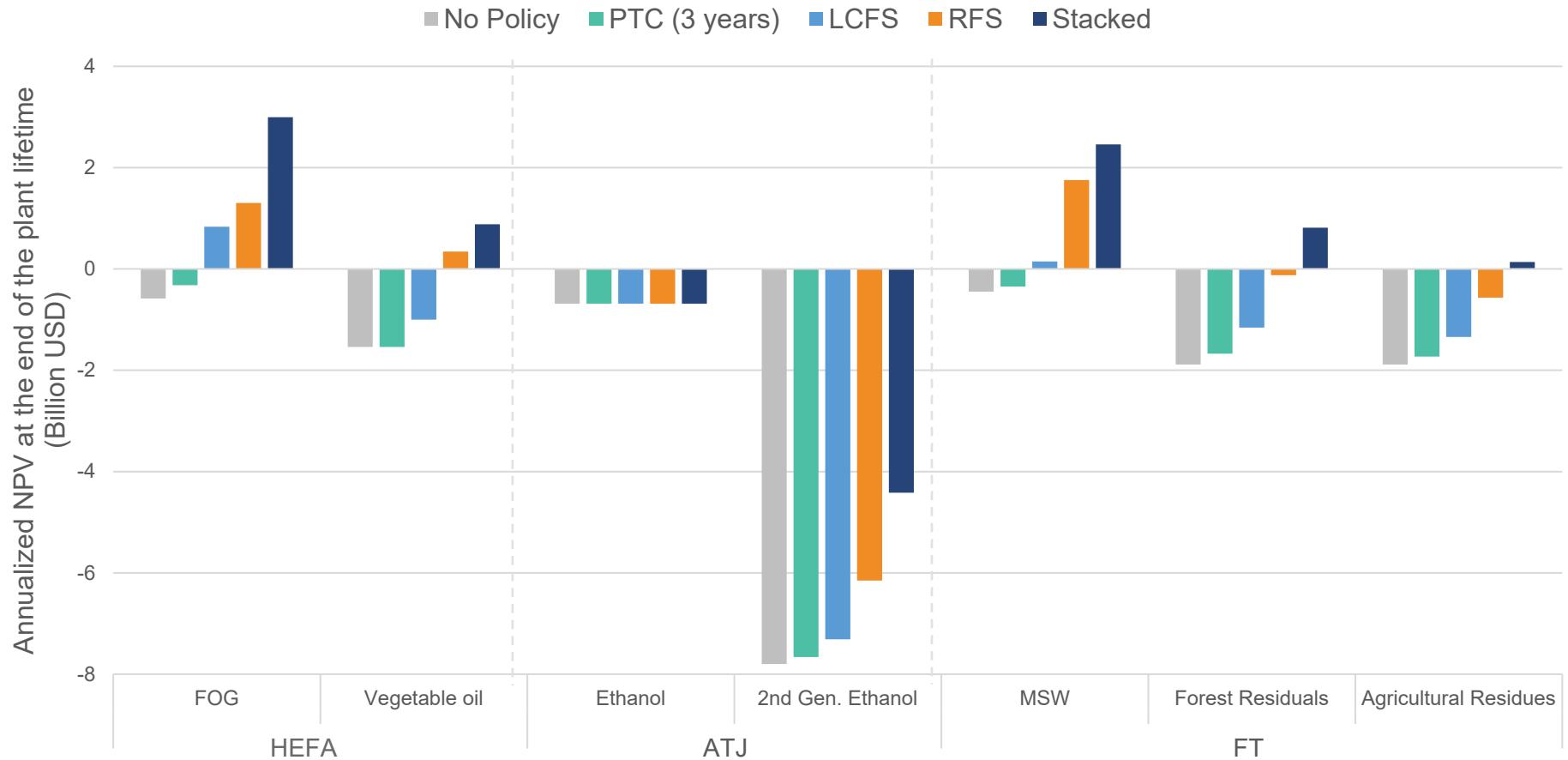
## ASSUMPTIONS

- RINs and LCFS are applied for the entire life of a facility
- Producer's Tax Credit (PTC), aka 45Z is only applied for the first 3 years of a facility
- PTC uses CORSIA CI per the Inflation Reduction Act (IRA)

# Impact of Stacking Policies – Soybean Oil vs. UCO

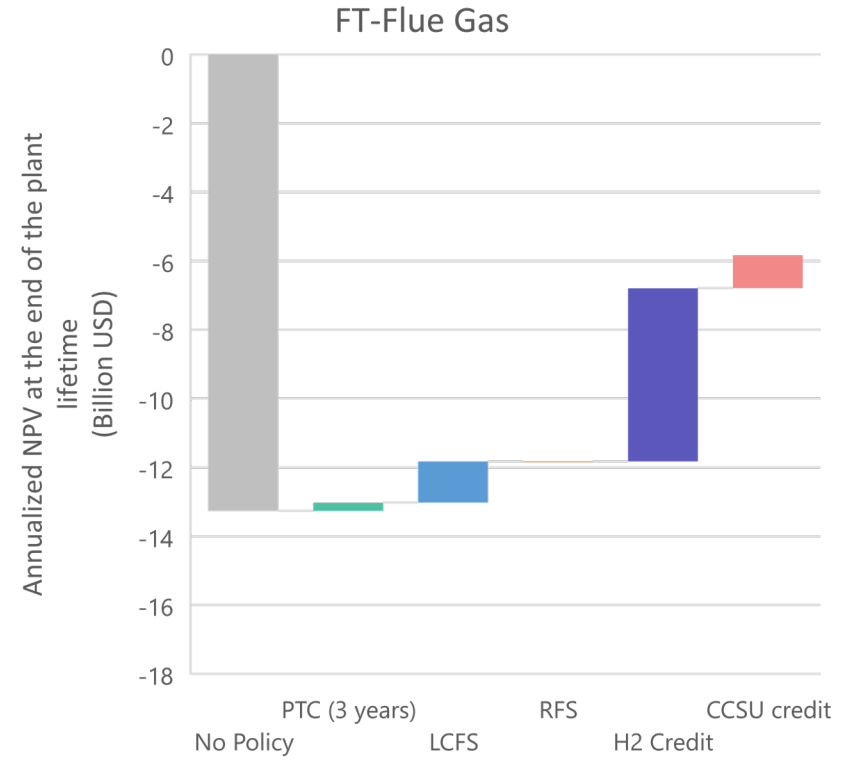
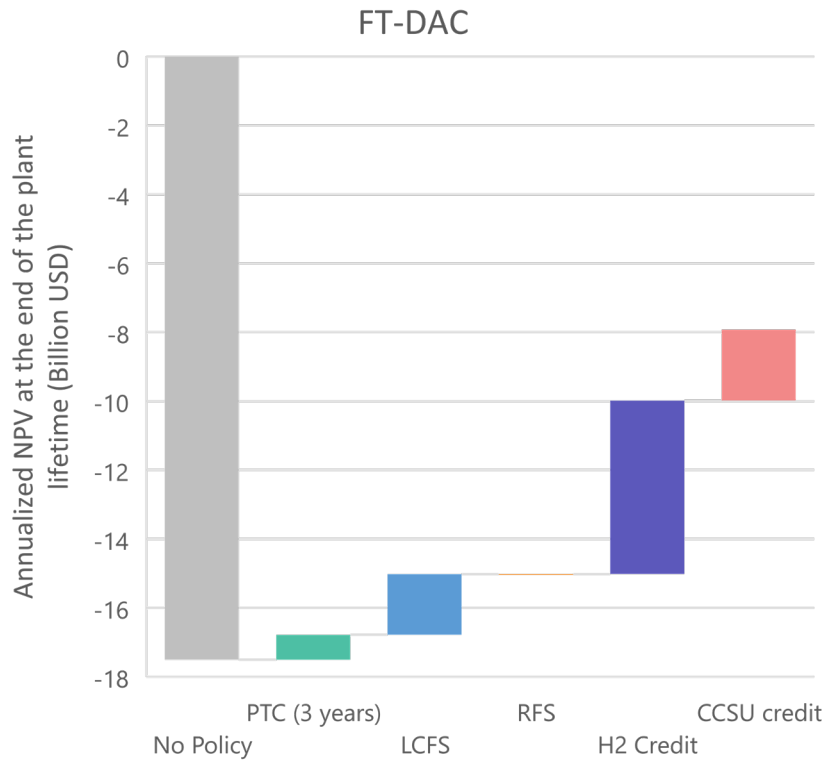


# Policy impact on the annualized NPV (20<sup>th</sup> year)

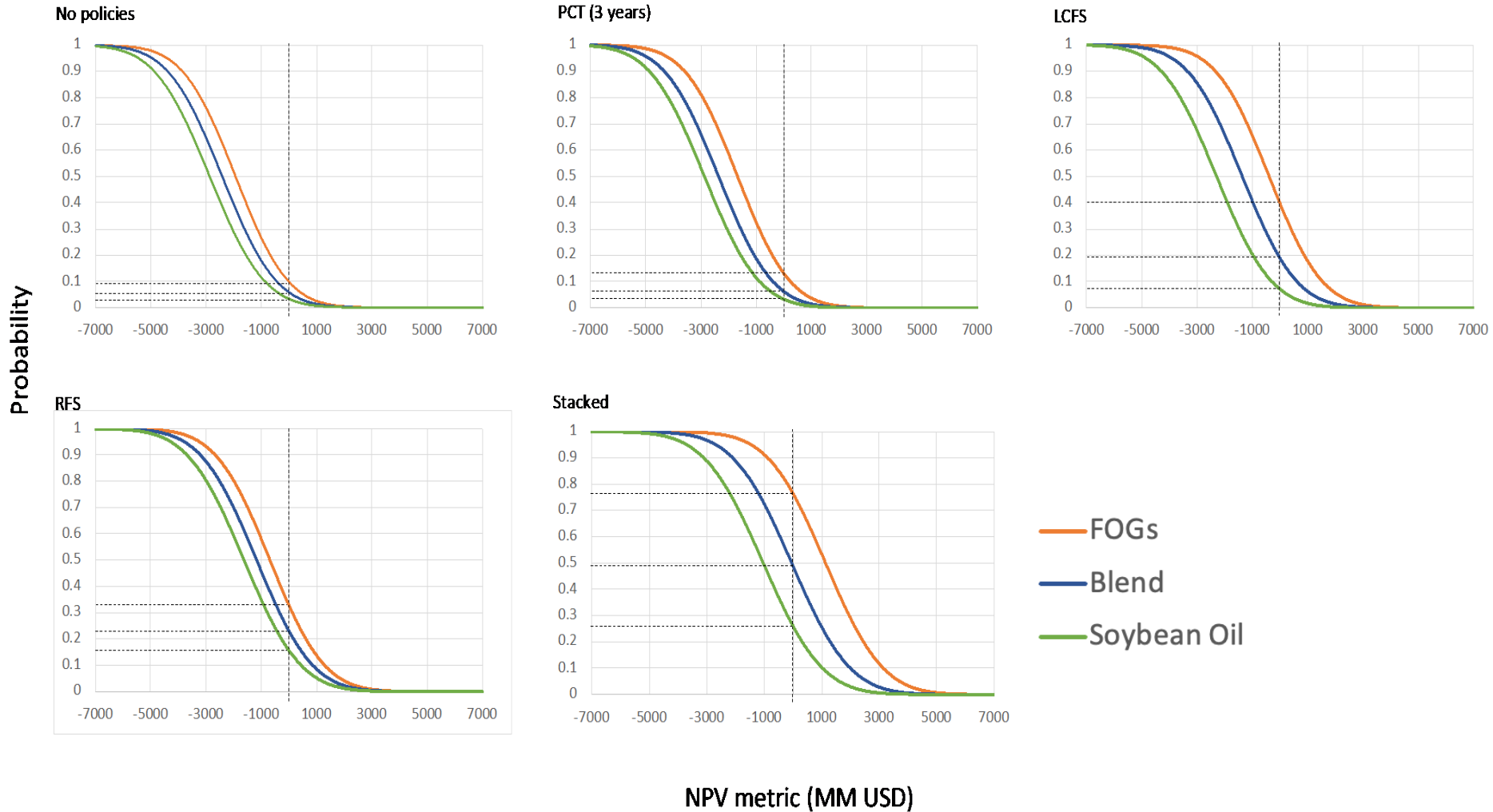




# Impact of US policies on the annualized NPV (20<sup>th</sup> year) FT- DAC and FT-Flue gas



# Risk of investment - Probability of getting positive NPV (20<sup>th</sup> year) -HEFA



# Resources



- Alan Krupnick & Aaron Bergman, "Incentives for Clean Hydrogen Production in the Inflation Reduction Act," *Resources for the Future* (Nov. 9, 2022), <https://www.rff.org/publications/reports/incentives-for-clean-hydrogen-production-in-the-inflation-reduction-act/>.
- Jacqueline Reigle & Matthew Cope, "Illinois Passes Sustainable Aviation Fuel Tax Credit," Argus (Jan. 23, 2023), <https://www.argusmedia.com/en/news/2412226-illinois-passes-sustainable-aviation-fuel-tax-credit>.
- Kendal Ashman et al., "GHG Emissions: California Senate Passes New Emissions Disclosure Requirements for Billion-Dollar Businesses," Shale Law Weekly Review, Penn State Center for Ag and Shale Law (Sep. 24, 2023), <https://aglaw.psu.edu/shale-law-weekly-review/shale-law-weekly-review-week-of-september-25-2023/>.
- Megan Boutwell, "Inflation Reduction Act Sustainable Aviation Fuel Credit," *Stillwater Associates* (Sept. 7, 2022), <https://stillwaterassociates.com/inflation-reduction-act-sustainable-aviation-fuel-credit-carbon-intensity-matters/>.
- "New Sustainable Aviation Fuel Purchase Credit Enacted," *Illinois Department of Revenue* (July 3, 2023), <https://tax.illinois.gov/content/dam/soi/en/web/tax/research/publications/bulletins/documents/2023/fy-2023-23.pdf>.

## Thanks

## Questions welcome during the panel discussion