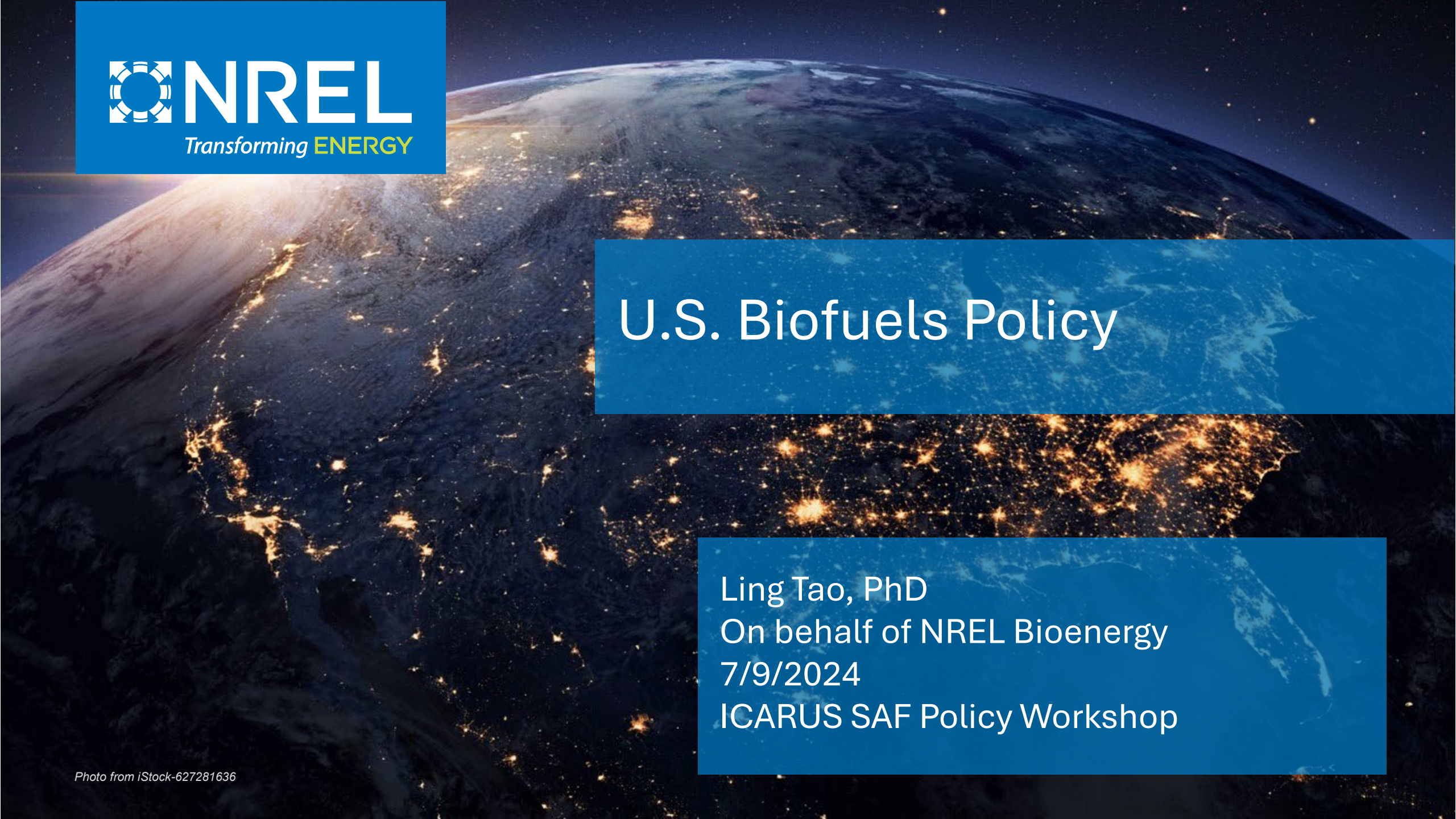


U.S. Biofuels Policy

Ling Tao, PhD
On behalf of NREL Bioenergy
7/9/2024
ICARUS SAF Policy Workshop

Photo from iStock-627281636


NREL: Transforming Energy Together

Integrated Energy Pathways

Electrons to Molecules

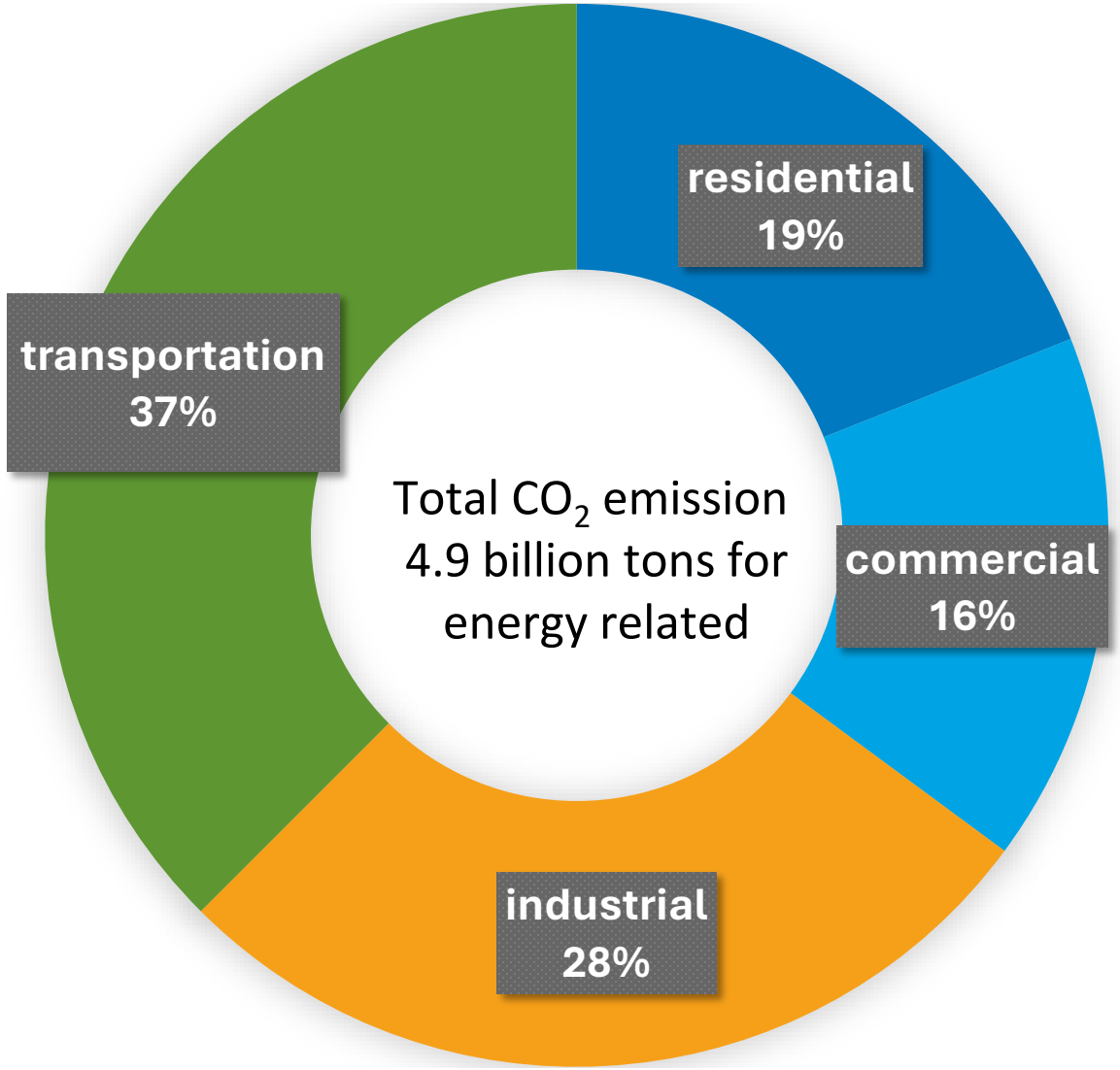
Circular Economy for Energy Materials

NREL's Vision:

A Clean Energy Future for the World

Three critical research areas respond to today's energy challenges and provide tomorrow's solutions

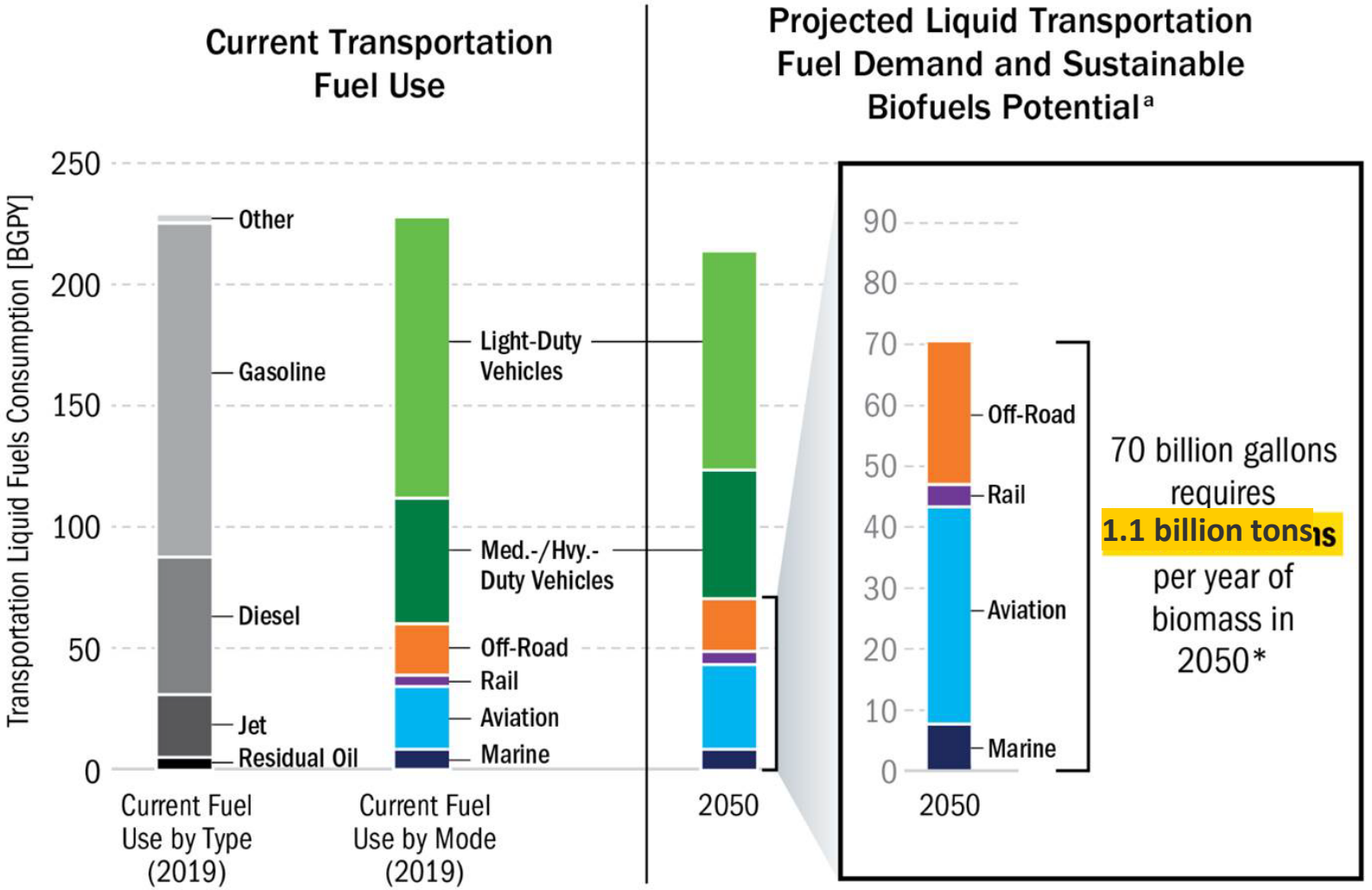
U.S. CO_2 Emissions



- GHG emission in the transportation sector accounted for 37% of energy-related emissions in U.S. in 2019.
- Transportation: **1.9 billion tons**.
  - Aviation: **261 million tons**.
- Chemical manufacturing: **186 million tons**, approximately 2.8% of total estimated GHG emissions in the U.S. in 2019.

Biofuels Potential for Hard-to-Electrify Transportation

- Biofuels are part of a sustainable transportation fuel strategy to decarbonize all modes.
- U.S. biomass can meet the needs of “hard to electrify” modes, such as aviation, marine and rail.



Source: AEO 2022 and https://www.osti.gov/biblio/2202642

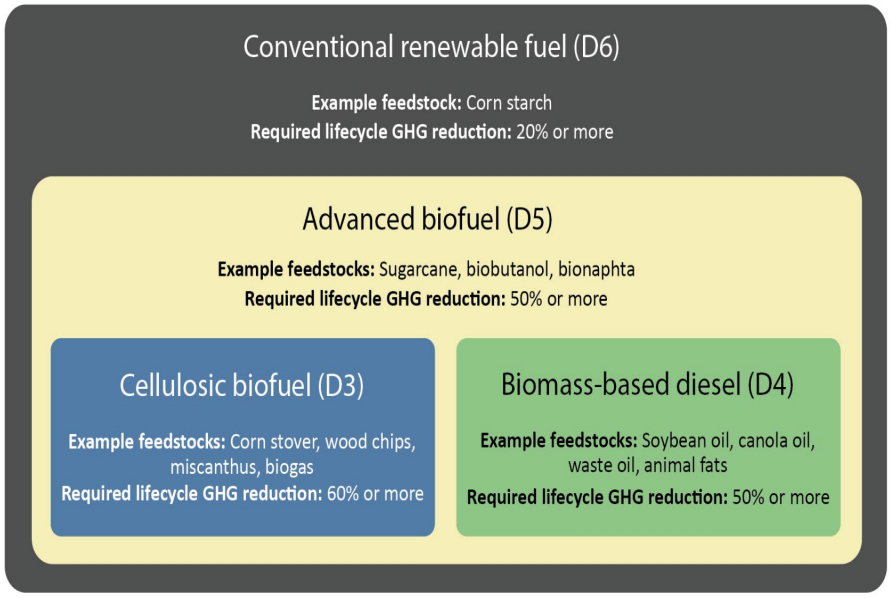
[a] The Base case and Expanded scenario bars above are reported on a GGE basis

U.S. Biofuel Policy

- Renewable Fuel Standard (RFS)
- Inflation Reduction Act (IRA)
- State Low Carbon Fuel Standard (LCFS)

U.S. EPA RFS Biofuel Volumetric Requirements for 2023-2025

	Cellulosic biofuel (D3)	Biomass-based diesel (D4)	Advanced biofuel (D5)	Renewable fuel (D6)	Supple-mental standard
Volumetric Targets (as billion RINs)					
2023	0.84	2.82	5.94	20.94	0.25
2024	1.09	3.04	6.54	21.54	-
2025	1.38	3.35	7.33	22.33	-
Percentage Standards (%)					
2023	0.48	2.58	3.39	11.96	0.14
2024	0.63	2.82	3.79	12.50	-
2025	0.81	3.15	4.31	13.13	-

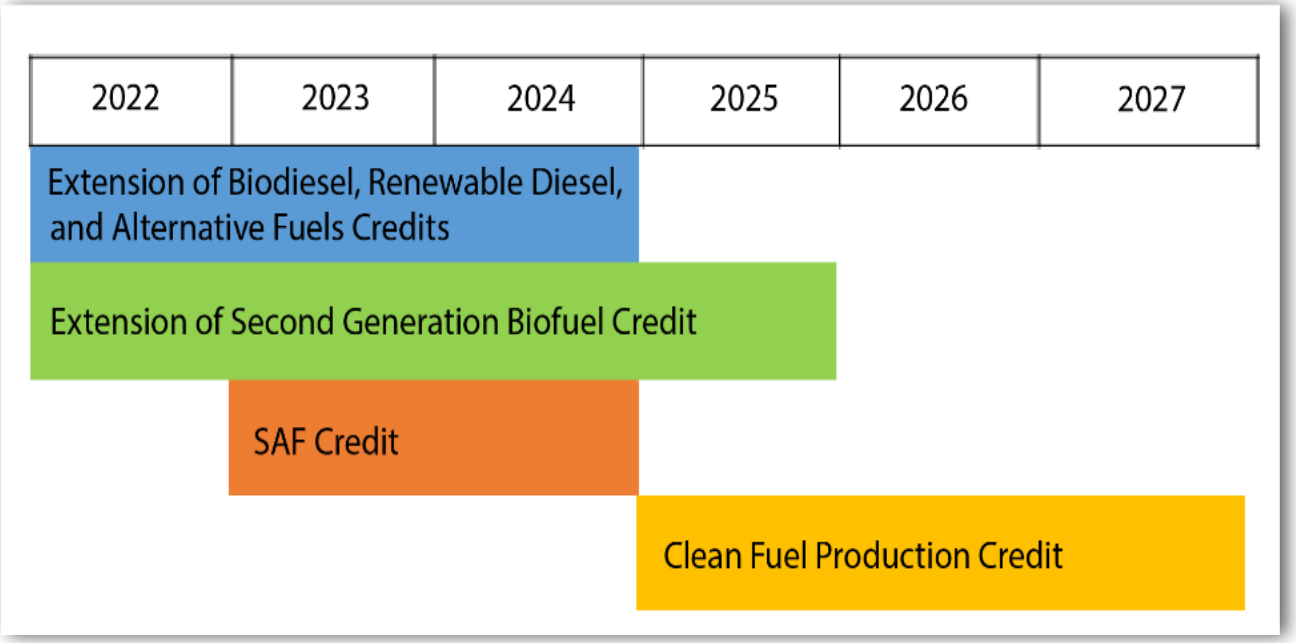


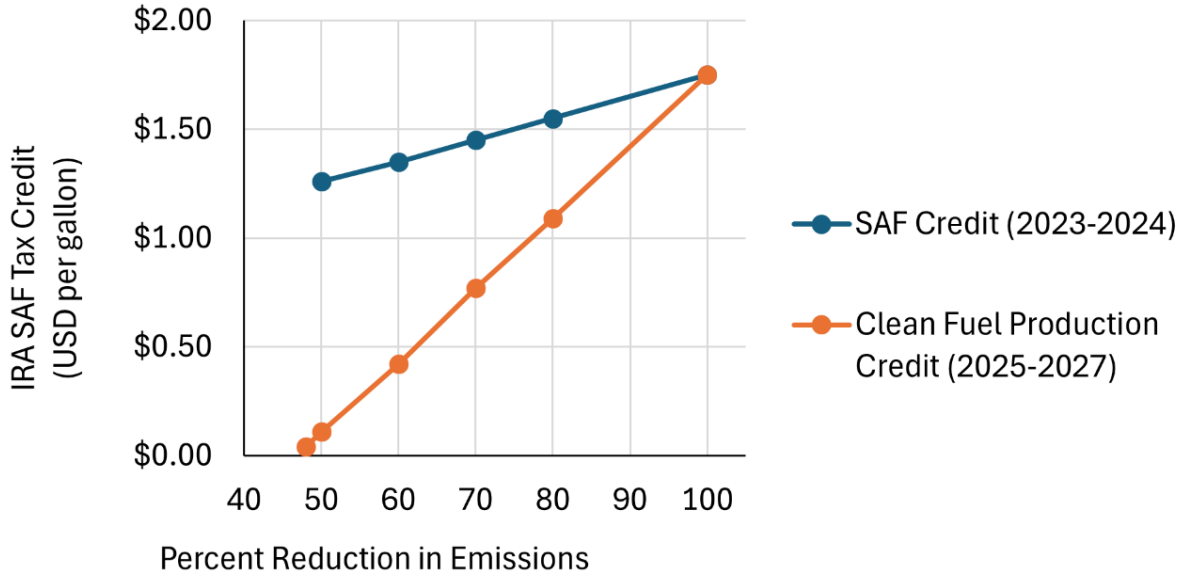
- Ethanol mandate would be limited to 15 billion gallons.
- Biodiesel producers sought higher targets.
- All fuels (SAF eligible) included in the RFS are required to meet a minimum 20% reduction in lifecycle GHG emissions compared to petroleum-based fuels. Advanced biofuels include biojet fuels (SAF), requires to meet a minimum 50% reduction in GHG emissions

Source: https://www.epa.gov/renewable-fuel-standard-program/renewable-fuel-annual-standards and https://www.epa.gov/renewable-fuel-standard-program/final-renewable-fuels-standards-rule-2023-2024-and-2025

IRA: provides and extends multiple tax credits

- Extend previous biofuel credits and introduce SAF Credit for 2024-2025
- Introduce clean fuel production credit for 2025-2027: largely replaces existing credits

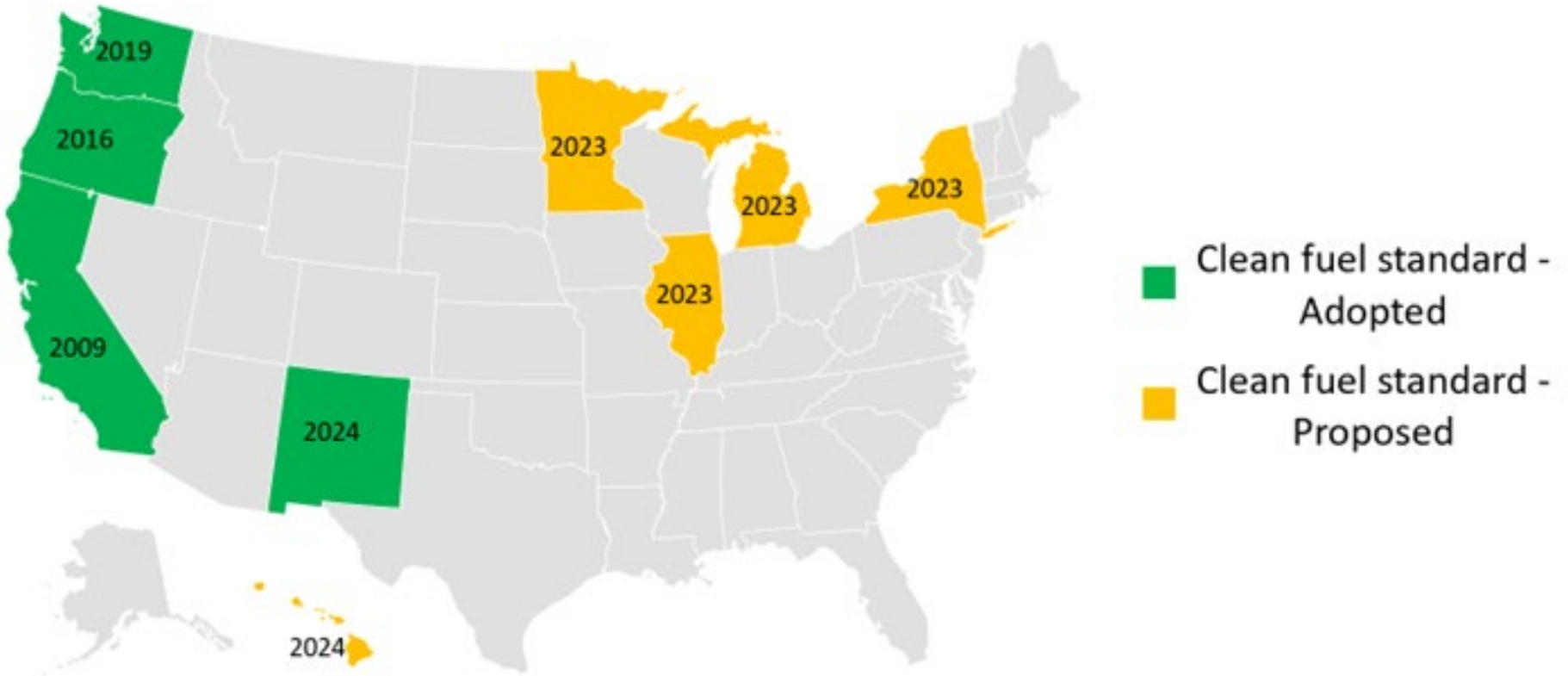




Key Takeaways:

- Performance-based credits and increased support for SAF compared to other biofuels
- Treasury and the IRS issued **Notice 2024-37** on April 30 and **Notice 2024-49** on May 31 regarding 40B and 45Z

State Policies



- California introduced the first Low Carbon Fuel Standard (LCFS) in 2009
- A number of states have adopted policies establishing SAF as eligible for credits, or SAF-specific credits inclusive of producers and/or purchasers.
- These states have also based these incentives on lifecycle GHG emission reduction requirements.

Federal and State Incentives

- Total combined incentives ranges from $3-$5/gal.
- One major concern has been the frequent expiration and reinstatement of tax credits.
- Multiple LCA methodologies, need for standardization.

Key Takeaways

- Effective carbon reduction depends on the feedstock, the production pathway, and all the emissions caused directly by the supply chain and by energy, hydrogen, and materials used in the supply chain.
- Market-pull and technology-push policies have been successfully used in the U.S. in the past. However, need to enhance the market pull through aggressive credits and incentives to close the gap in price with conventional fuels and chemicals.

Thank You

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Transforming ENERGY