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CLEAN HYDROGEN, CLEAN FUEL, AND LIFECYCLE: 45V AND 45Z CREDITS

Parker C. Fielder Oil and Gas Tax Conference

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Inflation Reduction Act (IRA), Section 45V

Credit overview

Section 45V Credit – Overview

The hydrogen production tax credit is based on the amount “qualified clean hydrogen” produced by a taxpayer at a qualified facility the construction of which begins before January 1, 2033 over a 10-year period. Taxpayers may elect to claim an investment tax credit (“ITC”) in lieu of the production tax credit (“PTC”). The applicable amount is determined by the applicable percentage, which is based on the **lifecycle greenhouse gas emissions rate** of the production of qualified clean hydrogen.

What is Qualified Clean Hydrogen?

- Congress defines this as “produced through a process that results in a lifecycle greenhouse gas emissions rate of not greater than 4 kilograms of CO2-e per kilogram of hydrogen,”
 - which is produced: (i) in the US or a US territory, (ii) in the ordinary course of a trade or business of the taxpayer, and (iii) for sale or use. The production and sale or use of such hydrogen must be **verified** by an unrelated third party.

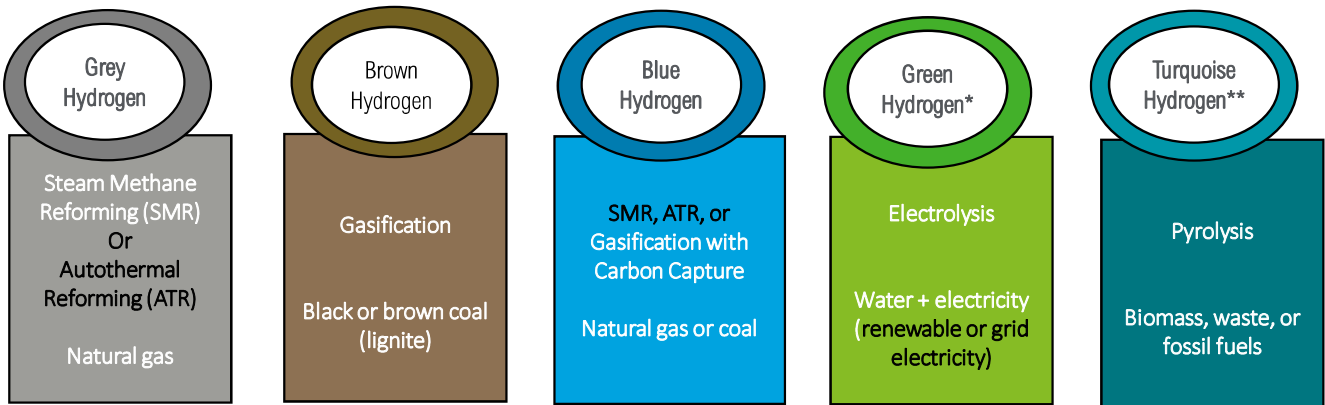
CO2-e Rate	Applicable %	PTC per kg Base	PTC per kg Bonus	ITC % Base	ITC % Bonus
< 0.45 kg	100.0%	\$0.60	\$3.00	6.0%	30.0%
0.45 kg ≤ 1.5 kg	33.4%	\$0.20	\$1.00	2.0%	10.0%
1.5 ≤ 2.5 kg	25.0%	\$0.15	\$0.75	1.5%	7.5%
2.5 kg ≤ 4 kg	20.0%	\$0.12	\$0.60	1.2%	6.0%

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Section 45V Credit – Production Technologies & Carbon Intensity

Color Terminology based on Technology & Energy Feedstock



*Additional categorizations include: (e.g., yellow hydrogen for solar; pink hydrogen for nuclear).

**Turquoise hydrogen is an emerging technology; results in pyrolytic carbon black (solid by-product) without carbon emissions.

EMISSIONS INTENSITY IS WHAT MATTERS

Source: [Hydrogen Production Processes | Department of Energy](#) and [Hydrogen Production: Natural Gas Reforming | Department of Energy](#), accessed September 12, 2023.

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Section 45V credit – Simplified Project Economics

Example: A new **\$60 million** qualified clean hydrogen production facility is placed in service in 2023, producing **5,000,000 kg of qualified clean hydrogen annually**. The facility uses electrolysis to produce green hydrogen that generates less than 0.45 kg of CO₂-e per kg of H₂ produced.

What Impact Could the 45V tax credit have on project economics?

Scenario 2: ITC in lieu of 45V PTC

Year	Eligible Capital Expenditures	ITC Applicable Amount – Bonus	Credit Amount – Bonus	ITC Applicable Amount – Base	Credit Amount – Base
2023	\$60,000,000	30.0%	\$18,000,000	6.0%	\$3,600,000
Total			\$18,000,000		\$3,600,000

Notes:

- Bonus credits apply for taxpayers that meet wage and apprenticeship requirements.

Scenario 1: 45V PTC

Year	H2 Production (kg)	PTC Rate per kg – Bonus	PTC Credit Amount – Bonus	PTC Rate per kg – Base	PTC Credit Amount – Base
2023	5,000,000	\$3.00	\$15,000,000	\$0.60	\$3,000,000
2024	5,000,000	\$3.06	\$15,300,000	\$0.61	\$3,060,000
2025	5,000,000	\$3.12	\$15,606,000	\$0.62	\$3,121,200
2026	5,000,000	\$3.18	\$15,918,120	\$0.64	\$3,183,624
2027	5,000,000	\$3.25	\$16,236,482	\$0.65	\$3,247,296
2028	5,000,000	\$3.31	\$16,561,212	\$0.66	\$3,312,242
2029	5,000,000	\$3.38	\$16,892,436	\$0.68	\$3,378,487
2030	5,000,000	\$3.45	\$17,230,285	\$0.69	\$3,446,057
2031	5,000,000	\$3.51	\$17,574,891	\$0.70	\$3,514,978
2032	5,000,000	\$3.59	\$17,926,389	\$0.72	\$3,585,278
Total	50,000,000		\$164,245,815		\$32,849,163

Notes:

- Bonus credits apply for taxpayers that meet wage and apprenticeship requirements.
- Assumes a 2% inflation rate each year.

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Section 45V Credit – Lifecycle Greenhouse Gas Emissions Intensity

- The GHG emissions intensity, or ‘carbon intensity’ of hydrogen refers to how many kilograms of carbon dioxide equivalent (CO₂e) are released to produce one kilogram of hydrogen (H₂).

To determine this, a Life cycle assessment (LCA) must be performed.

What are the Key components of a LCA for 45V eligibility?

- **“System Boundary” or scope: Well-to-gate.** Lifecycle GHG emissions shall only include emissions through the point of production (well-to-gate rather than cradle-to-grave). This includes energy feedstock production (natural gas from the production well, or grid electricity from power plants or renewables, through to the moment the hydrogen gas been produced at the facility.
- LCAs shall be performed using the most recent Greenhouse gases, Regulated Emissions, and Energy use in Technologies (“GREET” model) or a successor model as determined by the Secretary.
- Taxpayers seeking a credit under section 45V would model their projected emissions along the value chain in GREET to determine the appropriate lifecycle GHG rate tier and subsequent credit amounts.
- **Provisional emissions rate:** In the case of any hydrogen for which a lifecycle greenhouse gas emissions rate has not been determined for purposes of this section, a taxpayer producing such hydrogen may file a petition with the Secretary for determination of the lifecycle greenhouse gas emissions rate with respect to such hydrogen.

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Title search: Clean Hydrogen, Clean Fuel, and Lifecycle: Understanding the Complexities of 45V and 45Z Credits

Also available as part of the eCourse

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"Clean Hydrogen, Clean Fuel, and Lifecycle: Understanding the Complexities of 45V and 45Z Credits"