CleanEnergyGroup

45V Clean Hydrogen Production Tax Credit:

A Windfall for the Fossil Fuel Industry?

March 26, 2025

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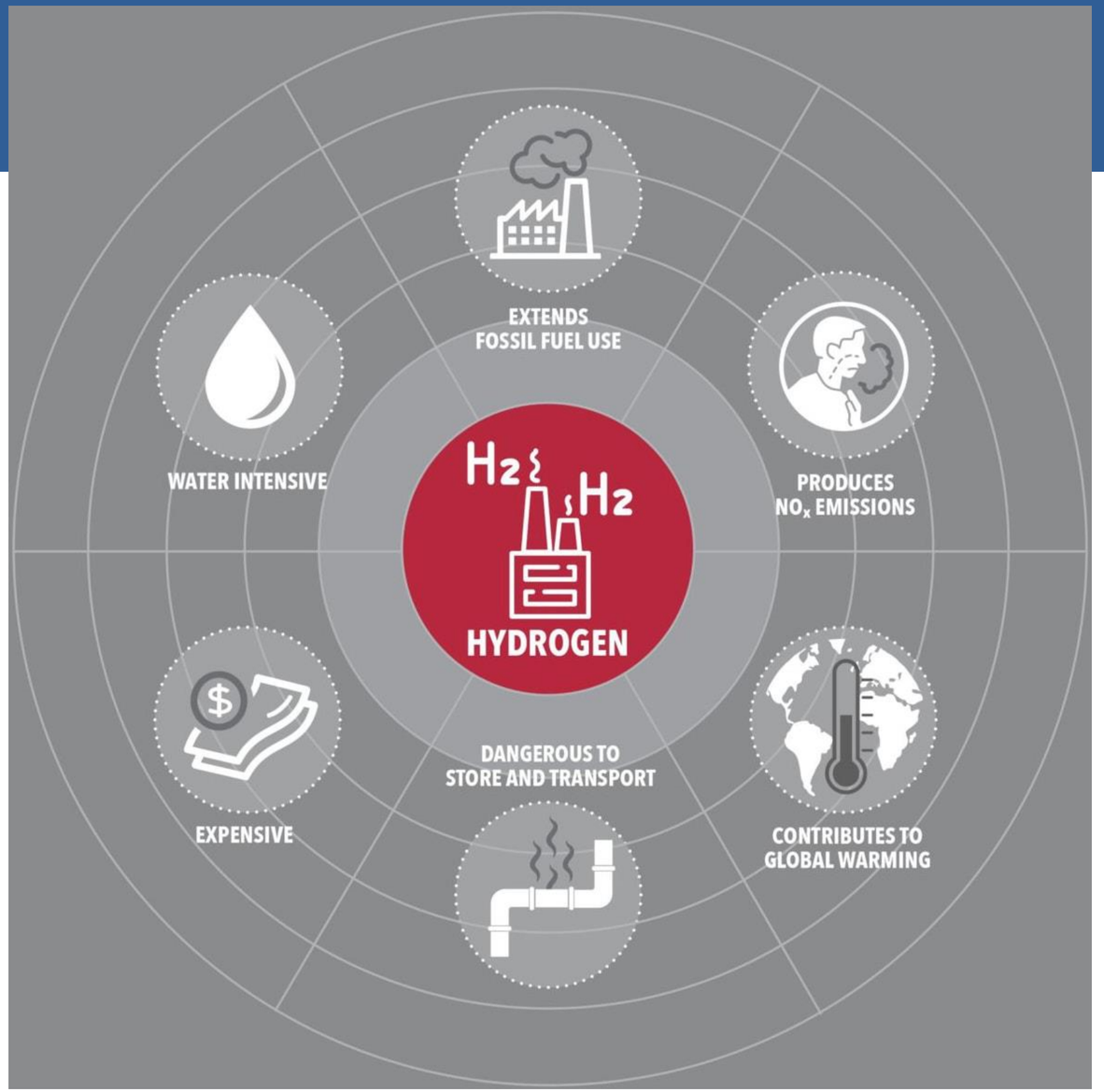
Hydrogen Information & Public Education

Raising awareness of the health and environmental impacts of hydrogen production and use.



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THE POINT

UPROSE

www.cleanegroup.org/initiatives/hydrogen

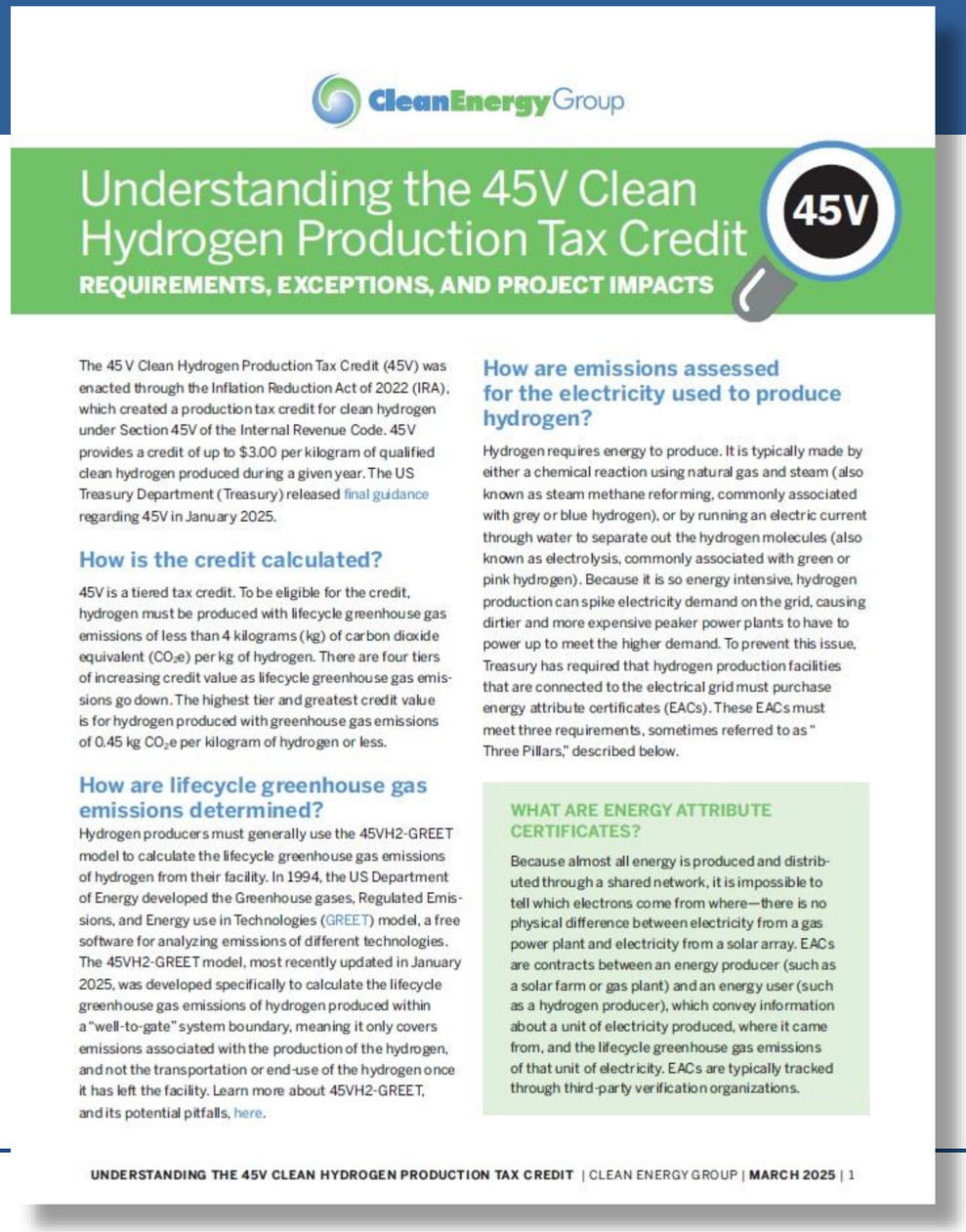
MARCH 2025

Understanding the 45V Clean Hydrogen Production Tax Credit

Eva Morgan, Abbe Ramanan

Available at:

www.cleanegroup.org/publication/45V-Clean-Hydrogen-Production-Tax-Credit



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Understanding the 45V Clean Hydrogen Production Tax Credit

45V

REQUIREMENTS, EXCEPTIONS, AND PROJECT IMPACTS

The 45 V Clean Hydrogen Production Tax Credit (45V) was enacted through the Inflation Reduction Act of 2022 (IRA), which created a production tax credit for clean hydrogen under Section 45V of the Internal Revenue Code. 45V provides a credit of up to $3.00 per kilogram of qualified clean hydrogen produced during a given year. The US Treasury Department (Treasury) released final guidance regarding 45V in January 2025.

How is the credit calculated?

45V is a tiered tax credit. To be eligible for the credit, hydrogen must be produced with lifecycle greenhouse gas emissions of less than 4 kilograms (kg) of carbon dioxide equivalent (CO_2e) per kg of hydrogen. There are four tiers of increasing credit value as lifecycle greenhouse gas emissions go down. The highest tier and greatest credit value is for hydrogen produced with greenhouse gas emissions of 0.45 kg CO_2e per kilogram of hydrogen or less.

How are lifecycle greenhouse gas emissions determined?

Hydrogen producers must generally use the 45VH2-GREET model to calculate the lifecycle greenhouse gas emissions of hydrogen from their facility. In 1994, the US Department of Energy developed the Greenhouse gases, Regulated Emissions, and Energy use in Technologies (GREET) model, a free software for analyzing emissions of different technologies. The 45VH2-GREET model, most recently updated in January 2025, was developed specifically to calculate the lifecycle greenhouse gas emissions of hydrogen produced within a "well-to-gate" system boundary, meaning it only covers emissions associated with the production of the hydrogen, and not the transportation or end-use of the hydrogen once it has left the facility. Learn more about 45VH2-GREET, and its potential pitfalls, here.

How are emissions assessed for the electricity used to produce hydrogen?

Hydrogen requires energy to produce. It is typically made by either a chemical reaction using natural gas and steam (also known as steam methane reforming, commonly associated with grey or blue hydrogen), or by running an electric current through water to separate out the hydrogen molecules (also known as electrolysis, commonly associated with green or pink hydrogen). Because it is so energy intensive, hydrogen production can spike electricity demand on the grid, causing dirtier and more expensive peaker power plants to have to power up to meet the higher demand. To prevent this issue, Treasury has required that hydrogen production facilities that are connected to the electrical grid must purchase energy attribute certificates (EACs). These EACs must meet three requirements, sometimes referred to as "Three Pillars," described below.

WHAT ARE ENERGY ATTRIBUTE CERTIFICATES?

Because almost all energy is produced and distributed through a shared network, it is impossible to tell which electrons come from where—there is no physical difference between electricity from a gas power plant and electricity from a solar array. EACs are contracts between an energy producer (such as a solar farm or gas plant) and an energy user (such as a hydrogen producer), which convey information about a unit of electricity produced, where it came from, and the lifecycle greenhouse gas emissions of that unit of electricity. EACs are typically tracked through third-party verification organizations.

UNDERSTANDING THE 45V CLEAN HYDROGEN PRODUCTION TAX CREDIT | CLEAN ENERGY GROUP | MARCH 2025 | 1

Webinar Speakers

45V Clean Hydrogen Production Tax Credit: A Windfall for the Fossil Fuel Industry?

Julie McNamara
Associate Policy Director, Union of Concerned Scientists

Anika Juhn
Energy Data Analysis, IEEFA

Sara Gersen
Senior Attorney, Earthjustice

Abbe Ramanan
Project Director, Clean Energy Group (Moderator)

Eva Morgan
Project Manager, Clean Energy Group (Moderator)

Union of Concerned Scientists

Institute for Energy Economics and Financial Analysis
IEEFA.org

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Case Study: Cape Light Compact's Cape and Vineyard Electrification Offering (4/8)

Energy Resilience for Medically Vulnerable Multifamily Affordable Housing Residents: A Technoeconomic Analysis for Connecticut (4/10)

A Climate Resilient Energy Code for Multifamily Affordable Housing (4/29)

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Status Check on 45V

Where the rules landed; how they could change

Julie McNamara

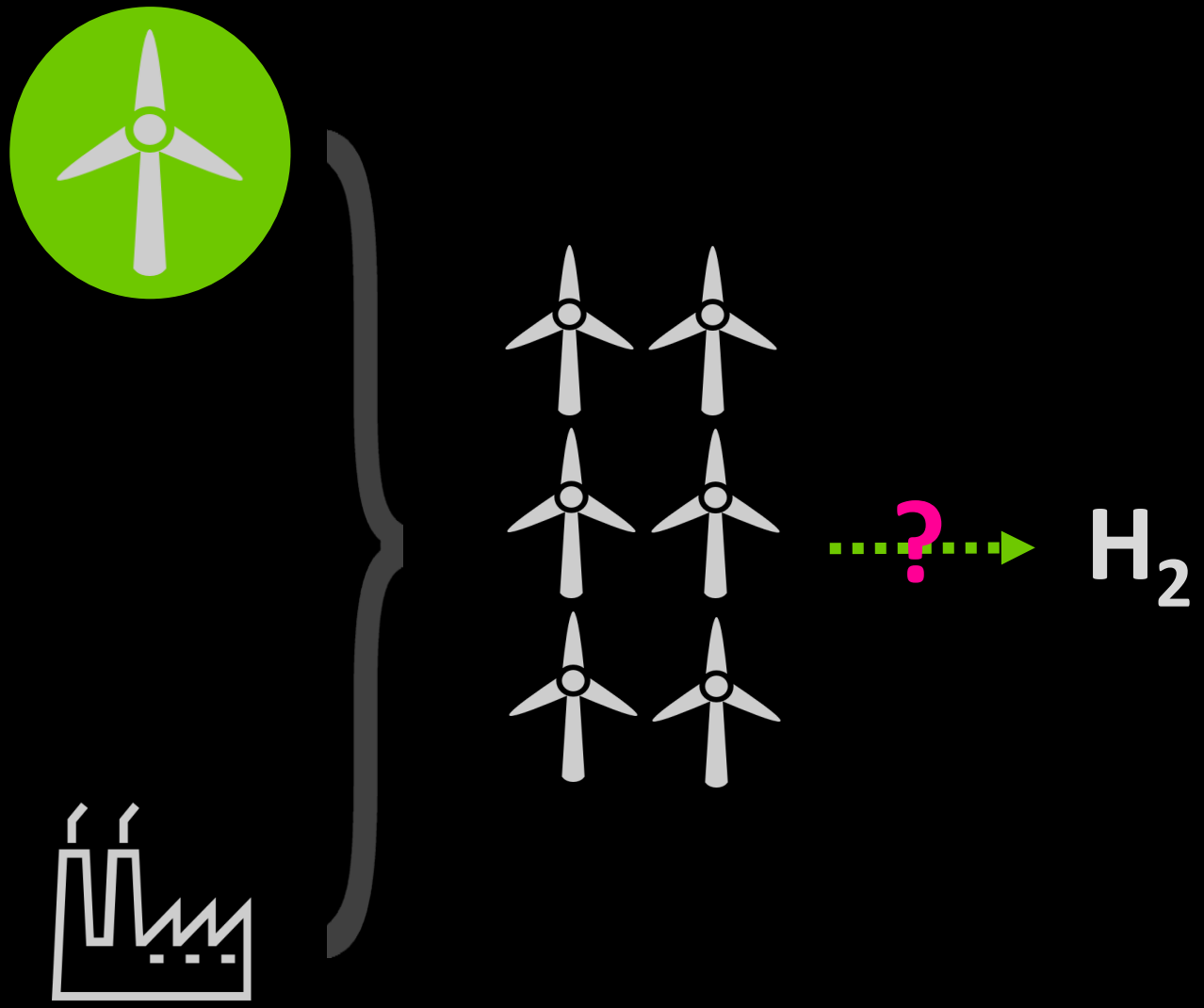
Union of Concerned Scientists

45V

- Encourage production of **clean** hydrogen
- Credit on a **kilogram-by-kilogram** basis for a **10-year** period
- Award on basis of **lifecycle emissions**, meaning direct *and* significant indirect

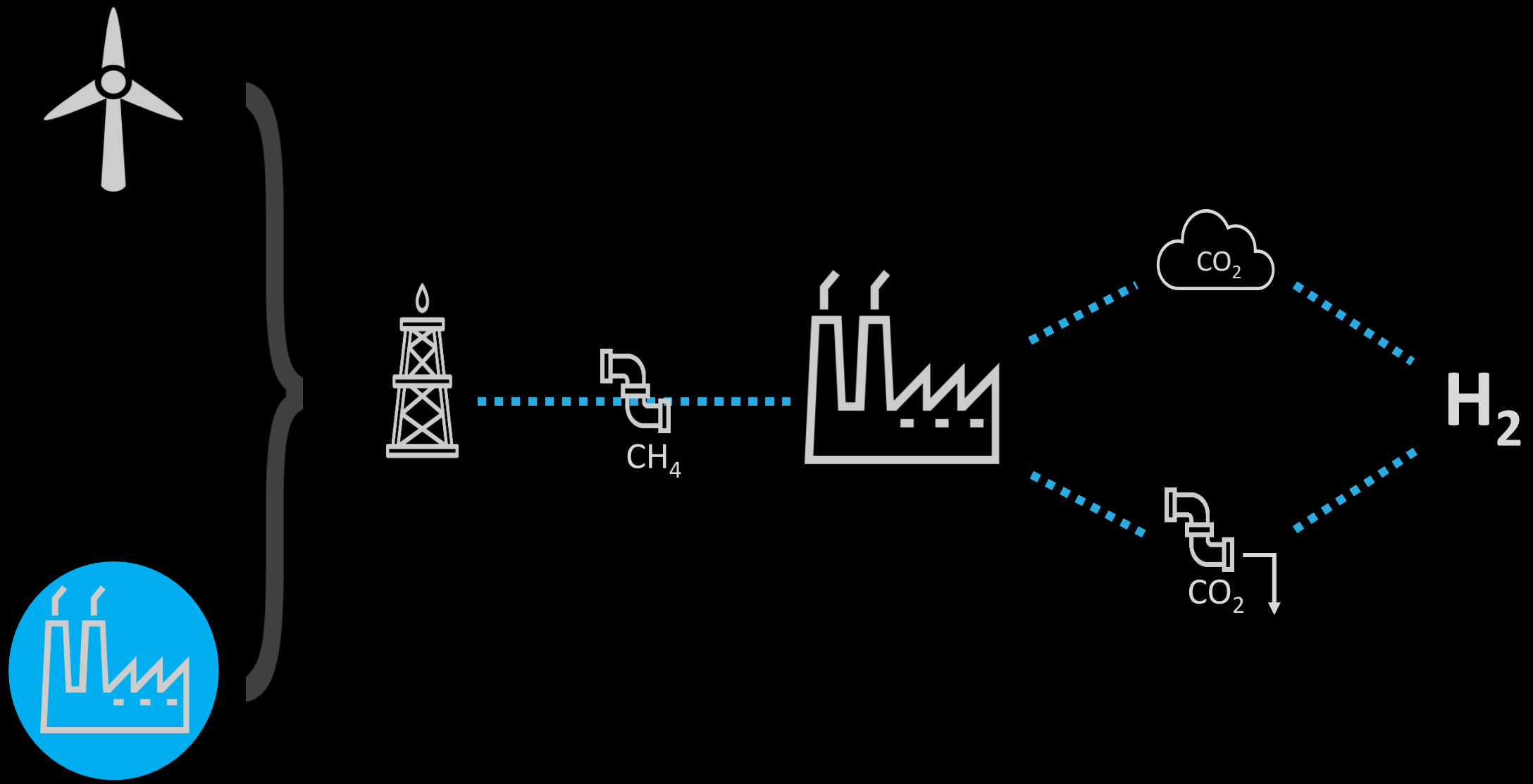
45V

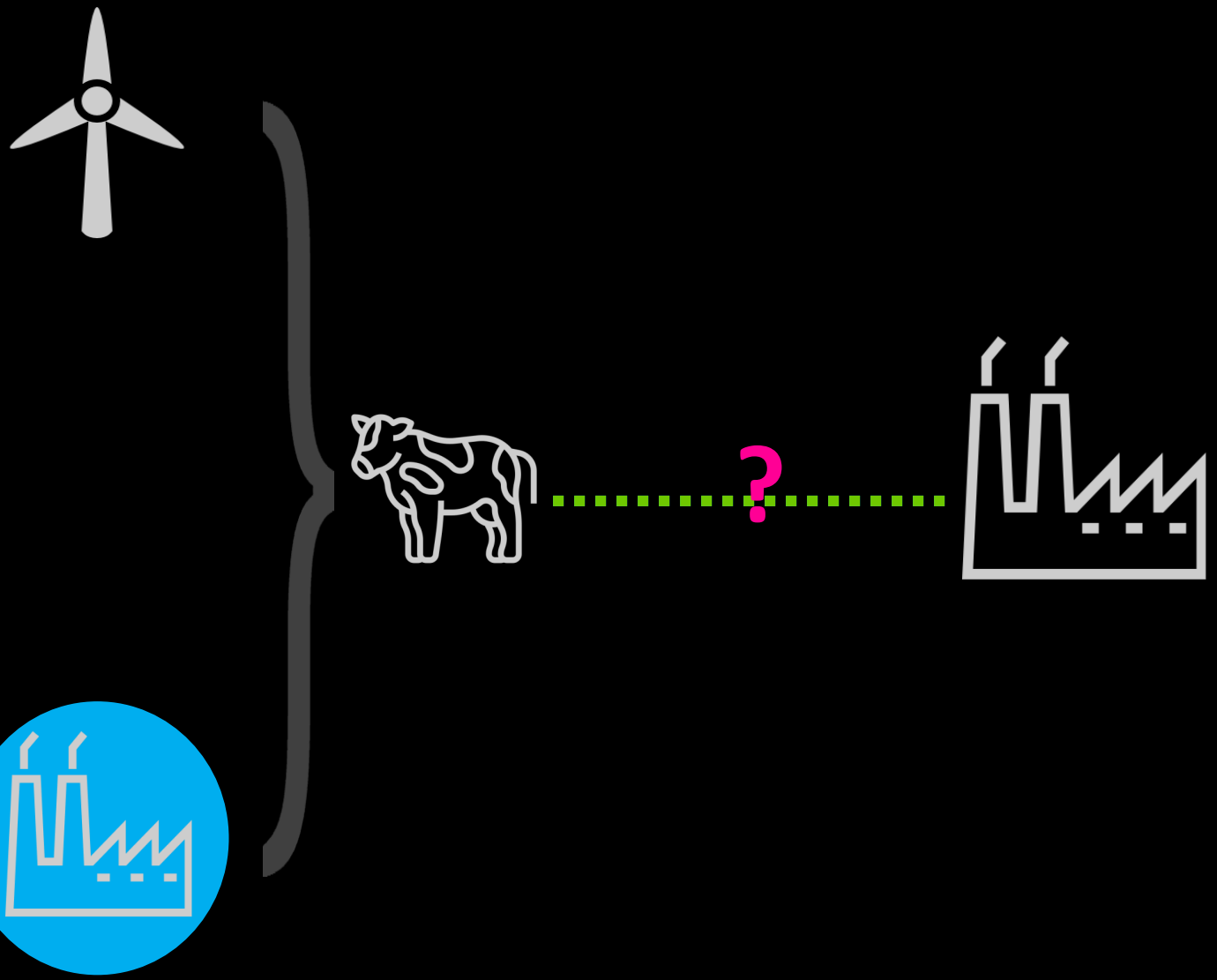
Lifecycle GHG Emissions Rate (kg CO_2e/kg H_2)	Credit Value
<0.45	$3
0.45 to <1.5	$1
1.5 to 2.5	$0.75
2.5 to 4	$0.60

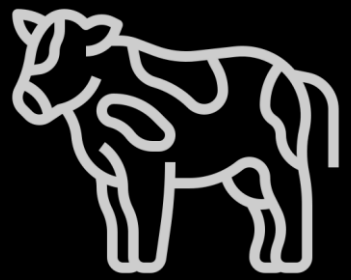


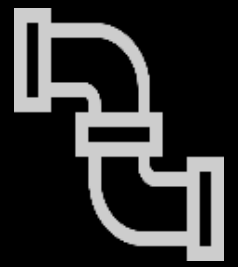
Three-pillars framework:

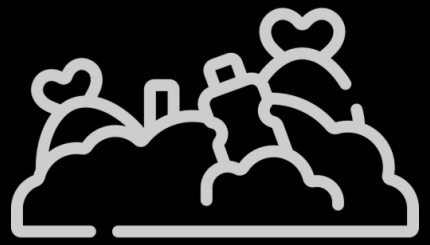
- Electricity is **incremental**, meaning new and/or additional
- Electricity is **deliverable**, meaning in same region as electrolyzer
- Electricity is **time-matched**, meaning used when produced


CH_4
CO_2
H_2
CO_2

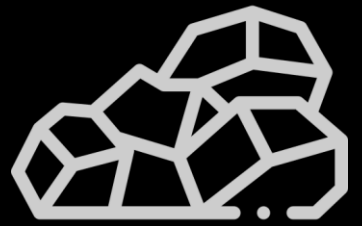








Sources of biomethane, fugitive methane



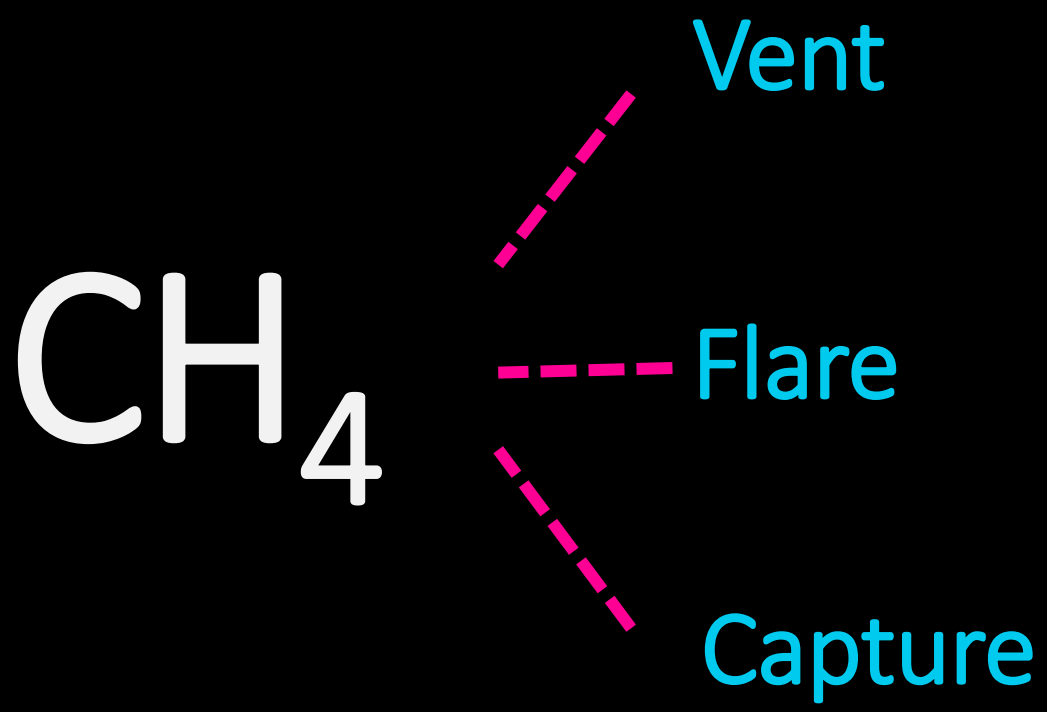
Why Talk About Fugitive Methane?

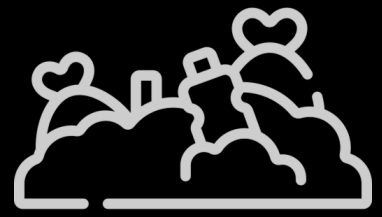
CH_4

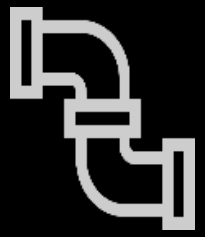
100-year timeframe: 28 - 36x CO_2

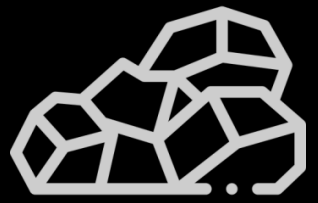
20-year timeframe: 84 - 87x CO_2

Managing Fugitive Methane

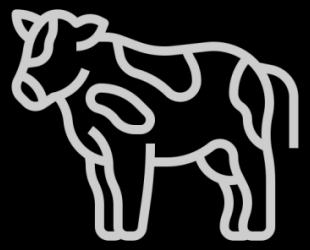








= Capture and flare



= Snapshot of current mgmt

How could 45V
change going forward?

Mechanisms and Risks

- **Sub-regulatory**
  - E.g., Changes to GREET assumptions
  - **Risks:** Changes to counterfactuals
- **Rulemaking**
  - E.g., Changes to fundamental statutory interpretations
  - **Risks:** Blending, cutting three pillars
- **Statutory (including via reconciliation)**
  - E.g., Changes to structure of incentive itself
  - **Risks:** Prioritize only fossil

Institute for Energy Economics and Financial Analysis

45V and Blue Hydrogen

Tax credits risk subsidizing a polluting industry

Anika Juhn, Energy Data Analyst

March 26, 2025

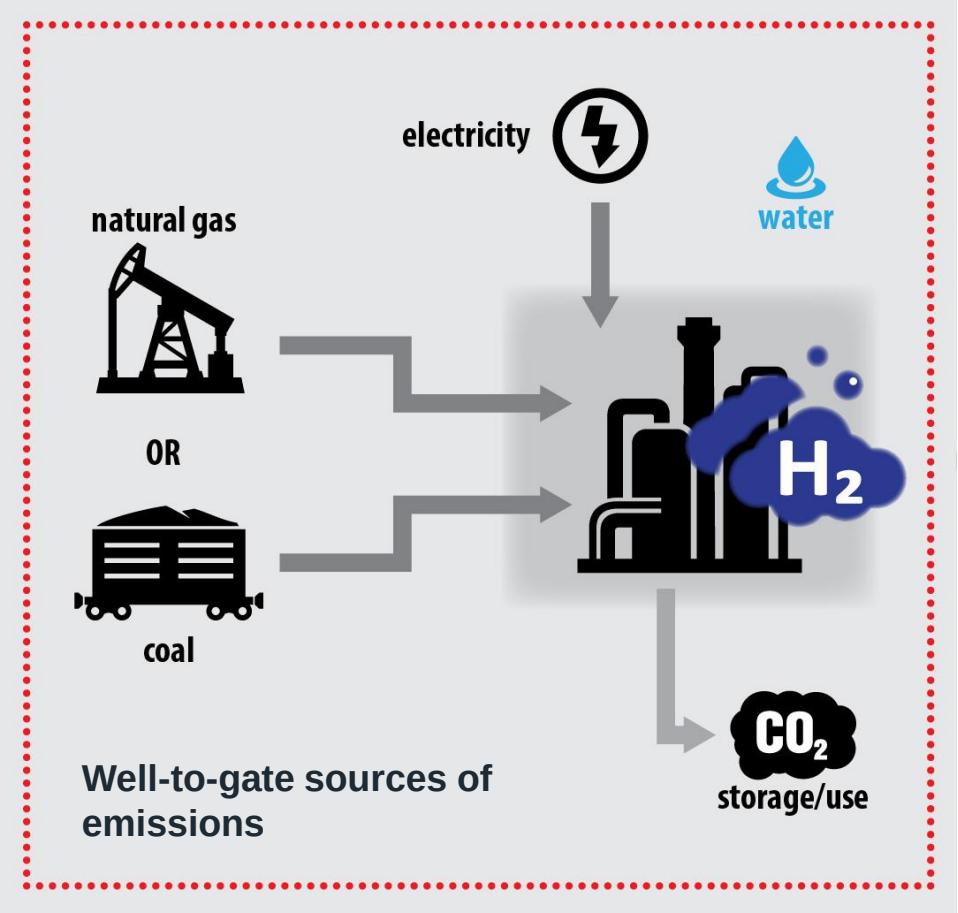
UK's HyNet North West blue hydrogen facility: https://www.nsenergybusiness.com/projects/hynet-north-west-project/

Overview

1. Carbon intensity of hydrogen from methane (blue hydrogen)
2. Blue hydrogen and the 45V tax credit
3. Blue hydrogen wins with 45Q tax credits
4. Billions of taxpayer dollars at risk for dirty hydrogen production

Fossil Hydrogen

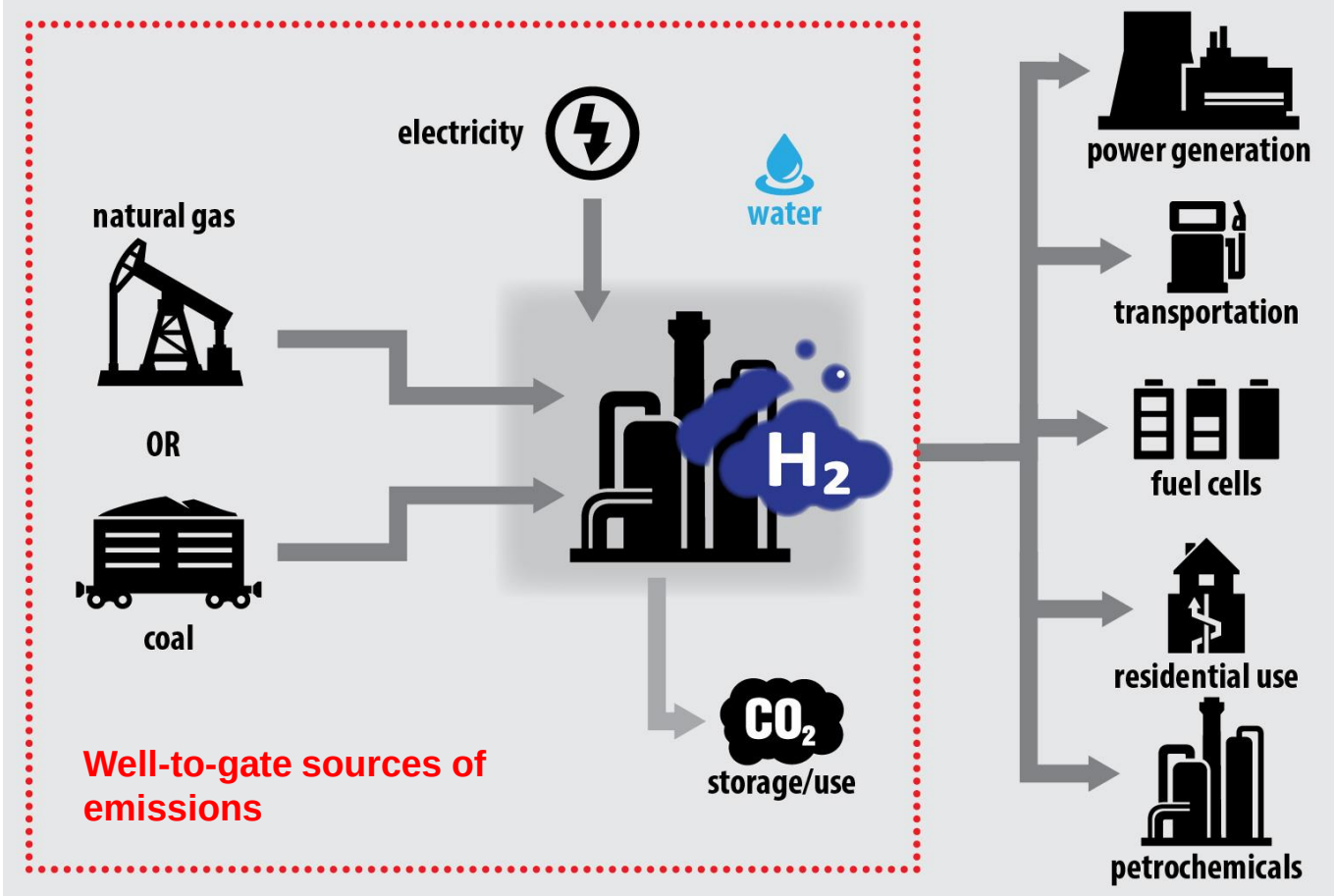
- Methane from (coal or natural gas) + CCUS = blue hydrogen
- Emissions are generated in each step and add up to represent carbon intensity
- DOE's GREET model (45V-GREET)
- 45V credits are based on the clean hydrogen standard (4 kg CO_2 equivalent per kg H_2 produced)
- Challenging for blue hydrogen to meet or exceed standard



What Is the Carbon Intensity of Fossil Hydrogen?

- GREET model underestimates climate impact
- Limited life cycle analysis envelope ignores downstream emissions
- Net benefit of producing and using blue hydrogen depends on
    1) How far hydrogen is transported
    2) End use of hydrogen

45V credits can be claimed regardless of net climate impact of hydrogen



45V Issues

Final rule fails to ensure credits will result in net climate benefit

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45V is a tax credit, not EPA regulation

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Final rule fails to ensure credits will result in net climate benefit

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Relies on 45Q for carbon management

45V Issues

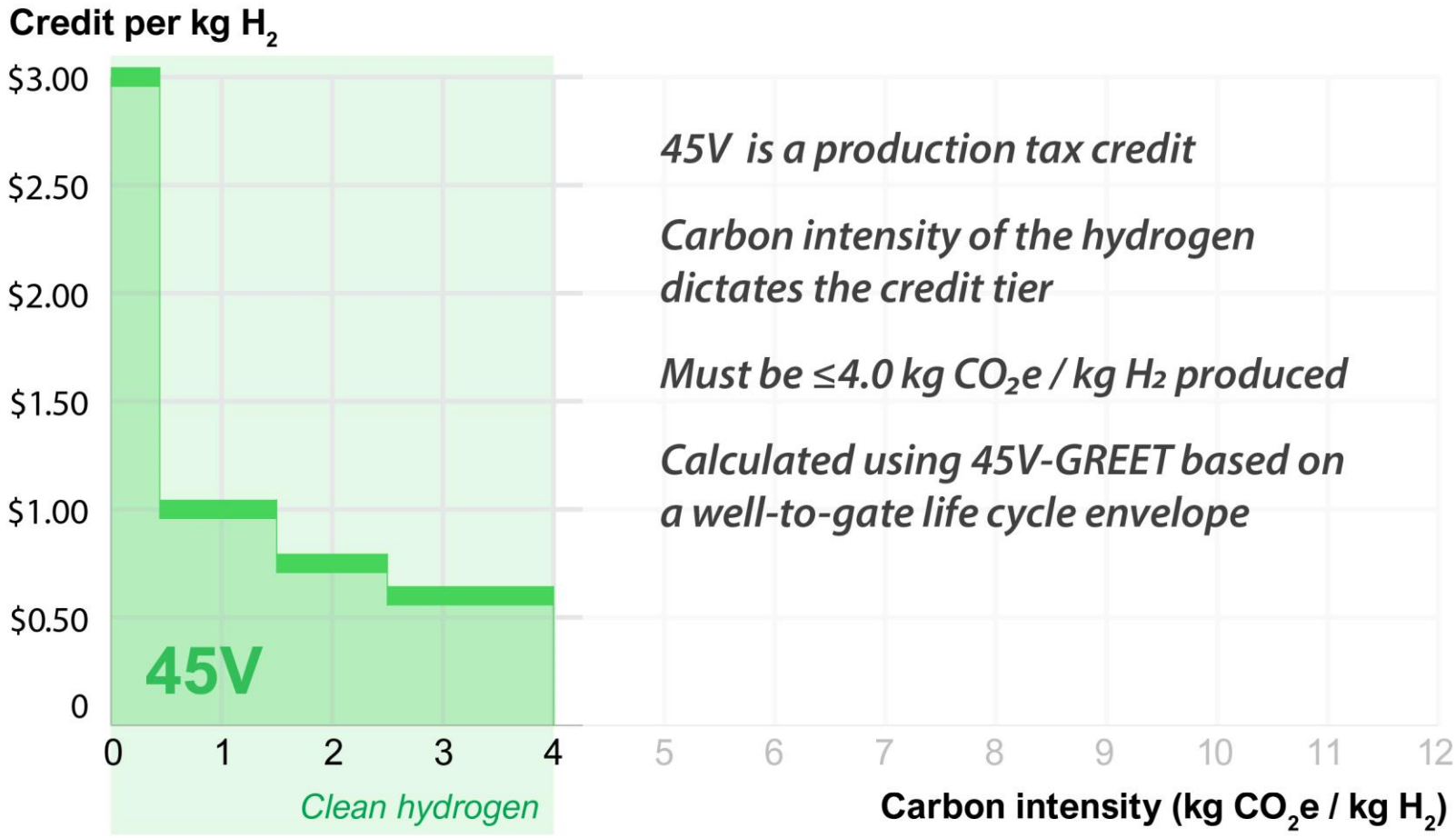
- Final rule fails to ensure credits will result in net climate benefit
- 45V is a tax credit, not EPA regulation
- Relies on 45Q for carbon management
- Lack of transparency

45Q: the Biggest Loophole of All

45V incentivizes clean hydrogen production

Meeting the clean standard will be very difficult for hydrogen and ammonia producers

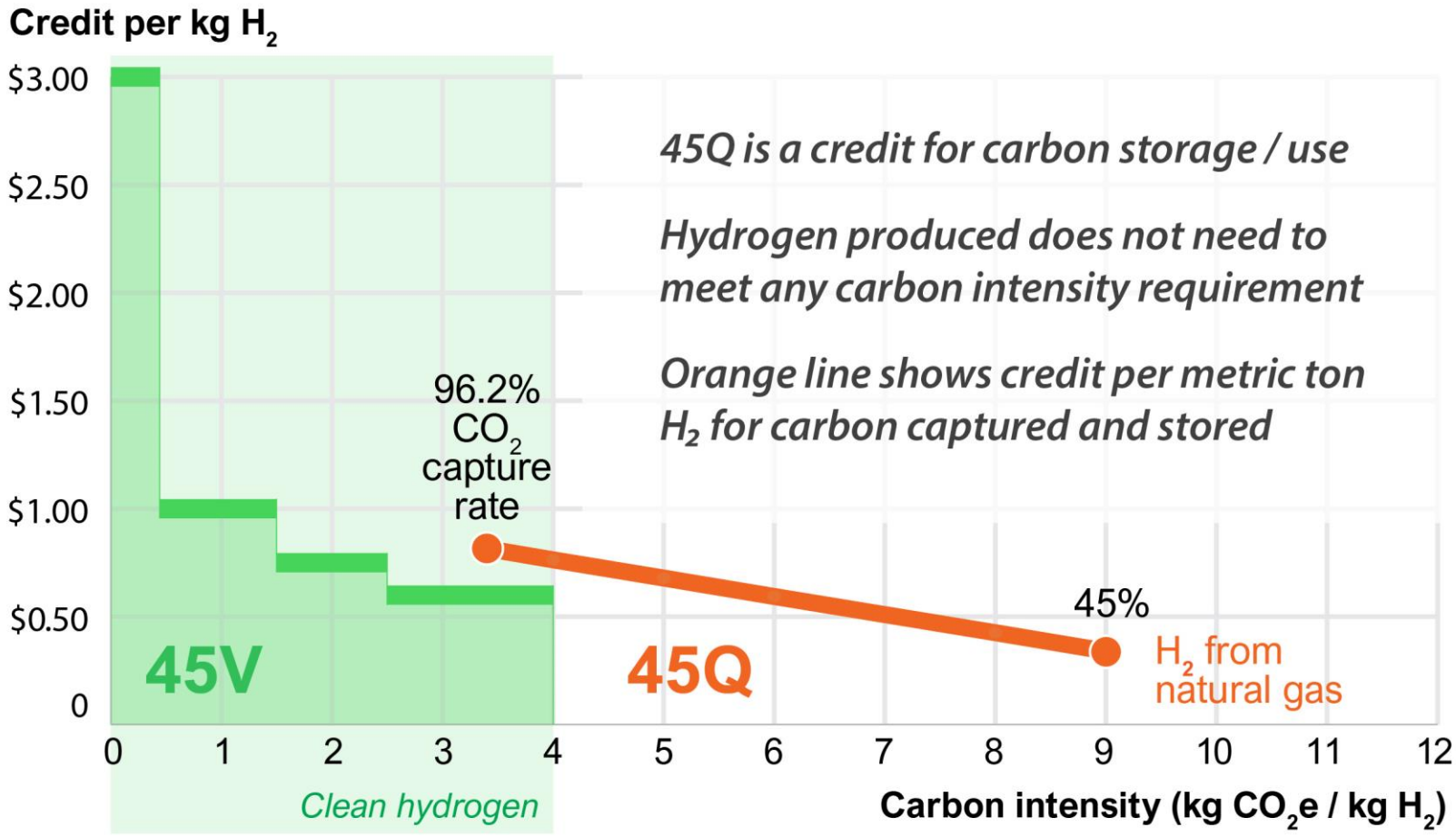
Some fossil-based projects will qualify for 45V due to co-products accounting methods in 45V-GREET (e.g. methanol)



45Q: the Biggest Loophole of All

45Q offers more flexibility to producers

Even at very low carbon capture rates that result in high carbon intensities, producers can still claim credits



LCEC site: https://www.desmog.com/2023/02/17/air-products-lake-maurepas-louisiana-ccs-blue-hydrogen/

Air Products' Louisiana Clean Energy Complex

New $7 billion facility (up from $4.5 billion in 2021)

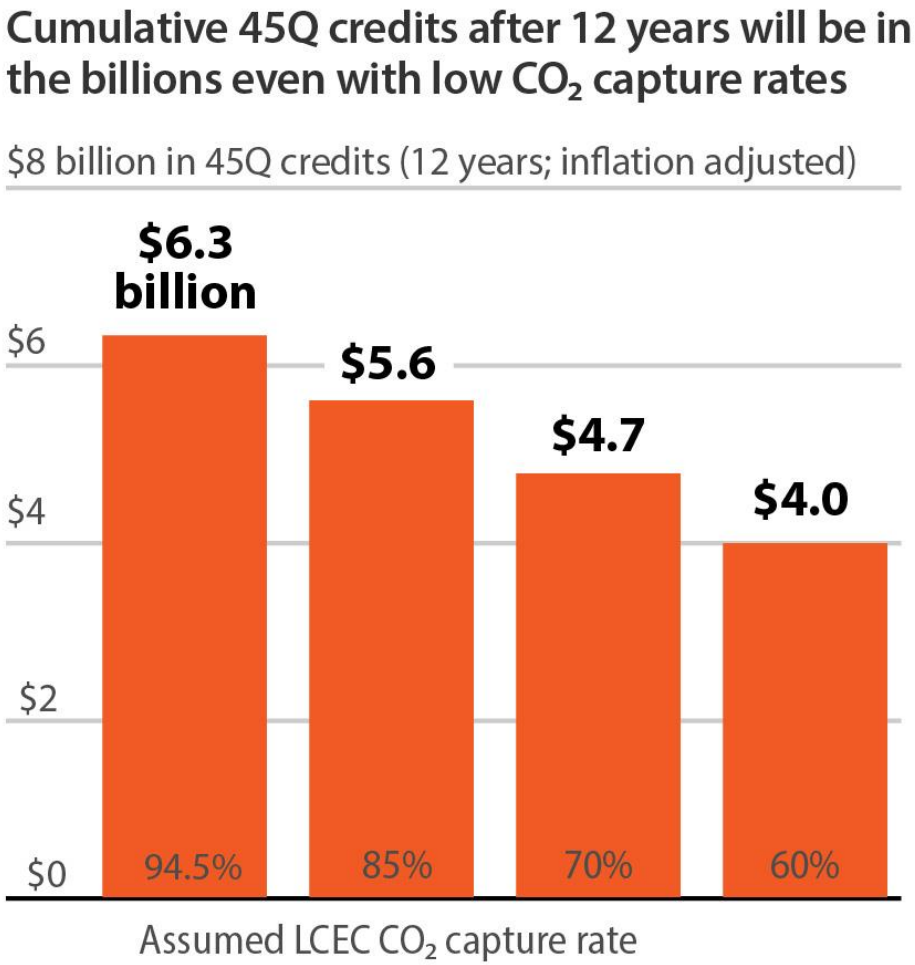
Methane feedstock for nearly 600,000 tonnes hydrogen per year, with some portion to be converted to ammonia

Planned to be online in 2028

Promises to capture 95% of CO_2 from autothermal reforming (ATR) unit

Equals about 5 million metric tons CO_2 to be stored annually

45Q Credits



Will not qualify for 45V credits

45Q is based on metric tons stored, not net CO_2 basis

Under 45Q, company could claim billions over 12 years of eligibility, even if capture rates are 35 percentage points lower than claims and product is much dirtier than promised

Conclusions

- The true climate impact of hydrogen production and use should be evaluated on a net basis, covering the full life cycle
- Fossil hydrogen with carbon capture is an expensive distraction and will not result in emissions benefits
- Tax-based programs are poor tools for environmental regulation
- Programs like 45V and 45Q have the potential to provide billions in subsidies to the fossil fuel industry without any climate benefit

Wind and Solar Are Better Together (Scientific American)
https://www.scientificamerican.com/article/wind-and-solar-are-better-together/

Questions?

More information: https://ieefa.org/topic/hydrogen

Contact: Anika Juhn, ajuhn@ieefa.org

The Impact of the 45V Tax Credit on Regional Clean Hydrogen Hubs

Sara Gersen
Senior Attorney

EARTHJUSTICE

March 26, 2025

What are Hydrogen Hubs?

Check out https://earthjustice.org/feature/hydrogen-hub-program.

Are the Hubs Still Happening?

45V Can Turbo-Charge the Hubs

45V is a much bigger subsidy than the hub program

- Regional hubs
  - Total spending: $7 billion
  - Each hub: Varies among the seven hubs. California's hub may receive up to $1.2 billion
- 45V
  - Total spending: Unknown because there is no cap
  - When the IRA was under consideration, the congressional Joint Committee on Taxation estimated 45V would cost over $13 billion in 2022-2031, but costs will continue ramping up after 2031 and last until around 2045.
  - Spending could explode if rules are weakened. The Electric Power Research Institute warned of costs between $385 and $756 billion by 2050.

The Hubs Lobbied Treasury to Maximize Subsidies from 45V

- The hubs for California and the Pacific Northwest will benefit from a carveout for states with cap-and-trade programs.
- The Midwest and Mid-Atlantic hubs will benefit from a carveout for hydrogen produced with energy from existing nuclear powerplants.

45V Supports Hydrogen that May Not Receive Direct Hub Funding

- Hydrogen hubs have announced the kinds of hydrogen production they intend to support.
- For instance, ARCHES once committed to not funding hydrogen produced from livestock biomethane.
- The 45V tax credit will boost production of this hydrogen, which can take advantage of the demand and infrastructure from the hub.

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