



# Clean Hydrogen Tax Credit (45V) Guidance Explained

A deep dive into  
the Treasury guidance for  
hydrogen electrolysis

# Speakers

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# Agenda

- **Review of Proposed Clean Hydrogen Tax Credit (45V) Rules**
- **Discussion: Understanding the Impacts of 45V**
- **Q&A**
- **What's Next?**

# Basics and Background

- **Section 45V of the Inflation Reduction Act** provides a tax credit to produce low carbon intensity hydrogen
- **The value of the credit** is based on emissions intensity (as calculated by GREET) and is technology-neutral
- **Prevailing wage and apprenticeship** unlocks full value
- Congressional intent included allowance of **“book and claim”** systems to reduce **“effective GHG emissions”**

## Timeline:

- **February 26<sup>th</sup>**: Public comment period closes
- **March 25<sup>th</sup>**: Public hearing

CO2e kilograms (kg) to produce a kg of H2	PTC per kg
<0.45	\$3
0.45 to < 1.5	\$1
1.5 to < 2.5	\$.75
2.5 to < 4 kg	\$.60

*Inflation adjusted*

*Direct pay for 5 years*

# Proposed Rule - Summary

- 1. The guidance provides clarity to developers on the details of a "well-to-gate" lifecycle systems to demonstrate the production of low carbon hydrogen**
- 2. Enables the use of Energy Attribute Certificates (EACs) and EAC trading, opening the door to a diversity of contract types**
- 3. EACs must demonstrate: incrementality, deliverability, and temporal matching**
- 4. Developers can propose new hydrogen production pathways**
- 5. Further comments are requested on gas-based pathways and edge cases**

# Incrementality

**Proposed rule:** New clean electricity must be placed in service less than 36 months prior to the hydrogen facility being placed in service

**Flexibility points:** 3-year grace period, technology inclusive, repowering, ability to “lock-in” attributes from facilities, curtailment, and clean grids

## **Outstanding questions that could expand eligibility:**

- 5% rule for existing clean power
- Curtailment
- Grids with very high clean electricity penetrations
- Eligibility of existing facilities

# Why are the incrementality rules important?

- Incrementality enables grid-connection and attempts to mitigate direct emissions
- Diverse resource procurement and innovating clean firm technology is incentivized
- Developers and regions that are building clean power projects and expand the grid will be more competitive; active queue positions are in play
- 3 year vintage offers a growing pie of clean electricity from which hydrogen producers can procure EACs

# Temporal Matching

**Proposed rule:** Clean electricity and clean hydrogen production can be annually matched until 2028. Starting on January 1, 2028, projects must match clean electricity and hydrogen production at an hourly level

**Flexibilities:** Transition period allows projects to execute hourly matching optimization

## **Outstanding questions:**

- How will missed hours be accounted for?
- How will storage play into hourly matching?
- Data infrastructure and project certainty?



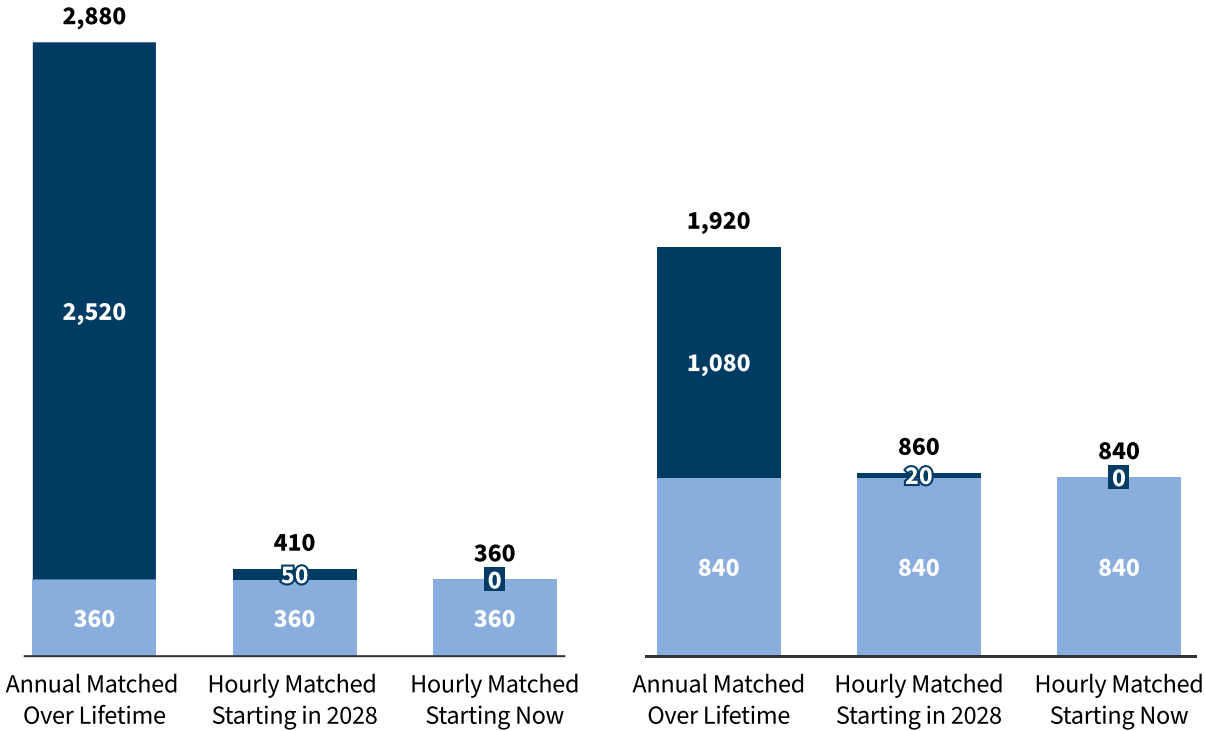
# Emissions dynamics associated with annual phase-out

## Electrolysis Dominates Market: Emissions from the 10 MMt Clean Hydrogen Production Goal

## SMR + CCS Dominates Market: Emissions from the 10 MMt Clean Hydrogen Production Goal

Million Metric Tons CO<sub>2</sub>e (MMt)

SMR + CCS Electrolysis

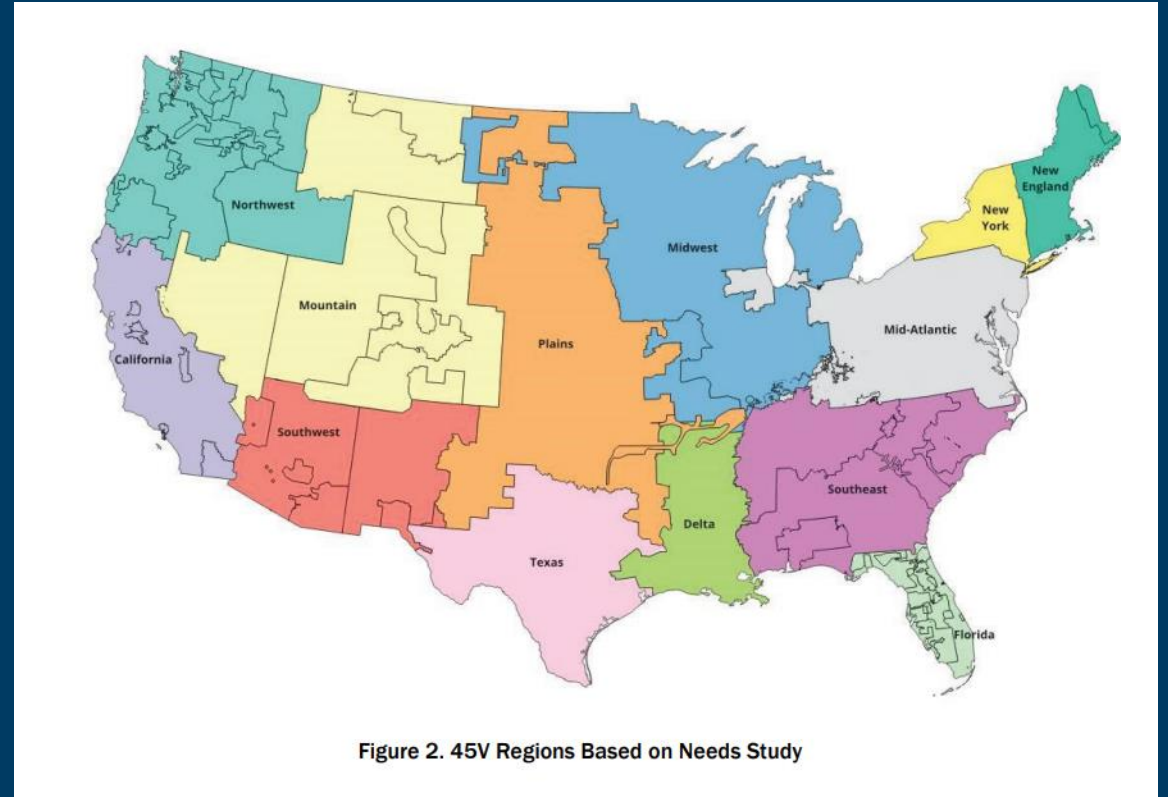


# Deliverability

**Proposed rule:** Clean electricity must be generated in the same DOE Grid Congestion Zone as the hydrogen production

## Outstanding questions:

- Are there other ways to prove deliverability when the facilities are in different grid regions?
- Should these regions be adjusted?



**How will the proposed clean hydrogen tax credit rules impact...**

**...emissions outcomes?**

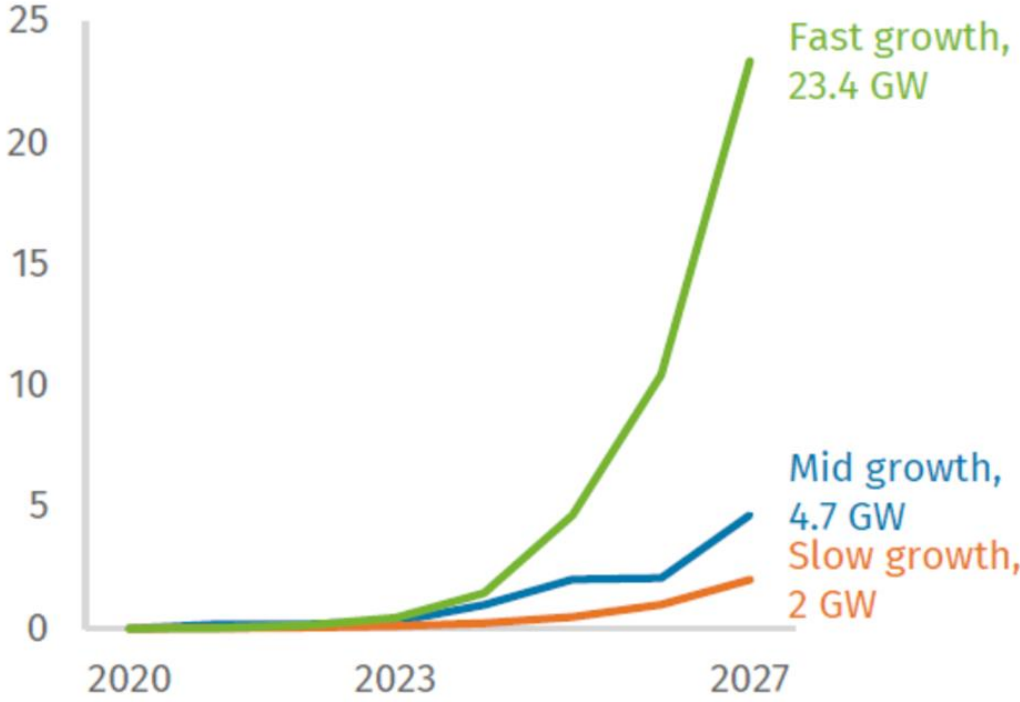
**...the development of clean hydrogen projects and hubs?**

**...the future of the hydrogen commodity market?**

# As proposed, 45V will drive net emission reductions from electrolyzer deployment through 2035

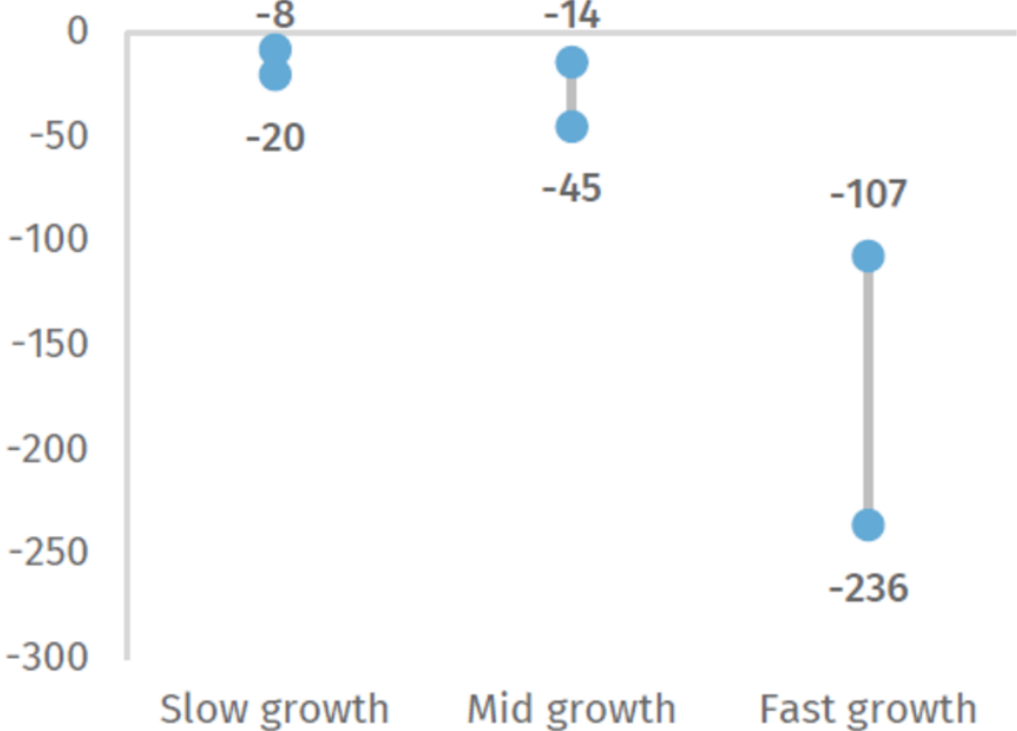
## Electrolyzer deployment scenarios

GW of installed electrolyzer capacity



## Range of cumulative emissions impacts in 2024-2035

Million metric tons CO<sub>2</sub>-e



Source: Rhodium Group

*4.7GW of announced electrolyzer projects as of EOY2023 (RhG-MIT Clean Investment Monitor)*

Source: Rhodium Group

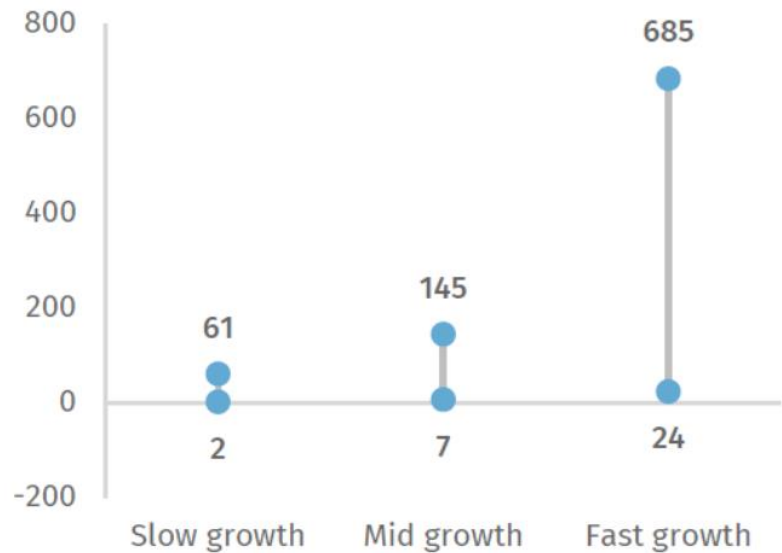
(Emission impacts are from electrolyzers online through 2027, based on 45V rules published by Treasury on 12/22/23 . 80% capacity utilization rate assumed.)

# What if the rules are tweaked?

## What if grandfathering is allowed?

Range of cumulative emissions impacts in 2024-2035 with grandfathering provision

Million metric tons CO<sub>2</sub>-e

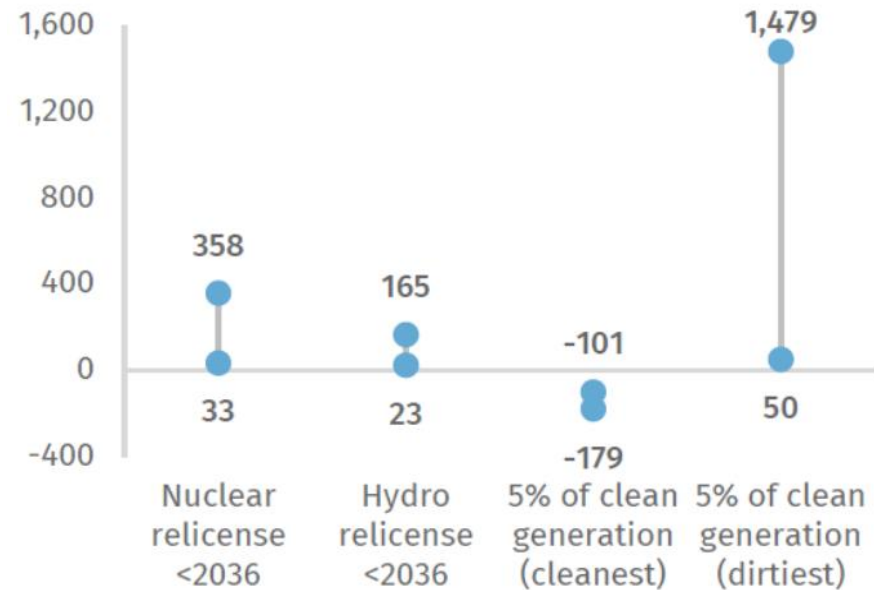


Source: Rhodium Group

## What if existing clean generation qualifies?

Range of cumulative emissions impacts in 2024-2035 under existing generation qualification options

Million metric tons CO<sub>2</sub>-e



Source: Rhodium Group

Takeaway: there are always tradeoffs

## Several factors will play a role in how the clean hydrogen industry evolves in the next ten years, which interplay with 45V:

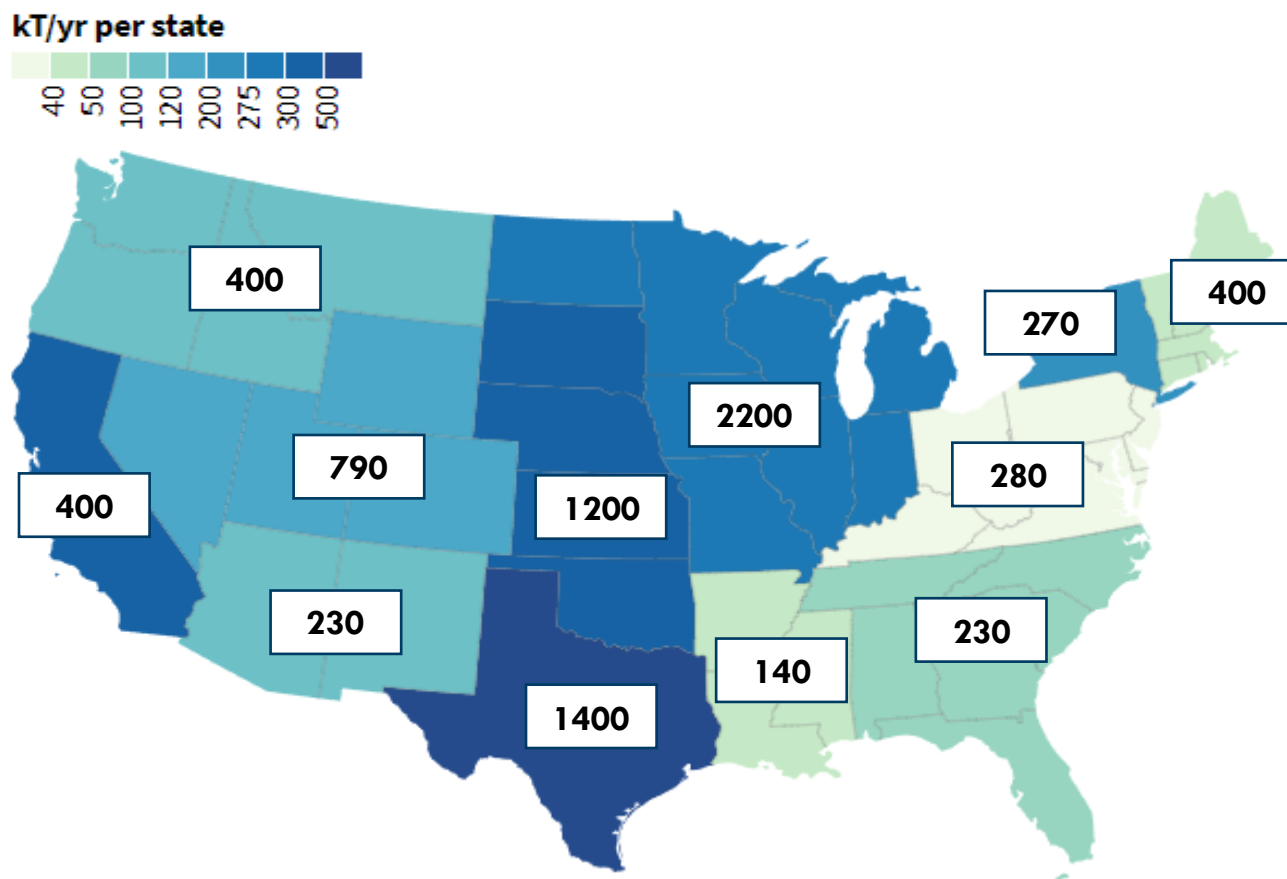
- Clean hydrogen technologies are still innovating – the hydrogen “rainbow” continues to grow and GREET will need to evolve to keep up with innovation
  - Emerging technologies: electrolyzers, pyrolysis, natural hydrogen
- Demand for clean H<sub>2</sub> is limited, long-term offtake is hard to come by
  - Other federal and state hydrogen incentives will influence new end uses for H<sub>2</sub>
- Contract terms and structures are complex, especially for first movers
- Enabling energy infrastructure will be a rate limiter for clean energy deployment, grid congestion and transmission constraints in particular
- Broader macroeconomic conditions

Proposed guidance creates **opportunities** to accelerate clean hydrogen market development by **clarifying compliant business models**, **expanding the pool of eligible projects**, and unlocking access to immediate and secure **off-take markets in Europe**.

# Allowing use of clean energy built within the past three years can bolster early project development and continued development will expand the pool of eligible electricity.

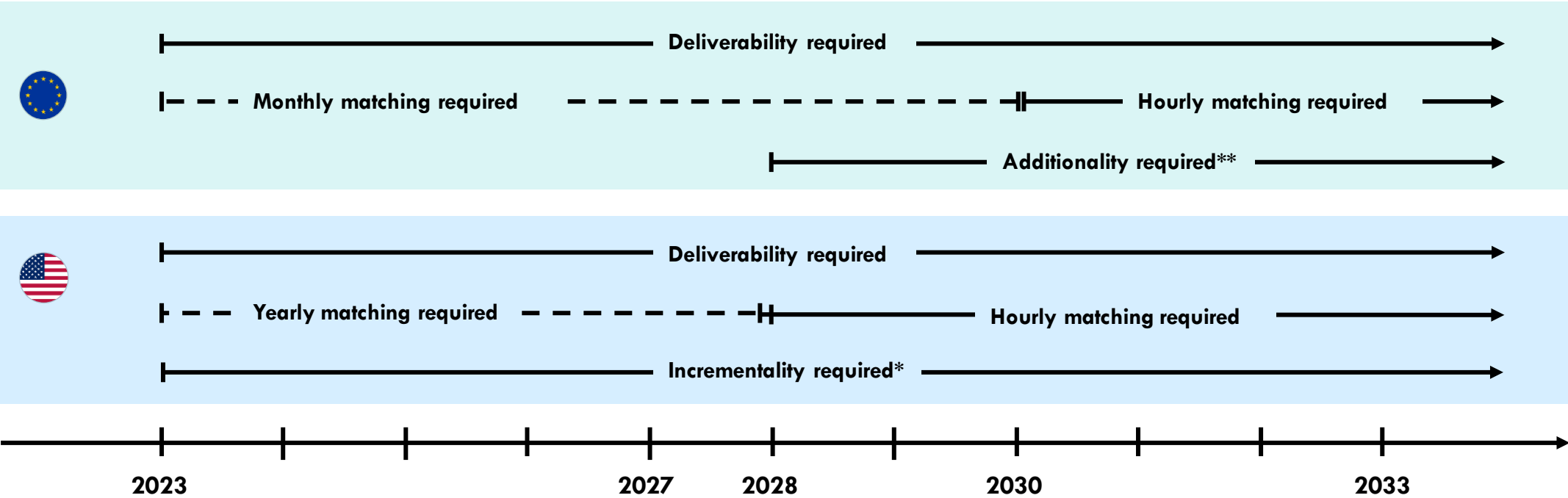
## Hydrogen supported by attributes distributed across regions (kT/yr) by 2030

Three pillar compliant production based on NREL REED IRA-mid case projections





# Harmonization with Europe's standards for renewable hydrogen ensures U.S. has access to the immediate and sizeable European off-take market.



\*Clean power assets installed within 3 years of hydrogen production  
\*\*EU does not allow subsidized upstream electricity generation

Proposed guidance may pose challenge for viable projects by heightening the need for electrolyzer **flexibility**, intensifying a need of **storage**, and elevating the need for hydrogen **pipelines**.

**Questions?**

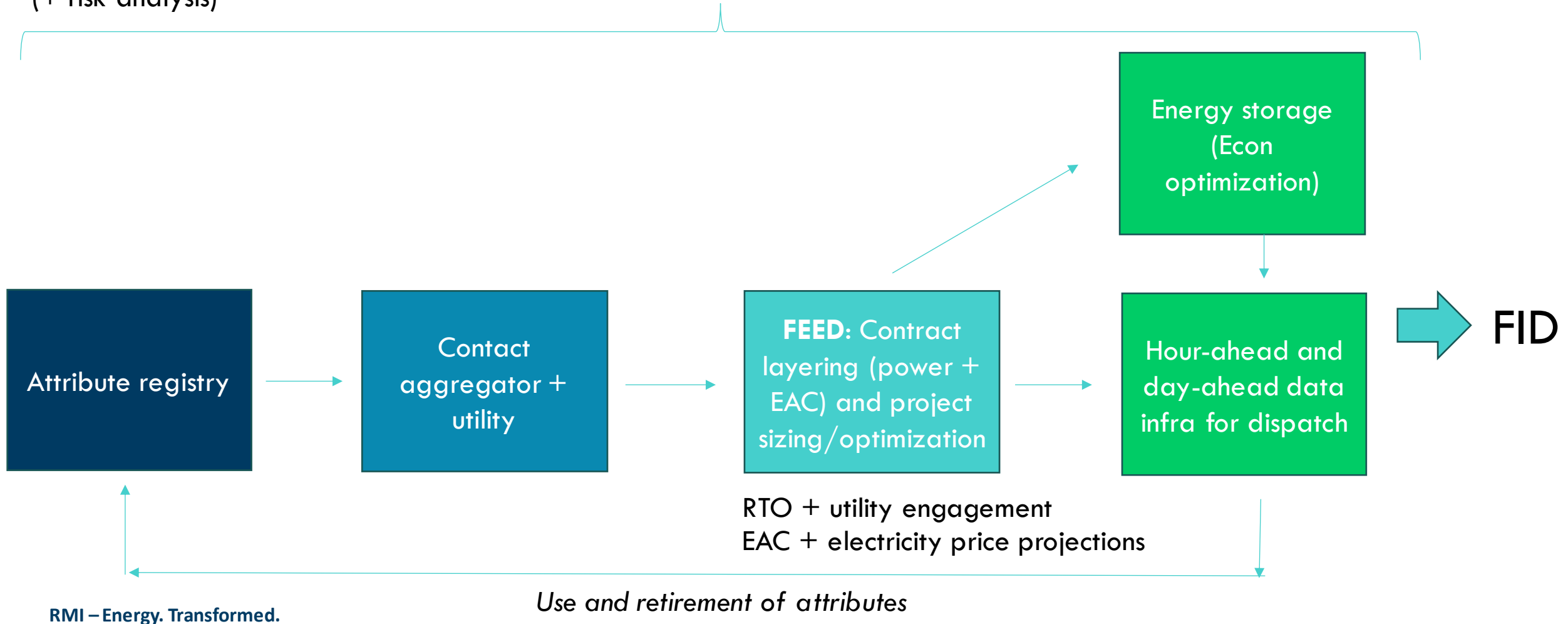
# What's Next?

**Thank you!**

# Appendix

# Hydrogen project data infrastructure

**Financial analysis for bankers includes:** Optimization of hydrogen storage, electrolyzer sizing, interconnect, and forecasts of both renewables and power prices, and create algorithms that drive ramping decisions to create contracts for offtakers (+ risk analysis)



# The Two Steps of the Three Pillars

**Qualifying facility** – rules that determine the pool of power plants that can create attributes for 45V

1. New clean power - defined as placed in service less than 36 months before the hydrogen facility is placed in service
2. Deliverability – same eGrids subregion

**Credit Measurement** – rules on how to use facility data to calculate credit

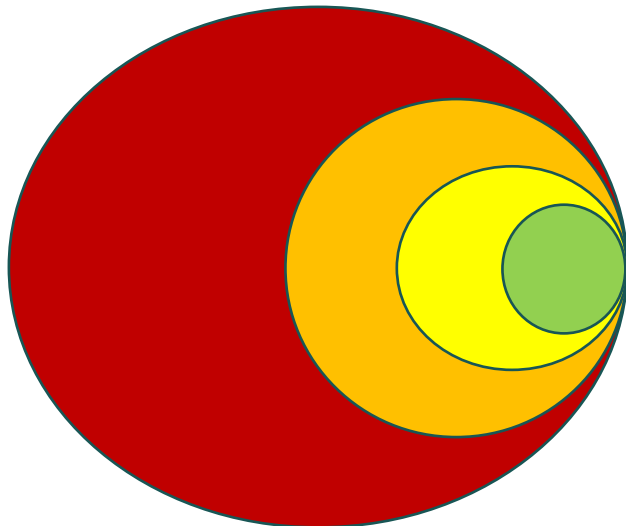
3. Hourly matching – e.g. 2028 phase-in, no-grandfathering

**Core question:** how many *zero carbon attributes* from qualifying facilities are available per region?



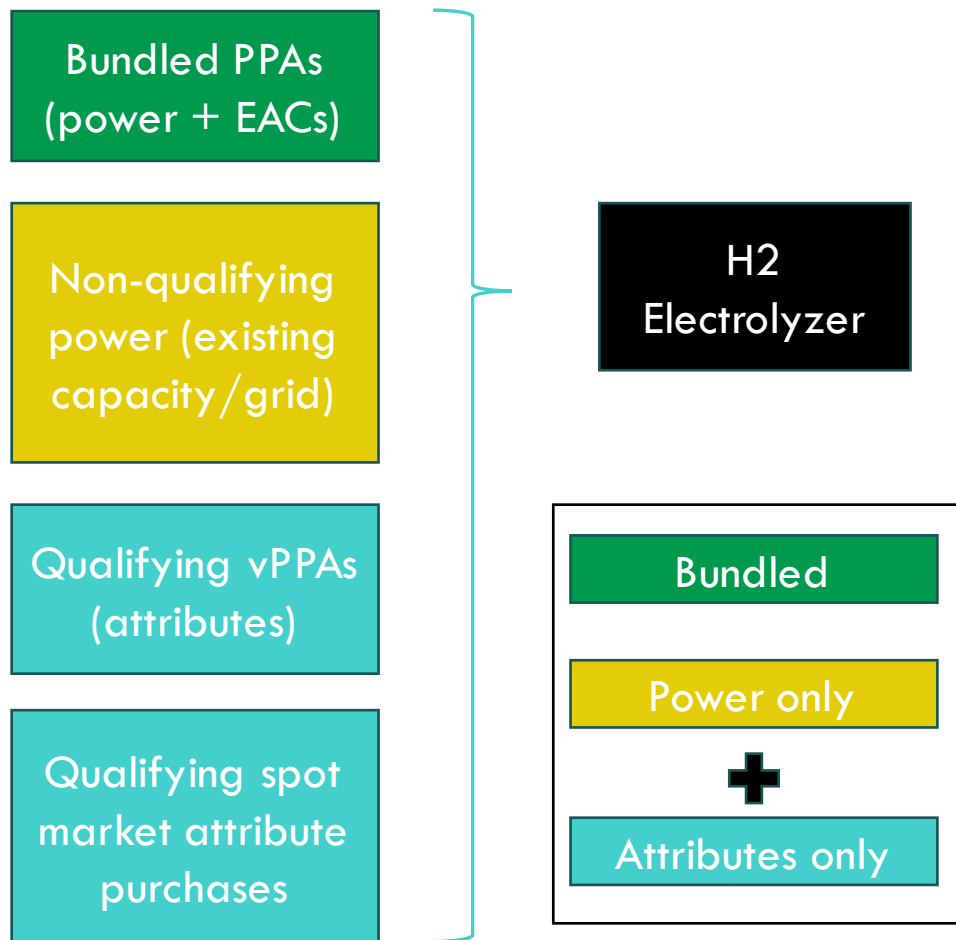
# Three Pillars as Emissions Guardrails

- **The pillars are a proxy for additionality and tightens the pool of available attributes**
- **Removing any one pillar expands the market so significantly that the accounting system is flush with free attributes and has minimal emissions impacts (supply is far greater than demand)**
- **The pillars also prevent certain credit gaming strategies**



**Three pillars:** spatial & temporal alignment, near term buildout

# The three paths of attributes



- To receive the 45V credit, producers would need to purchase both power and qualifying attributes (3P)
- This allows flexibility for hubs to contract directly with hydro/nuclear and purchase qualifying attributes separately