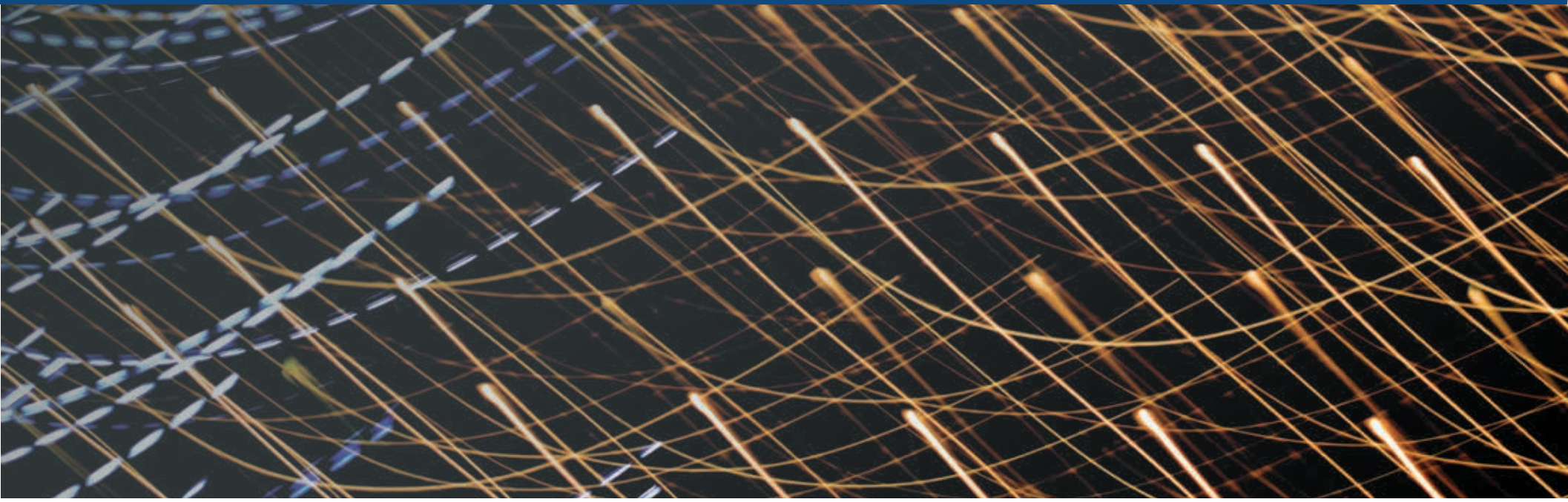
POLICY BRIEF

The Return on Investment of U.S. Clean Hydrogen Policy



JUNE 2025

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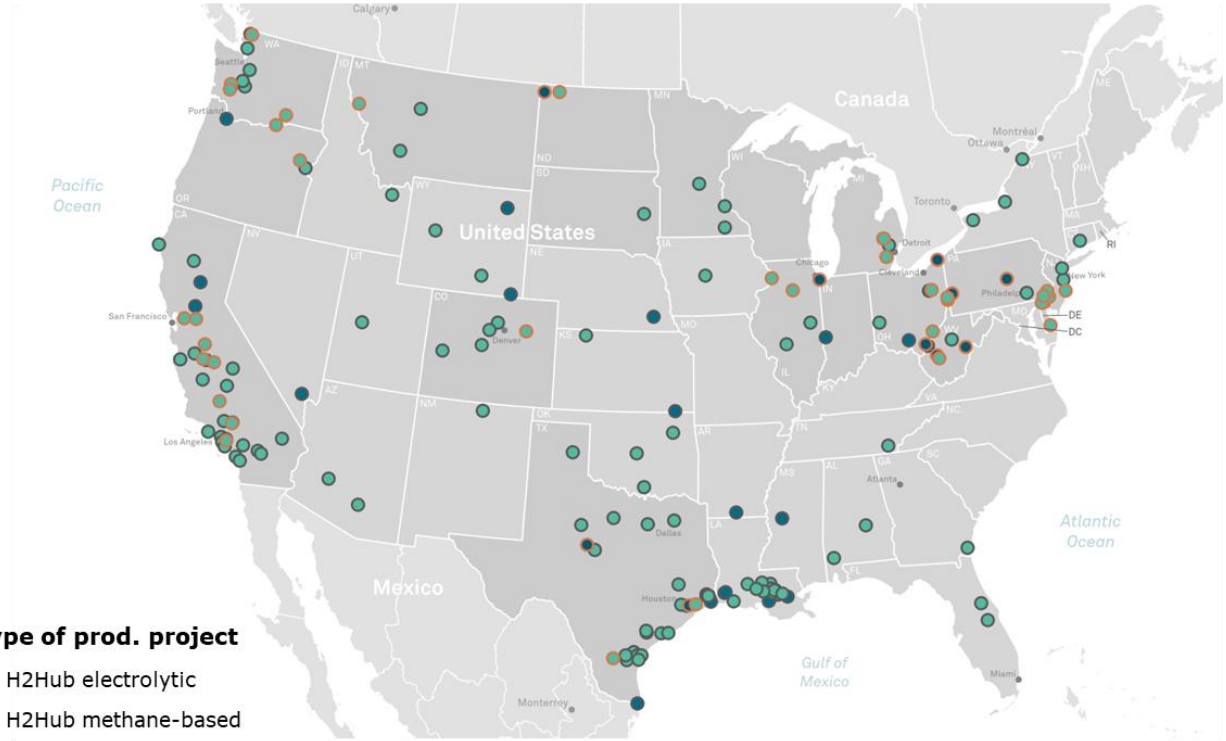
Context

- This analysis calculates the ROI of U.S. clean hydrogen policy by **comparing the costs of the H2 Hubs and 45V with the economic benefits these programs create** (i.e., new private investment, GDP growth, and jobs).
- Low-carbon hydrogen offers a new, homegrown, and energy-rich resource that can be used for power generation, transportation, and heavy industry. Tapping its potential supports economic growth, new jobs, and keeps the U.S. apace with China.
- When Congress passed the **Bipartisan Infrastructure Law (BIL)** with bipartisan support in 2021, they provided $8 billion in funding to invest in hydrogen hubs across the country. The regional H2 Hubs have been wildly successful in garnering the support of state and local governments and the private sector; EFI Foundation is tracking **at least 469 companies that have committed up to $50 billion for the projects**.
- When Congress passed the Inflation Reduction Act (**IRA)**, which created an incentive for producing low-carbon hydrogen, **it appeared the United States would become the world's hydrogen superpower. Over 130 new low-carbon hydrogen projects have been announced across the country since the IRA was passed.** Unlike other low-carbon technologies, hydrogen projects are often large infrastructure investments with new pipelines, production and storage facilities, and manufacturing.
- While Congress considers cutting funding to this emerging American industry, it is critical that they **consider the potential return on investment (ROI)** of these policies. In other words, what is the "bang for your buck" when it comes to clean hydrogen policies?

There are roughly 200 H2 projects in development across 35 states

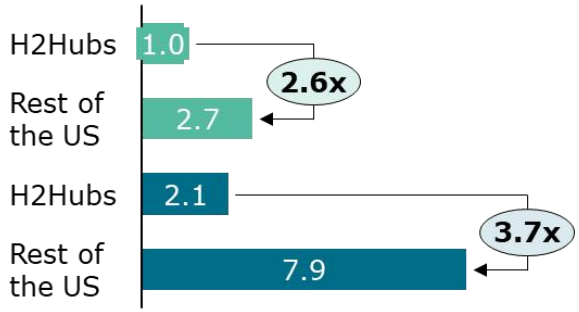
52 projects have already been canceled or are dormant, often due to policy uncertainty



1. Include projects across all development stages from early planning to operational, including announced, advanced planning, and under construction.
Source: S&P Global Commodity Insights

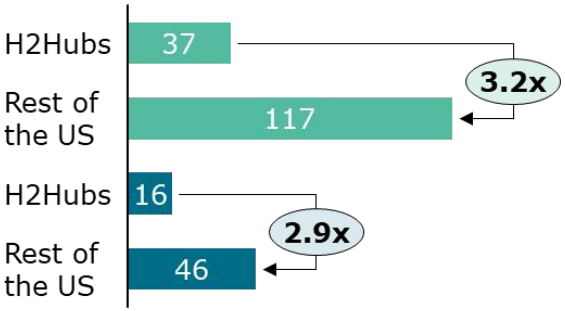
Production capacity of low-carbon hydrogen projects

MMtpa



Number of low-carbon hydrogen projects

# of projects



Electrolytic Methane-based

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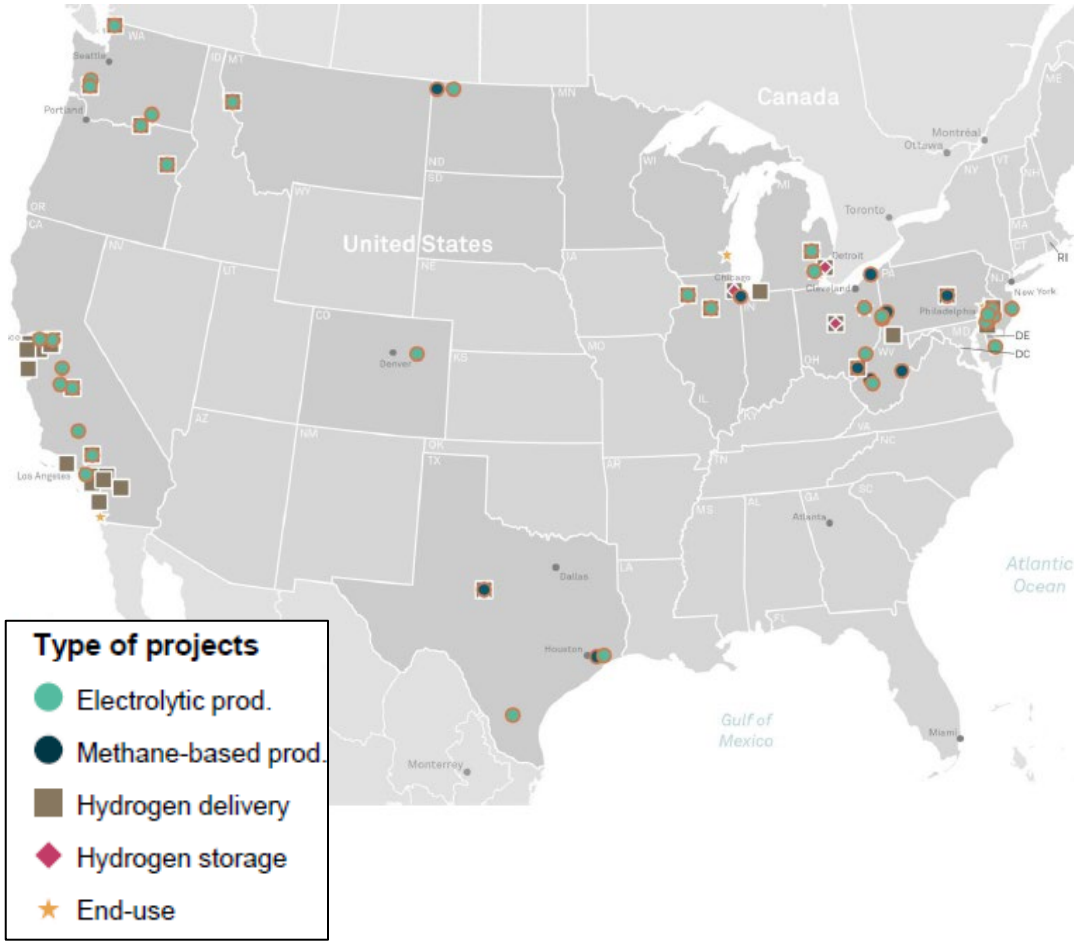
7 H2 Hubs are a major driver of infrastructure deployment

- The H2 Hubs represent over **50 low-carbon hydrogen supply projects** and over **3 million metric tons (MMt)** of production capacity across **18 states.**

- The BIL funding includes $8 billion with up to 50% public cost share per project.

- Total cost to build these hubs is estimated at over $**50 billion in CAPEX and $6 billion in annual OPEX** once they are operating at full capacity
  - 9 of the projects include midstream investments in a combination of hydrogen pipelines and delivery trucks
  - End-use projects target multiple sectors, including transportation, power generation, fertilizers, microgrids, and hydrogen blending.

H2 Hubs provide market enablers



Source: S&P Global Commodity Insights; EFI Foundation

Our approach to calculating ROI

EFI Foundation (EFIF) partnered with S&P Global to develop an H2Hub specific database, estimate capex and opex by project, and calculate the ROI of associated U.S. clean hydrogen policy[1]

Economic Benefits	Costs
Direct, indirect, and induced economic benefits of hydrogen policy across five metrics: • Employment/Jobs • Contribution to GDP, incl. business revenues for products sold or services • Sales Activity • Wages • Government Revenues (modelled as cost offset)	*Federal costs of maintaining the current rules for key low-carbon hydrogen incentives (based on EFIF's projected utilization):* • Hydrogen tax credits (45V and 45Q) • Clean power tax credits (for electrolytic power supply) • H2 Hubs program (government's cost share)

1. S&P Global report provided as appendix to this Policy Brief. Additional details on results and methodology provided separately in report appendix

This analysis shows, from 2026 to 2035, federal low-carbon hydrogen incentives will spur…

$76.2 B

Total direct capex and opex across the hydrogen value chain

80 K

Average annual direct, indirect and induced US jobs supported

$140.9 B

Impact on US GDP (value added)

$63.9 B

Total wages (labor income)

$205.3 B

Total revenues for US businesses

$6.8 B

Total federal and state production and income tax revenues

Note: a full set of economic impact results is included in Appendix A of S&P Global report
Source: S&P Global Market Intelligence; S&P Global Commodity Insights

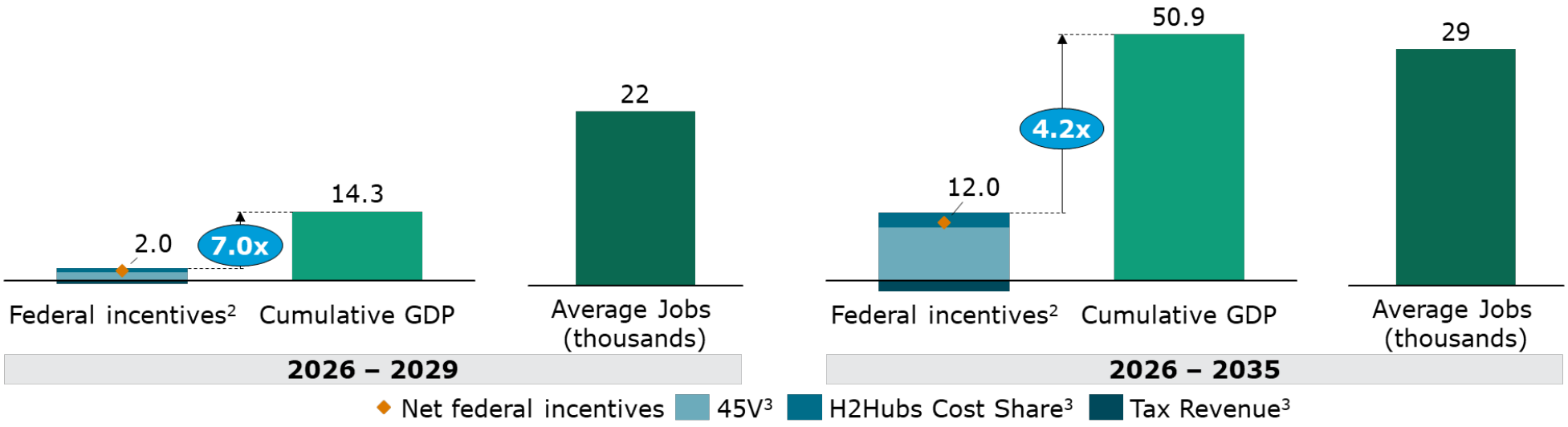
Incentives for 45V and H2 Hubs stimulate strong private investment and jobs growth

Return on Investment of 45V + cost share of H2Hub projects[1]

Billions of real 2025 dollars; direct, indirect, and induced jobs

In next four years, every $1 of incentive generates $7.0 in GDP

From 2026-2035, every $1 of incentive generates $4.2 in GDP



1. Analysis considers electrolytic projects associated with H2Hubs
2. From 2026-2029, 1.9B for 45V, 0.8B for H2Hubs cost share and 0.6B in tax revenues. From 2026-2035, 11.0B for 45V, 3.1B for H2Hubs cost share and 2.1B in tax revenue
3. 45V assumed for all electrolytic projects at $3/kg level; 45Q assumed for methane-based projects; H2Hub cost share is allocated based on technologies percent contribution to overall capex spend; tax revenue corresponds to incremental tax federal revenues from personal and corporate income taxes

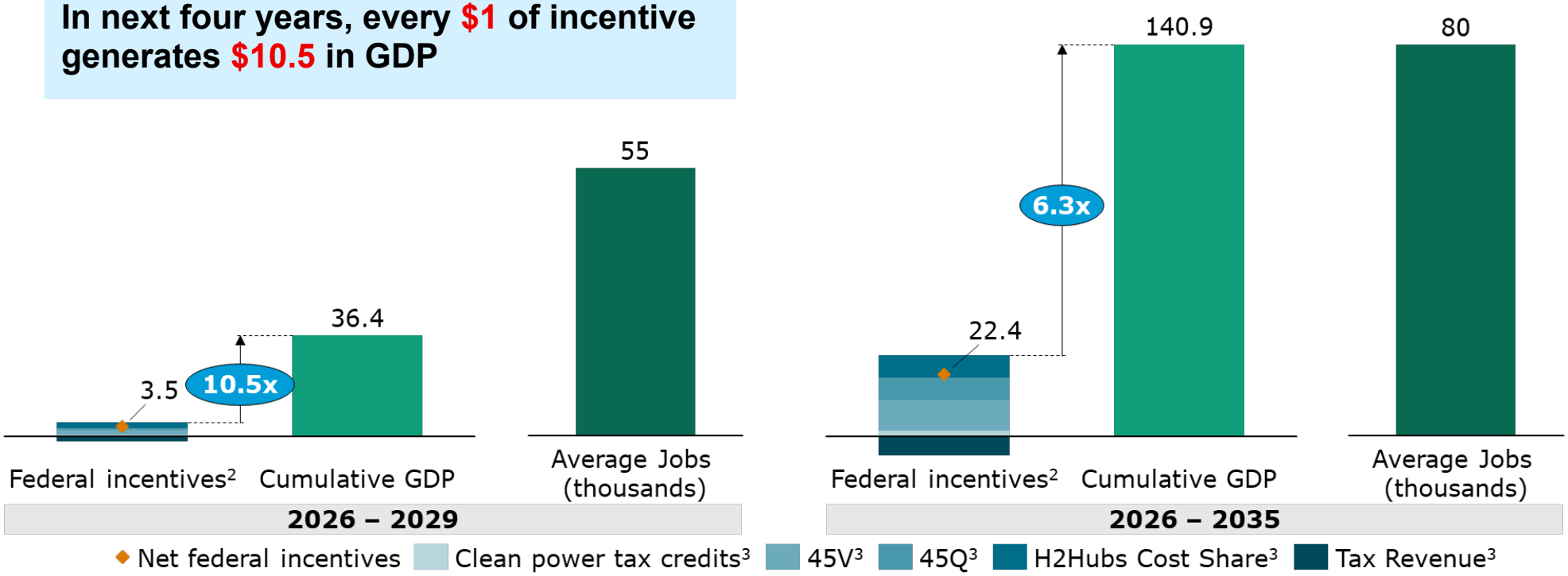
Source: S&P Global Market Intelligence; S&P Global Commodity Insights

The ROI is significantly expanded by considering all federal incentives and H2Hubs projects

Return on Investment of 45V + H2Hubs + 45Q + Clean Power Tax Credits[1]

Billions of real 2025 dollars; direct, indirect, and induced jobs

In next four years, every $1 of incentive generates $10.5 in GDP



1. Analysis considers production, delivery, storage and end use investments related to the planned H2Hubs
2. From 2026-2029, 0.6B for clean power tax credits, 1.9B for 45V, 0.5B for 45Q, 2.2B for H2Hubs cost share and 1.7B in tax revenues. From 2026-2035, 2.2B for clean power tax credits, 11.0B for 45V, 8.0B for 45Q, 8.0B for H2Hubs cost share and 6.8B in tax revenue
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Source: S&P Global Market Intelligence; S&P Global Commodity Insights

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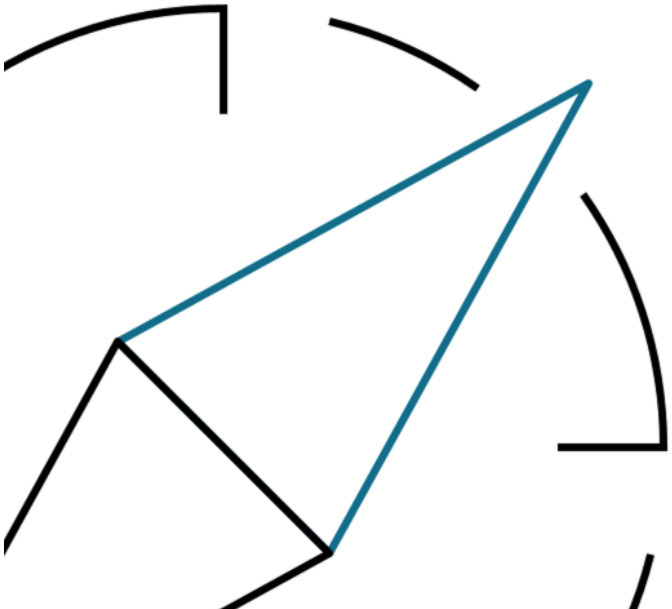
US Hydrogen Hubs Macroeconomic Impact Assessment

Final Report

May 29, 2025



S&P Global

Appendix

Introduction

Background and methodology

Background

- The Bipartisan Infrastructure Law (BIL) passed in November 2021 allocated $8 billion to regional clean hydrogen hubs (H2Hubs) in the United States
  - In June 2022, the US DOE (Department of Energy) released a notice of intent (NOI) to fund the H2Hubs
  - By April 2023, hydrogen hub applications were submitted
  - On October 13, 2023, the US DOE announced the seven winning hubs[1]
- In total, $7 billion of federal cost-share funding was allocated to these seven hubs with the remaining funding set aside to support the development of hydrogen demand in these hubs through the Hydrogen Demand Initiative (H2DI)
- Now, as the Trump administration and Republicans evaluate spending both for Inflation Reduction Act energy tax credits and Bipartisan Infrastructure Law (BIL) programs, an important consideration is what the return of these federal investments are
- To help quantify the return of investment (ROI) of the H2Hubs project, EFI Foundation has engaged S&P Global[2] to estimate the macroeconomic benefits (e.g., jobs, GDP growth, etc) the development of hubs would bring to both hub states and the rest of the US and compare this to the federal funding (both through H2Hubs federal cost share and expected tax credits that would be accrued by hub projects)

Methodology

Compile H2Hub project database:

- Leveraged public sources and internal S&P hydrogen project database
- Liaised with leadership for each H2Hub to refine on project database, including projects to be included, project sizes and timeline to improve accuracy

Estimate project-level capex and opex spend by NAICS industry sector through 2035:

- Utilized internal S&P cost models to estimate capex and opex across major project types:
  - Electrolytic supply projects (including power supply investments)
  - Methane-based supply projects (including CO2 pipelines and storage)
- Hydrogen midstream, storage and end use infrastructure (i.e., hydrogen refueling stations)
- Major end use investments include ammonia and methanol plants and FCVs (fuel cell vehicles)

S&P Global's US Economic Impact Analysis Modeling framework (US EIA Model) was used to quantify the contributions of H2Hubs projects to jobs, GDP, sales activity, wages and taxes.

Annual NAICS-level capex and opex was used as inputs to two linked regional models. One model aggregated contributions in the Hydrogen Hub states; the other captured contributions stimulated in Non-Hub states.

1. The seven winning H2hubs announced are ARCHES, HyVelocity, MachH2, MACH2, PNWH2, HH2H, and ARCH2
2. Both S&P Global Commodity Insights Consulting (CI Consulting) and S&P Global Market Intelligence contributed to the following report

Appendix

Introduction

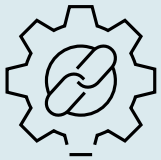
Key findings

Overview of H2Hubs

- The development of the H2Hubs projects would include over **50 low-carbon hydrogen supply projects** and over **3 million metric tons (MMt)** of hydrogen production capacity across **18** states
- **9** of the projects would also include key midstream investments in a combination of hydrogen pipelines (including re-purposing of existing pipelines) and delivery trucks
- **End-use projects target multiple sectors** including transportation, power generation, fertilizers, microgrids, and hydrogen blending. For **transportation projects**, investments are being planned to bring dozens of Hydrogen Refueling stations online and thousands of fuel cell buses and heavy-duty trucks on the road

Project cost estimations and resulting macroeconomic contribution

- The total cost to build out these hydrogen hubs is estimated at over **$50B of capex** with over **$6B in annual opex** once the hubs are operating at full capacity
  - Electrolytic projects (including renewable investments to supply clean power) account for over half of the capital investments and roughly 30% of the opex. Methane-based supply projects on the other hand account for roughly 30% of the capex and ~half of the opex
  - Midstream and downstream investments account for the estimated remaining hub spend
- These investments are estimated to result in a **$140B cumulative contribution to GDP** from 2026-2035



Return of federal investment

- The development of the H2Hubs is supported by several federal subsidies totaling an estimated $~29B from 2026-2035. These costs are partially offset by federal income and corporate taxes generated by th hub's projects and jobs ($~6.8B) for a net federal spend of $~22B
- **Thus, each $1.00 of net federal spend[2] results in ~$6.30 of GDP** from 2026-2035. From 2026-2029, each $1.00 of net federal spend results in ~$10.50 of GDP
- Additionally, these hubs would support an **average of 80,000 jobs** from 2026-2035

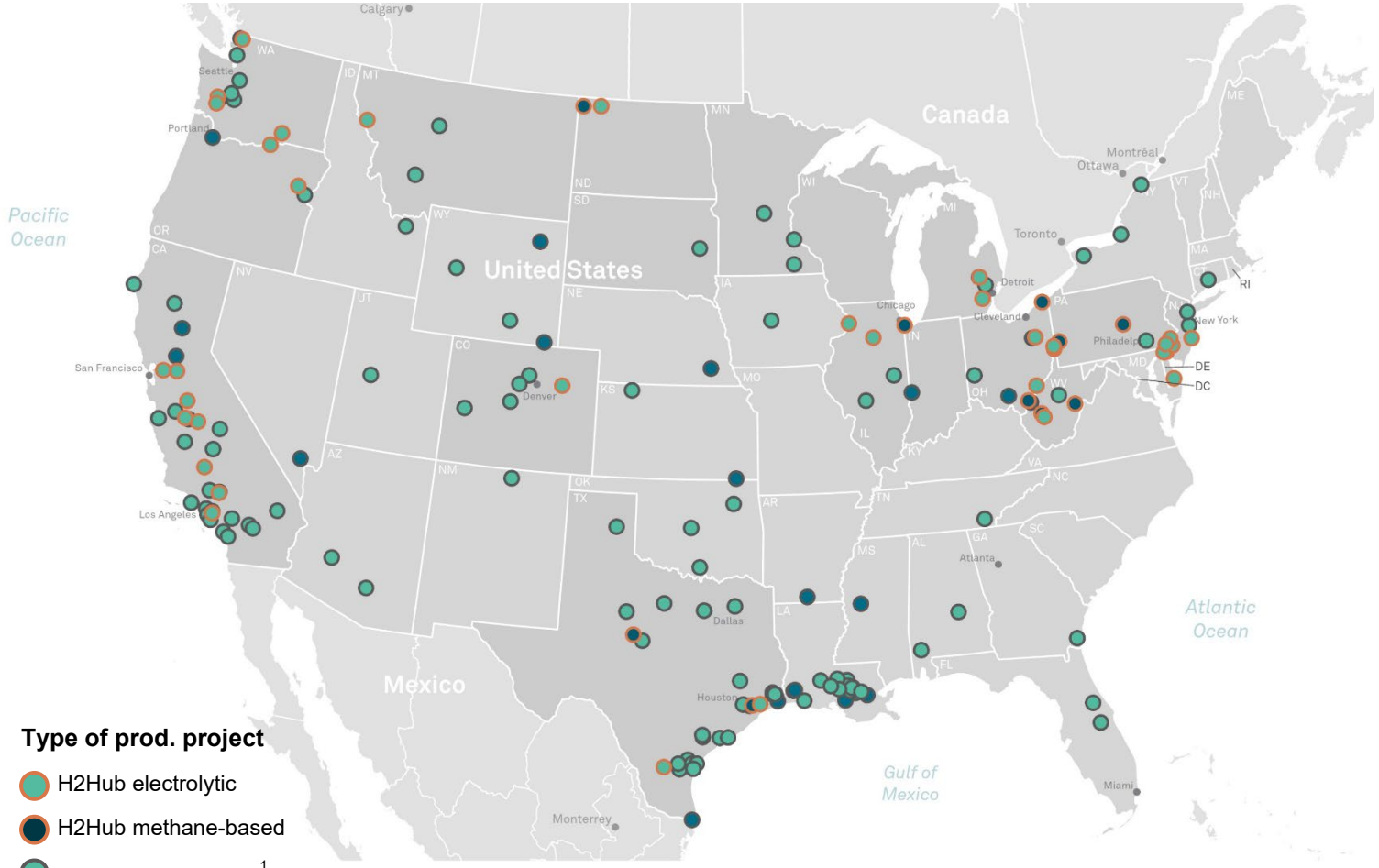
1. In addition to the H2Hub program ($8B), from 2026-2035, electrolytic projects are also supported by clean power tax credits (~$2B) and 45V tax credits (~11B), while methane-based projects are assumed to utilize the 45Q tax credit (~$8B)
2. Net federal spend refers to sum of H2Hub funding and applicable federal tax credits paid during the relevant period, less incremental tax revenues from income and corporate taxes

Source: S&P Global Commodity Insights

Appendix

S&P Global's H2Hubs Analysis

While the current analysis focuses on H2Hub related projects only, the overall US low-carbon hydrogen economy could be multiple times larger

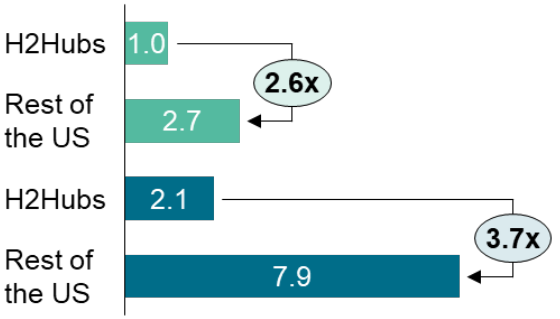


Type of prod. project

- H2Hub electrolytic
- H2Hub methane-based
- Other US electrolytic[1]
- Other US methane-based[1]

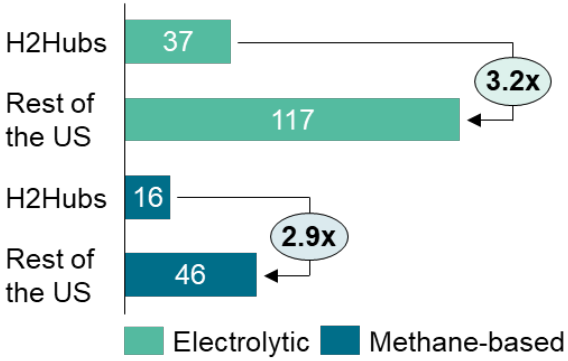
Production capacity of low-carbon hydrogen projects

MMtpa



Number of low-carbon hydrogen projects

# of projects



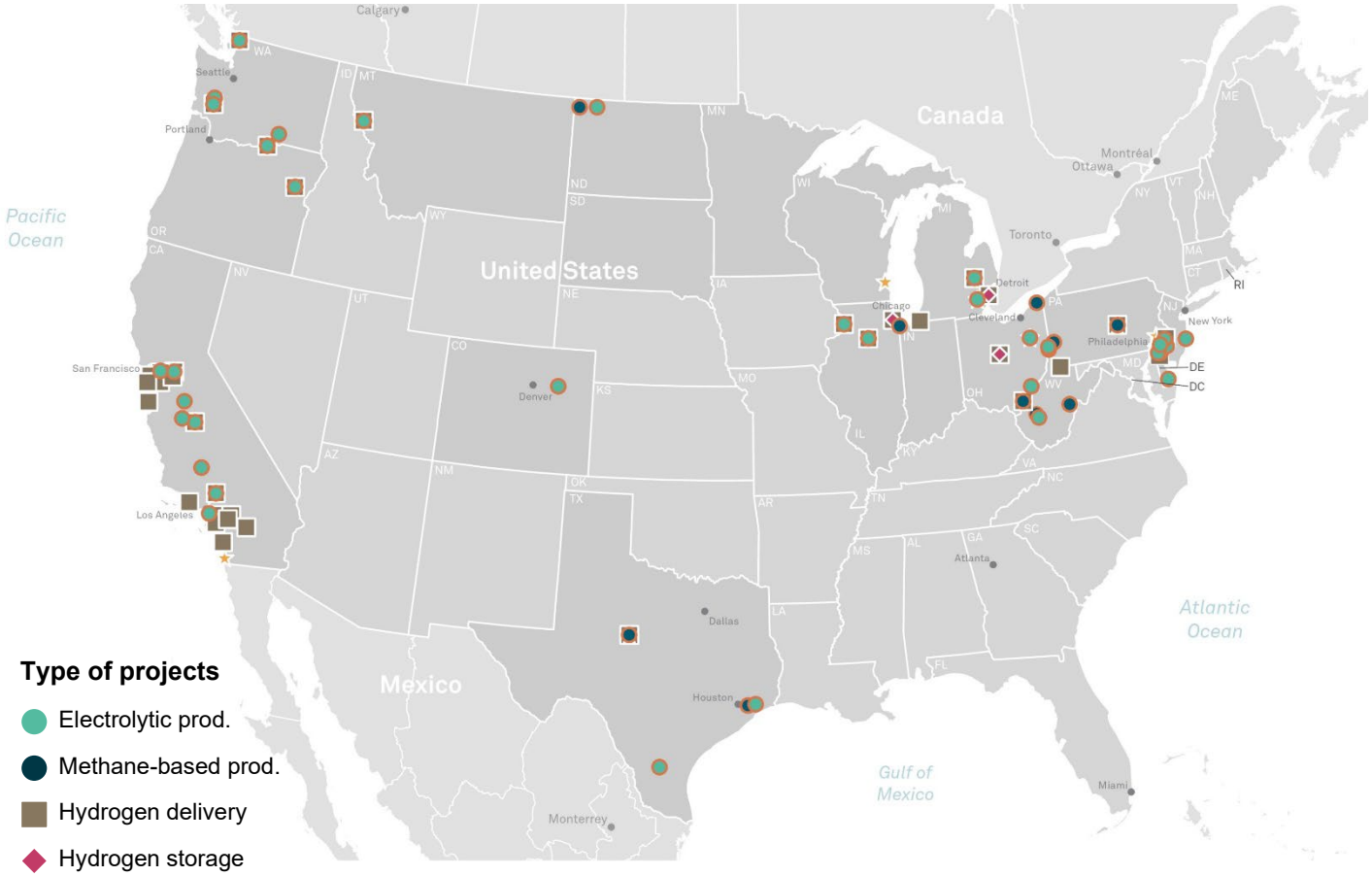
1. Include projects across all development stages from early planning to operational, including announced, advanced planning, and under construction.

Source: S&P Global Commodity Insights

Appendix

S&P Global's H2Hubs Analysis

The H2Hubs development reflects regional specialization and technology choices, with transportation demand and strategic infrastructure shaping project scale and focus



Source: S&P Global Commodity Insights

- Out of a total of 53 production projects, around 13 supply projects have been identified, with potential volumes exceeding 50,000 tpa
- More than 6.5 GW of electrolyzer capacity is estimated to be needed in order to support electrolytic hydrogen production
- Over 19 MMtpa of carbon capture and storage capacity is anticipated to be developed in connection with methane-based projects
- Almost 30 hydrogen refueling stations are planned for development in alignment with the procurement of nearly 6,900 fuel cell buses and heavy-duty trucks

Appendix

S&P Global's US Economic Impact Analysis Modeling

From 2026 to 2035, $76 billion in hydrogen-related capex and opex will stimulate $141 billion to US GDP while supporting an annual average of 80,000 jobs

$76.2 B

Total direct capex and opex across the hydrogen value chain

80 K

Average annual direct, indirect and induced US jobs supported

$140.9 B

Impact on US GDP (value added)

$63.9 B

Total wages (labor income)

$205.3 B

Total revenues for US businesses

$6.8 B

Total federal and state production and income tax revenues

Note: a full set of economic impact results is included in Appendix A

Source: S&P Global Market Intelligence

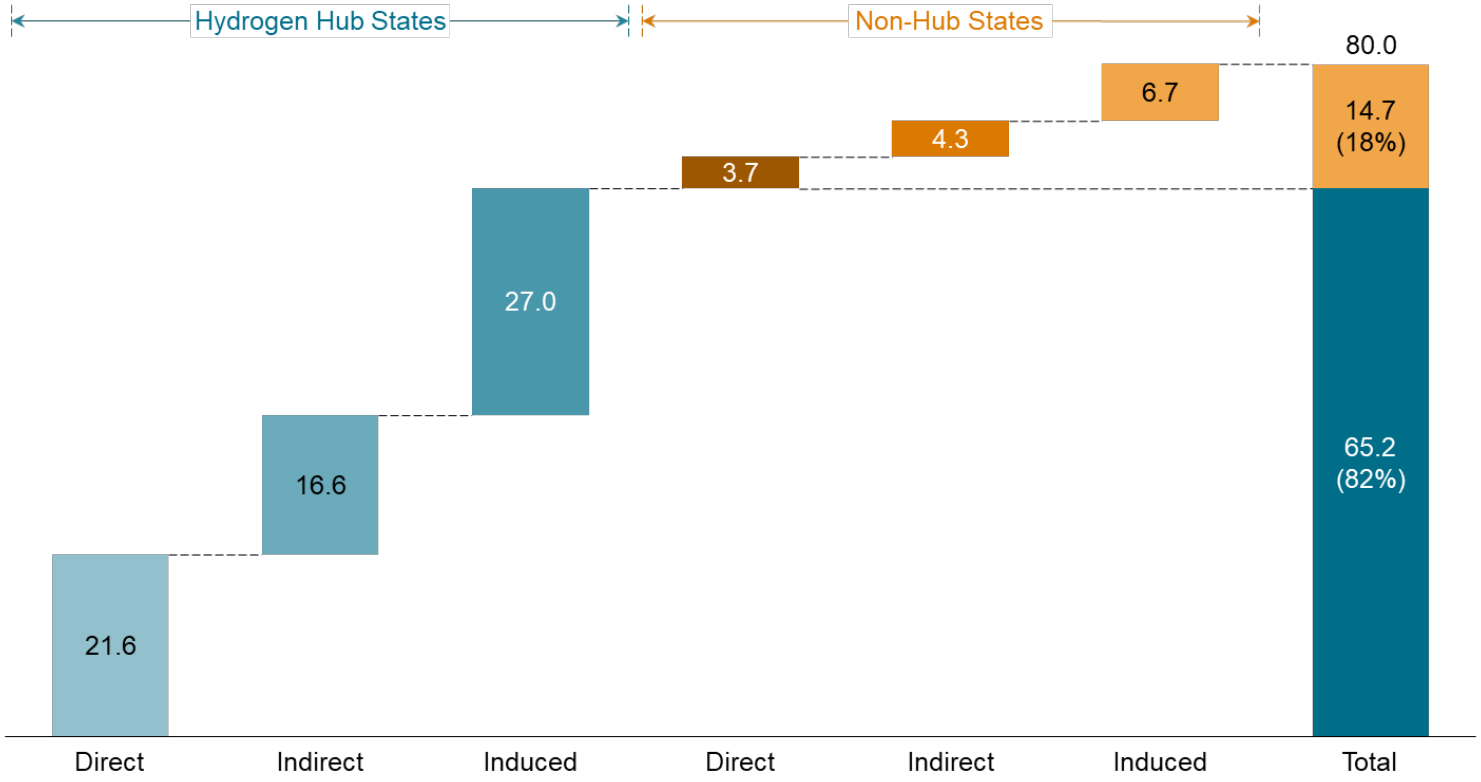
Appendix

S&P Global's US Economic Impact Analysis Modeling

For every direct job in Hydrogen Hub states, another three jobs will be supported across the United States

Average annual direct, indirect and induced contributions to US employment, 2026 — 2035

Thousands of jobs



Source: S&P Global Market Intelligence

- The hydrogen-related capex and opex spending will support and annual average of 80.0 thousand jobs across the US
- About 21.6 thousand (27%) will be jobs directly supported by the opex and capex spending in Hydrogen Hub states
- The remaining 73% of the jobs will be due to follow-on supply chain and induced activity — a 3X multiplier
- Induced jobs are due to workers re-spending wages on household and consumer purchases. The particularly robust induced effects in Hydrogen Hub states is indicative of high wages paid to the direct workers.
- Almost 1 in 5 (18%) of the jobs will occur in Non-Hub states

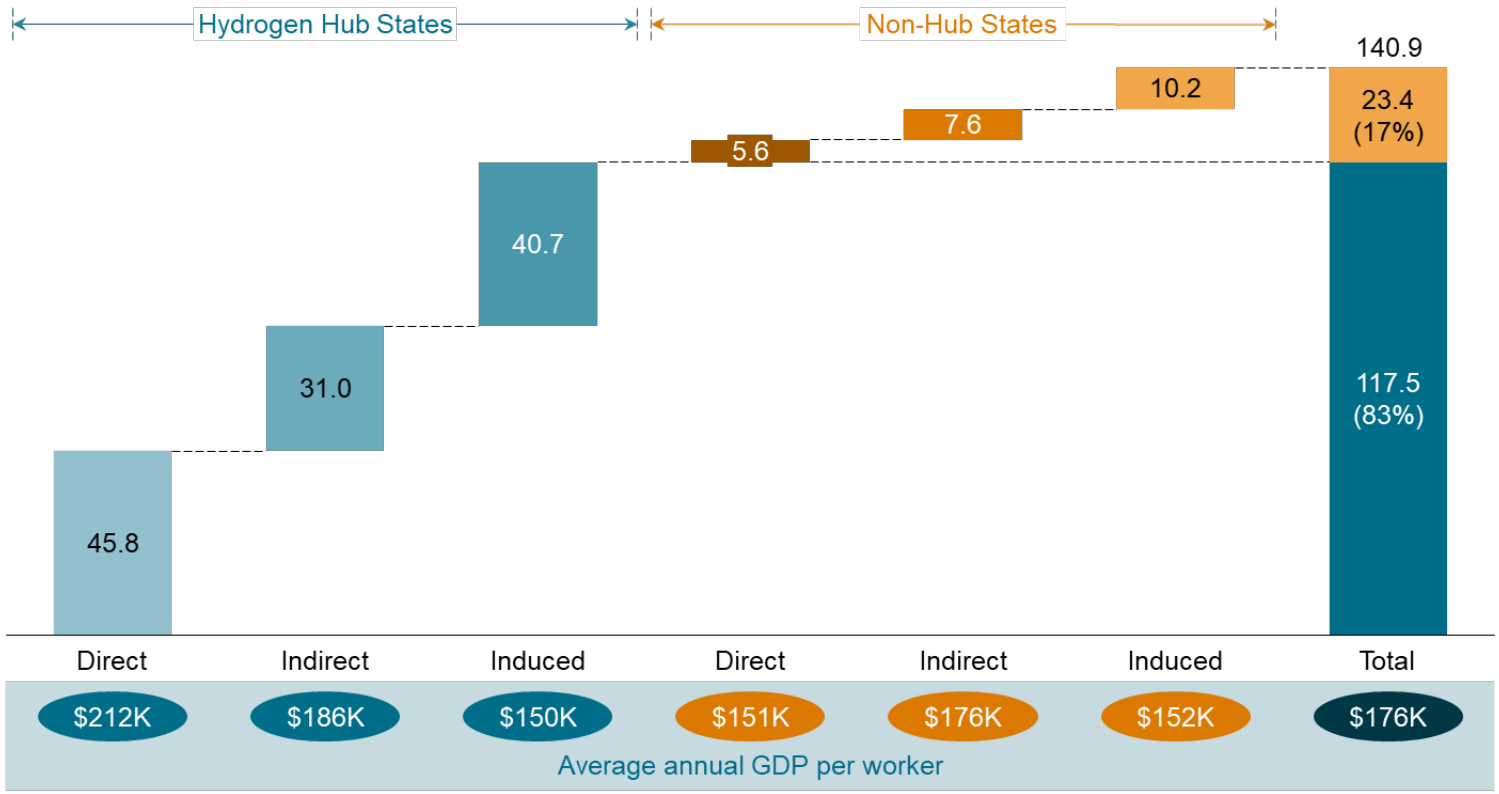
Appendix

S&P Global's US Economic Impact Analysis Modeling

Every million dollars of direct capex and opex will generate $1.8 million in US GDP

Cumulative direct, indirect and induced contributions to US GDP, 2026 — 2035

Billions of real 2025 dollars



- The economic activity stimulated by hydrogen-related capex and opex will ultimately generate $140.9 billion in US GDP
- GDP is an indicator of how much value is added to the US economy relative to inputs. The $76.2 billion in cumulative direct hydrogen-related capex and opex will ultimately generate $140.9 billion in US GDP
- **1.8X multiplier: This means every billion dollars of direct capex and opex will drive $1.8 billion in US GDP**
- The significantly stronger average annual GDP per direct worker in the Hydrogen Hub states — $212K vs. an overall average of $176K — is another indicator of the high quality of the direct jobs.

Source: S&P Global Market Intelligence

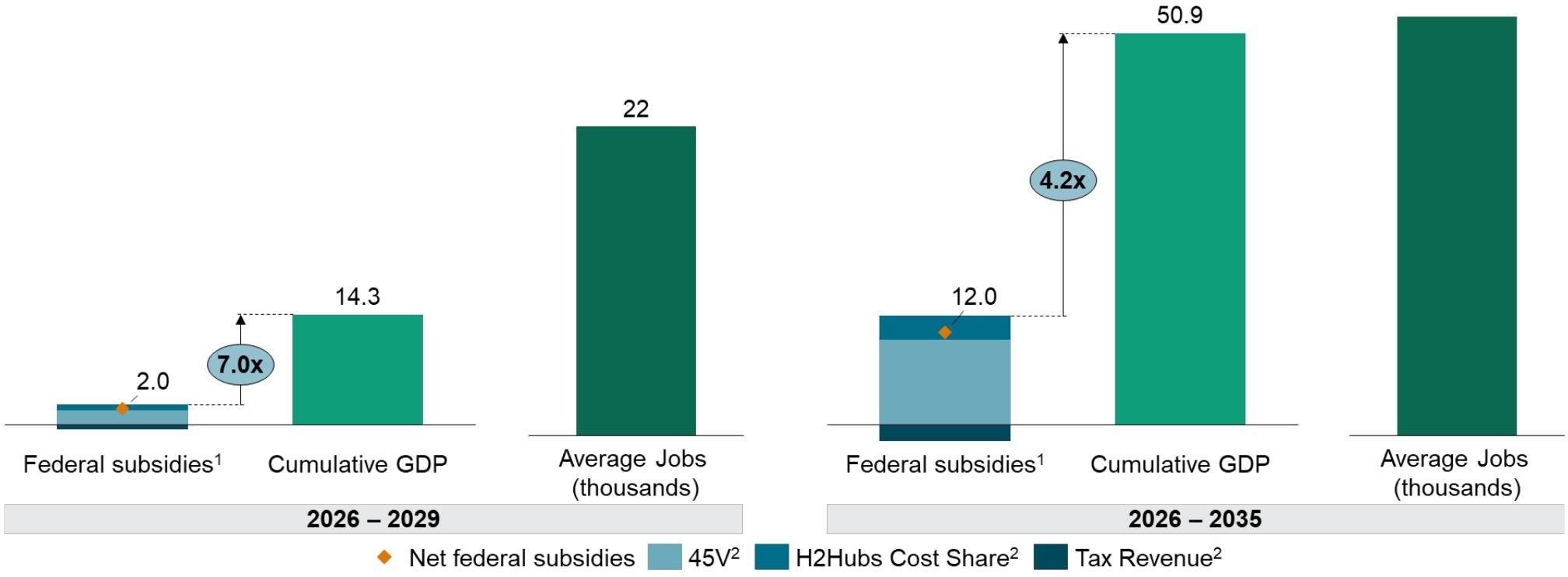
Appendix

S&P Global's US Economic Impact Analysis Modeling

Every (net) dollar of federal spending on electrolytic projects is expected to generate $7.0 in GDP through 2029 and $4.2 cumulatively by 2035

Return on federal subsidies – H2Hub electrolytic projects

Billions of real 2025 dollars; number of jobs



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Source: S&P Global Market Intelligence; S&P Global Commodity Insights

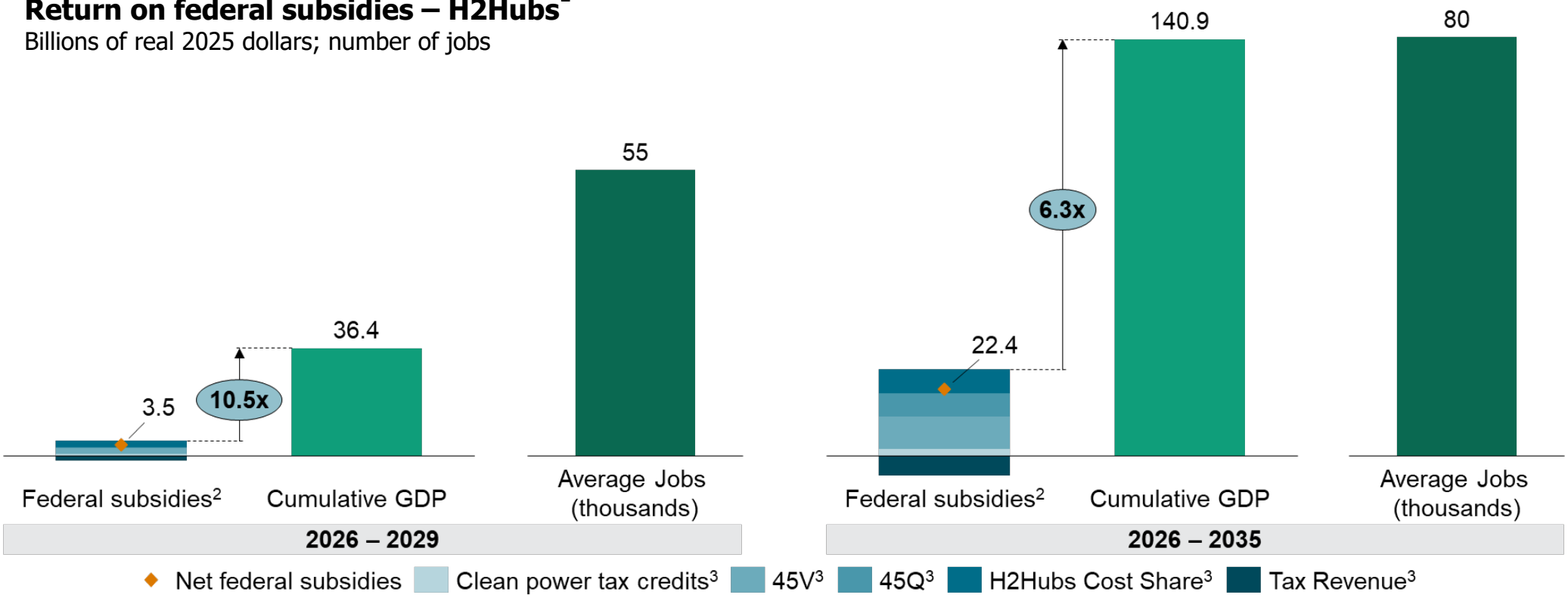
Appendix

S&P Global's US Economic Impact Analysis Modeling

Every (net) dollar of federal spending is expected to generate $10.5 in GDP through 2029 and $6.3 cumulatively by 2035

Return on federal subsidies – H2Hubs[1]

Billions of real 2025 dollars; number of jobs



1. Includes production, delivery, storage and end use investments related to the planned H2Hubs
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Source: S&P Global Market Intelligence; S&P Global Commodity Insights

Appendix

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Appendix

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