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# It's Elemental: Hydrogen Tax Incentives to Fuel the Energy Transition — Part I

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Roughly 10 million metric tons of hydrogen are produced every year in the United States, enough to power 20 to 30 million cars or 5 to 8 million homes.[1] Yet this hydrogen production is used primarily not to power cars or homes but to refine petroleum, produce fertilizer, and treat metals.[2] Transitioning to a ''hydrogen economy'' – the vision of an economy that relies on hydrogen as the low-carbon energy source for fuel, vehicle power, and energy storage – is going to take significant investment in hydrogen technology, facilities, equipment and infrastructure.

Around the globe, measures to address climate change focus on the reduction of carbon emissions. Hydrogen produced through low-carbon means offers a solution that is expected to drive significant growth in hydrogen projects in the coming decades. The EU and its member countries, Australia, Canada, and Japan have all developed national strategies to stimulate investment in low-carbon hydrogen production.[3]

The development of policies supporting hydrogen investment, including tax incentives, is similarly moving to center stage in the United States. The Biden Administration's recent proposal to increase infrastructure investment contained multiple references to hydrogen development. It has become clear that the retention and expansion of tax incentives for hydrogen will be an essential part of U.S. climate change measures.

This article is presented in two parts. This Part I will first provide some background information regarding hydrogen production and projects to set the stage for a discussion of hydrogen tax incentives. It will then describe existing federal tax incentives supporting hydrogen development in the United States. Part II, which will be published in coming weeks, will provide a description of certain proposed federal tax legislation intended to affect hydrogen investment. It will offer some commentary on the role of tax incentives in transitioning to the hydrogen economy, including a comparison to the role such incentives have played in stimulating investment in renewable energy sources such as wind and solar. Part II will also describe existing state tax incentives supporting hydrogen development.

## HYDROGEN PRODUCTION AND PRODUCTS

Hydrogen is not found in pure form on Earth, so it must be produced; primarily it is currently produced from natural gas, but it can also be produced from biomass, alcohols or water. Regardless of the source, the conversion of such compounds into hydrogen takes energy. The carbon footprint of hydrogen therefore depends on the nature of the energy used to produce it, and hydrogen is generally categorized by type of production – its ''color,'' as described below.

It is also important to recognize that hydrogen is not an energy source itself, such as wind. Instead, hydrogen functions as an energy carrier or energy storage medium. In fact, the ability of hydrogen to store renewable energy from intermittent sources, such as wind and solar sources, is viewed as a key element of the role it can play in decarbonization efforts (as illustrated, for example, by the Mitsubishi and Magnum

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The authors gratefully acknowledge the assistance and insightful commentary provided by Thomas Holmberg, Co-Chair of the Hydrogen Practice Group at Baker Botts LLP, on drafts of this article.

[1] Department of Energy, Office of Energy Efficiency and Renewable Energy, https://www.energy.gov/eere/fuelcells/h2scale.

[2] Energy Information Agency,https://www.eia.gov/energyexplained/hydrogen/use-of-hydrogen.php.

[3] See Appendix for a summary of some of these strategies.

Developments Advanced Clean Energy Storage project, described below).[4]

Hydrogen fuel cells combine hydrogen and oxygen in an electrochemical reaction to generate electricity. Thus, fuel cells are used to convert hydrogen into electricity, which then can power homes or power a vehicle. That is why policies and incentives for hydrogen investment are spoken of almost synonymously with policies and incentives for fuel cells and the tax incentives that we describe below include tax provisions related to fuel cells specifically.

## The Colors of Hydrogen

All discussions of hydrogen projects inevitably reference the ''color'' of the hydrogen, as a shorthand for describing the method of production of the hydrogen.

We present here a quick guide:

> **Green Hydrogen:** produced from the electrolysis of water using electricity from renewable sources, such as wind, solar or hydropower. The system that produces hydrogen is referred to as an ''electrolyzer.''
>
> **Blue Hydrogen:** produced from natural gas with the carbon oxide by-product of such production, rather than being emitted, being captured and sequestered.
>
> **Grey Hydrogen:** produced in the same manner as blue hydrogen but the carbon oxide by-product is emitted.[5]

While ''green'' hydrogen is the lowest-carbon technology currently being widely considered, the path toward developing a hydrogen economy will likely include incentivizing all types of hydrogen—including the much cheaper ''grey'' hydrogen—in order to develop the required infrastructure.[6]

Obviously, the color of the hydrogen molecule itself does not vary; the hydrogen molecules are entirely fungible regardless of their method of production or the carbon footprint of that method of production (the ''color''). As a result, increasing attention is being paid to the means by which the source of hydrogen will be verified, tagged, certified or credited.[7]

## Recently-Announced U.S. Hydrogen Projects

In recent years there has been a significant increase in the initiation of hydrogen projects in the United States. To help frame the discussion regarding the role that tax incentives play in the development of hydrogen projects, we list below several recent examples:

- In May 2019, Mitsubishi Hitachi Power Systems and Magnum Development announced an initiative to launch their Advanced Clean Energy Storage project in central Utah. The initiative will develop 1,000 megawatts of 100% clean energy storage, including storage of green hydrogen. The project will utilize new gas turbine technology that enables a mixture of hydrogen and natural gas to produce power with lower carbon emissions. The project aims to use 100% green hydrogen as a fuel source with the result that the turbines produce electricity with zero carbon emissions.[8]

- A green hydrogen project was launched in California in May 2020 by the global energy company SGH2.[9] The facility in Lancaster, California will be able to produce up to 11,000 kilograms of green hydrogen per day using a proprietary biogenic waste gasification technology, pursuant to which it gasifies plastic, paper and other waste to produce hydrogen it describes as ''greener than green'' because it uses no externally sourced energy and avoids more carbon dioxide emissions than green hydrogen from renewables.[10]

- A $10.8 million project to integrate hydrogen storage, fuel cells and fuel cell refueling property began in September 2020 through a partnership between Frontier Energy, the University of Texas, and the Department of Energy, known as H2@

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[4] See text at Note 8, below.

[5] Other colors sometimes referenced include black (coal-fired), white (powered by electricity from the grid, not renewable power), pink (nuclear-powered), brown (coal gasification) and turquoise (pyrolysis with a solid carbon by-product).

[6] *See Special Committee on the Climate Crisis, The Case for Climate Action: Building a Clean Economy for the American People* 36 (Aug. 25, 2020).

[7] How will buyers know they are getting hydrogen produced by one method versus another and does it matter whether they are getting the molecules produced by a certain method or is it sufficient that the seller produced some molecules by that method even if those were not the molecules transferred to the buyer? These questions tare receiving increasing attention as policymakers consider how to best support the greenest hydrogen production methods. *See* Akane Okutsu, *Saudi Aramco Bets on Ammonia-Hydrogen Business with Japan*, Nikkei Asia (2021); Dr. Thomas Oberst, *Tuv Sud Provides Green Hydrogen Certification*, TUV 500 (2020).

[8] Magnum Energy: World's Largest Renewable Energy Storage Project Announced in Utah (May 30, 2019), https://magnumdev.com/. The announcement explains that there are times of day when demand for electricity is lower than the production of renewable power, which leads to curtailment of renewable generation and negative electricity pricing. Therefore, the goal of the project is to store excess power for later use.

[9] Christian Heartquist, *World's Largest Green Hydrogen Project to Launch in California,* Businesswire (2020).

[10] See Note 9, above.



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Scale.[11] The UT-Austin campus will host a project integrating commercial hydrogen production, distribution, storage, and use.[12] The hydrogen power will power a stationary fuel cell and supply a hydrogen station with fuel for a fleet of hydrogen fuel cell vehicles.[13]

- In October 2020, Ohio-based Long Ridge Energy Terminal announced plans to transition its 485 MW combined-cycle power plant to run on hydrogen in collaboration with New Fortress Energy and GE. The plant utilizes a combustion turbine which can burn between 15-20% hydrogen by volume in the gas stream initially, with the capability to transition to 100% hydrogen over time.[14]
- A nuclear lab partnered with Xcel Energy in November 2020 to develop a hydrogen-energy production facility with just under $14 million awarded from the U.S. Department of Energy.[15] Xcel Energy claimed it will be the first company to produce hydrogen at a nuclear plant using high-temperature steam electrolysis.[16]
- CF Industries announced in November 2020 a green hydrogen project to produce approximately 20,000 tons per year of ammonia that, because it is produced from green hydrogen is, in turn, referred to as ''green ammonia.''[17] The company is installing an electrolysis system to produce green hydrogen that will be used to produce the ammonia.[18]
- In January 2021, Saulsbury Industries announced it had been awarded a contract to construct a 30-tons a day liquified hydrogen facility in the United States for an unnamed project developer.[19]
- In February 2021, Plug Power Inc. announced that it will begin construction of a new $290 million state-of-the-art green hydrogen production facility and electric substation in New York. The plant will use hydropower to produce 45 metric tons of green liquid hydrogen daily and will be North America's largest green hydrogen production facility.[20]
- Southern California Gas Co. recently announced it will provide $1.3 million to fund the development of hydrogen fuel technologies that could provide emissions-free transportation for railways and at ports in California.[21]

## HYDROGEN-RELEVANT FEDERAL TAX PROVISIONS

Several federal tax provisions currently incentivize the transition to a hydrogen economy. Some of these provisions apply to end-users of hydrogen technology, some to developers of hydrogen projects, and others to sellers and retailers of hydrogen energy-related assets. Although some of these provisions are currently slated to sunset, legislative proposals, would extend most of these provisions into the near future.

### Hydrogen Fuel Cell Investment

The I.R.C. currently provides several credits for investment in fuel cell properties and associated equipment that generate power from an electrochemical reaction of hydrogen and oxygen.

#### Investment Tax Credit

Section 48[22] offers an investment tax credit equal to a percentage of the cost of qualified energy property, which includes ''qualified fuel cell property.''[23] ''Qualified fuel cell property'' is defined as a fuel cell power plant which has a nameplate capacity of at least 0.5 kilowatt of electricity using an electrochemical process and an electricity-only generation efficiency

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[11] *See* Darrel Proctor, *DOE-Backed Hydrogen Project Underway in Texas*, Power (2020).

[12] See Note 11, above.

[13] See Note 11, above.

[14] Long Ridge Energy Terminal: Long Ridge Energy Terminal Partners with New Fortress Energy and GE to Transition Power Plant to Zero-Carbon Hydrogen (Oct. 13, 2020), https://www.longridgeenergy.com/news/2020-10-13-long-ridge-energy-terminal-partners-with-new-fortress-energy-and-ge-to-transition-power-plant-to-zero-carbon-hydrogen.

[15] Keith Ridler, *US Nuclear Lab Partnering with Utility to Produce Hydrogen*, Associated Press (2020).

[16] See Note 15, above.

[17] See press release from CF Industries, October 29, 2020, accessed at: http://www.cfindustries.com/newsroom/2020/commitment-to-clean-energy-economy. *See also* Green Car Congress, *CF Industries to Build Green Ammonia Plant in Louisiana* (Nov. 6, 2020), https://www.greencarcongress.com/2020/11/20201106-cf.html.

[18] See Note 17, above.

[19] Jay Faris, *Saulsbury to Build Hydrogen Liquefaction Plant in the US*, H2 Bulletin (2021).

[20] Plug Power, Plug Power to Build North America's largest Green Hydrogen Production Facility in Western New York (Feb. 25, 2021), https://www.ir.plugpower.com/Press-Releases/Press-Release-Details/2021/Plug-Power-to-Build-North-Americas-Largest-Green-Hydrogen-Production-Facility-in-Western-New-York/default.aspx.

[21] Southern California Gas Company, *SoCalGas to Provide Over $1 Million to Fund Research & Development of Hydrogen to Fuel Commercial Transportation*, Waste 360 (2021), https://www.waste360.com/gas-energy/socalgas-provide-over-1-million-fund-research-development-hydrogen-fuel-commercial

[22] All section references herein are to the Internal Revenue Code of 1986, as amended (the ''Code''), or the Treasury regulations promulgated thereunder, unless otherwise indicated.

[23] §48(a). The credit percentage was originally 30% but has been phased down to 26% for property the construction of which begins in 2020-2022 and 22% if construction begins in 2023.



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of greater than 30%.[24] A ''fuel cell power plant'' is defined as ''an integrated system comprised of a fuel cell stack assembly and an associated balance of plant components that converts a fuel [such as hydrogen] into electricity using electrochemical means.''[25]

The credit cannot exceed $1,500 for each 0.5 kilowatt of nameplate capacity.[26] The property must also be depreciable, cannot be public utility property, and the taxpayer must construct, reconstruct or erect the property, or be its first user. IRS guidance sets forth additional quantity and performance standards.[27] When a taxpayer claims the investment tax credit, it must reduce its basis in the property by 50% of the amount of the credit claimed.[28] In addition, all or part of the credit may be recaptured if the property disposed of or ceases to be used for qualified purposes or at all within five years after the property is placed in service.[29] Construction must begin by December 31, 2023.[30] Proposed legislation, titled The Green Act of 2021, would extend the credit to 2028 and expand it to cover ''energy storage technology,'' which would include hydrogen storage property.[31]

## Qualifying Advanced Energy Project Credit

Section 48C provides a credit for 30% of the qualified investment with respect to any qualifying advanced energy project of the taxpayer. A ''qualifying advanced energy project'' means a project related to a manufacturing facility for the production of various clean energy properties including fuel cells and property designed to capture and sequester carbon dioxide, which has been approved by Treasury and the Department of Energy. Upon enactment in 2009, however, the aggregate amount of credit to be awarded was capped at $2.3 billion and, by 2010, all the credits were allocated to pre-approved projects. Therefore, while the credit remains in the I.R.C., as a practical matter, no credit dollars are currently available under this provision.

The program authorized by §48C has supported investments in 183 clean energy projects in 43 states.[32] Examples of hydrogen-related use of the credit include that of W.L. Gore & Associates, Inc., which used a roughly $800,000 credit to produce an advanced membrane for high-efficiency fuel cells for buildings and vehicles.[33] Their technology has been incorporated into the Toyota Mirai hydrogen vehicle.[34] UTC Power Corp. also received a credit for the investment in a manufacturing facility to produce a hydrogen fuel cell powerplant.[35] The rest of the projects receiving credit allocations were for solar, wind, battery, smart grid, and other non-hydrogen technologies.

If additional credit dollars were allocated under this provision, however, fuel cell projects, as well as carbon capture, use and sequestration projects would qualify to be pre-approved by the Treasury.[36] Pending legislation would extend the provision by adding an annual allocation for the years 2022–2026 of $2.5 billion per year.[37] Further, if the IRS did not allocate all $2.5 billion in a given year, the IRS could carry it forward to the next year.[38]

## Residential Tax Credit

Section 25D provides a credit for individual taxpayers for the cost of residential fuel cells.[39] The credit is currently equal to 26% of expenditures for qualified fuel cell property placed in service before

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[24] §48(c)(1)(A). ''Nameplate capacity'' is the maximum electrical output of a generator as rated by the manufacturer. For fuel cells, it is determined at the normal operating conditions designated by the manufacturer. Notice 2008-68, §3.01(7).

[25] §48(c)(1)(C).

[26] §48(c)(1)(B).

[27] Notice 2008-68, §3.02.

[28] §50(c)(1).

[29] §50(a).

[30] §48(c)(2)(D). Property must be placed in service by January 1, 2026.

[31] H.R. 848, 117th Cong., §102(a) (2021). ''Energy storage technology'' generally would include equipment that uses hydrogen storage (including hydrolysis and electrolysis) to store energy for conversion to electricity and has a capacity of not less than five kilowatt hours.

[32] Daniel J. Weiss, *The Clean Tech Hole in the Tax Deal*, Center for American Progress (2010), https://www.americanprogress.org/issues/green/news/2010/12/08/8757/the-clean-tech-hole-in-the-tax-deal/.

[33] Department of Energy, President Obama Awards $2.3 Billion for New Clean-Tech Manufacturing Jobs (2010), https://www.energy.gov/articles/president-obama-awards-23-billion-new-clean-tech-manufacturing-jobs.

[34] W.L. Gore & Co., Gore's Membrane Technology Enables Toyota's Second-Generation Fuel Cell Vehicle (2020), https://www.gore.com/news-events/press-release/gore-membrane-enables-toyota-second-generation-fuel-cell-vehicle.

[35] Selections for Section 48C Manufacturing Credit, The White House, President Barack Obama (2010), https://obamawhitehouse.archives.gov/the-press-office/fact-sheet-23-billion-new-clean-energy-manufacturing-tax-credits.

[36] §48C(c)(1)(A)(i). Note that, although §48(a)(3) denies the credit to investment in any facility the production from which is allowed as a credit from §45 and although §48C(a) denies the credit to any qualified investment for which a credit is allowed under §48, §48A or §48B, neither §48 nor §48C denies the credit for investment in a facility which also is allowed a credit under §45Q for carbon capture. Therefore, in theory at least, it appears that, if additional funding is authorized for §48C with no other revision to the provision coordinating credit claims, a blue hydrogen project that involves carbon capture would not be prohibited from also claiming credits under §45Q.

[37] H.R. 848, 117th Congress §501(e)(2)(B).

[38] See Note 37, above.

[39] §25D(a), §25D(g).



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2023, as defined in §48, installed on or in connection with a dwelling unit located in the United States used as a principal residence.[40] The credit is capped at $500 per 0.5 kilowatt of capacity of the qualified fuel cell property.[41] Unused credits can be carried forward, and taking the credit decreases a taxpayer's basis in the property by the amount of the credit.[42] The credit started a phaseout in 2020 and is set to expire on December 31, 2023.[43] There is currently a proposal to extend the credit to 2028 and delay the phaseout.[44]

## Blue Hydrogen Production – Credit for Carbon Oxide Sequestration

As discussed above, ''blue'' hydrogen refers to hydrogen produced from natural gas with the carbon dioxide by-product of such production, rather than being emitted, being captured and sequestered. Both the European Union and the United States have emphasized that blue hydrogen production may be the first step of the transition to green hydrogen production since deployment of green hydrogen projects is currently limited by the cost and availability of renewable power (wind and solar) to support them.[45] Therefore, in the near term, blue hydrogen projects are likely to be more common than green hydrogen projects.[46]

For blue hydrogen projects, the most important tax incentive is offered by §45Q, which offers a credit per ton of carbon oxide captured that is sequestered or utilized. The credit was originally enacted in 2008 but the Bipartisan Budget Act of 2018 increased and expanded the §45Q credit making it very attractive to those considering blue hydrogen production. The credit is a specific dollar amount per metric ton of qualified carbon oxide captured and sequestered, used, or utilized in the United States.[47] Prior to 2018, the credit was $20 per ton for sequestration and $10 per ton for enhanced oil recovery projects. Now the credit is $31 in 2021, increasing ratably to $50 in 2026 for sequestration, and $20 increasing ratably to $35 in 2026 for enhanced oil recovery projects and other utilization.[48] The credit can be claimed for 12 years from the date the qualified facility is placed in service.[49] Final regulations on the §45Q credit were promulgated in January of 2021.[50] A detailed discussion of the §45Q credit is beyond the scope of this article but its importance to the development of blue hydrogen projects should not be ignored.[51]

Tax equity partnerships are used often in wind and solar projects to monetize tax credits, and such structures are expected to be used similarly with respect to §45Q tax credits by having the partnership own the carbon capture equipment and allocate the tax credit to the partners. With the release of final §45Q regulations in January 2021, the tax equity market is expected to play an increasing role in the financing of blue hydrogen projects.

Proposed legislation re-introduced by Rep. McKinley (R-WV) and Rep. Veasey (D-TX) in February of 2021, titled the ACCESS 45Q Act, would implement two significant changes to §45Q:[52]

- The first is a direct pay option for the §45Q tax credit. To implement the direct pay option, the bill would add §6431, allowing taxpayers to elect to treat the credit as having been made as a payment against their tax liability.[53] This election would allow the taxpayer to treat earned credits as an overpayment of taxes in cases in which the taxpayer does not have a tax liability.[54] Direct pay is expected to reduce the need for tax equity inves-

[40] §25D(d)(3).

[41] §25D(b)(1).

[42] §25D(c), §25D(f).

[43] §25D(h).

[44] H.R. 848, 117th Cong. §302 (2021).

[45] *See* The Oxford Institute for Energy Studies, EU Hydrogen Strategy 2 (July 2020); Kate Abnett, *EU Plans Green Hydrogen Push, with Hints of Blue,* Reuters (June 18, 2020), https://www.reuters.com/article/eu-energy-hydrogen-idUSL4N2DV2ED.

[46] For example, Air Products operates a carbon dioxide capture project at a refinery in Port Arthur, Texas. Its system captures carbon dioxide from steam methane reformers, and it has captured over five million tons of carbon dioxide since 2014. Air Products, Large-scale Carbon Capture, Use and Storage, https://www.airproducts.com/company/innovation/carbon-capture. Shell has a blue hydrogen project in Alberta which also has captured roughly five million metric tons of carbon dioxide since 2015. Shell, Quest CCS Facility Capture and Stores Five Million Tonnes of $CO_2$ ahead of Fifth Anniversary, https://www.shell.ca/en_ca/media/news-and-media-releases/news-releases-2020/quest-ccs-facility-captures-and-stores-five-million-tonnes.html. Further, industrial gas major Linde will join forces with the DOE to study the application of carbon capture to its natural gas reformer under construction in Louisiana. Mike Fowler, *Another Gigawatt Scale Hydrogen Project Is on the Drawing Board, and this Time it's Deep "Blue,"* Clean Air Task Force (2020).

[47] §45Q(a).

[48] §45Q(a).

[49] §45Q(a).

[50] T.D. 9944, Credit for Carbon Oxide Sequestration, 86 Fed. Reg. 4728 (Jan. 15, 2021).

[51] For a more detailed discussion of the credit, *see* Baker Botts, Carbon Capture Tax Credit: IRS Issues Much-Anticipated Final Section 45Q Regulations (Jan. 7, 2021).

[52] H.R. 1062, 117th Cong. (2021). *See also* Carbon Capture Coalition, Coalition Welcomes Reintroduction of Access 45Q Act in the U.S. House (Feb. 16, 2021), https://carboncapturecoalition.org/coalition-welcomes-reintroduction-of-access-45q-act-in-the-u-s-house/, Baker Botts, The ACCESS 45Q Act Would Enhance Section 45Q Carbon Capture and Sequestration Tax Credit (Dec. 7, 2020).

[53] H.R. 1062, 117th Cong. (2021).

[54] H.R. 1062, 117th Cong. (2021). However, in the GREEN



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tors since a taxpayer's tax attributes would not limit its ability to receive the full amount of the credit — the credit would be automatically monetized. This would be especially helpful in the context of an economic slowdown since, in a slowdown, tax liabilities shrink for most taxpayers.

- The second proposal is a 10-year extension of the deadline to begin construction of a qualifying project for credit eligibility to January 1, 2034.[55] Delays in IRS issuance of detailed guidance and the Covid-19 pandemic have had a chilling effect on investment, so extending the date of construction would provide assurance to developers and their investors that new projects can meet the deadlines. Such a change would give taxpayers considering carbon capture projects more time to plan for a large-scale development.

The enactment of these changes to §45Q would strongly incentivize those considering blue hydrogen projects.

## Hydrogen Vehicles and Fuel

### Alternative Motor Vehicle Credit

Fuel cell motor vehicles use power derived from one or more cells that convert chemical energy into electricity by combining oxygen with hydrogen fuel stored on board the vehicle.[56] Section 30B provides a credit for purchasers of alternative motor vehicles, including fuel cell vehicles. The credit amount is up to $8,000 for a qualified light-duty fuel cell vehicle, depending on the vehicle's fuel economy.[57] Higher amounts are available for heavy-duty vehicles.[58]

To qualify for the alternative motor vehicle credit under §30B, the vehicle's original use must begin with the taxpayer, and the vehicle must be acquired or leased for use by the taxpayer and not for resale. Furthermore, the vehicle must not be used predominantly outside of the United States.[59] Passenger automobiles and light trucks must meet or exceed the Bin 5 Tier II emission level established in regulations prescribed by the EPA for that make and model of vehicle.[60]

Last year, a hydrogen-powered SUV, the 2020 Hyundai Nexo entered the U.S. market, and Toyota's hydrogen vehicle, the Mirai, also made its debut in California in February of 2021.[61] In the Department of Energy's Alternative Fuels Data Center, there are currently nine different models of light-duty fuel cell vehicles that are available for sale, manufactured by Honda, Hyundai, and Toyota.[62] The Honda Clarity is Honda's newest model of hydrogen automobile.

The credit operates as part of the general business credit under §38 to the extent attributable to property of a character subject to a depreciation allowance (i.e. the vehicle is used in a trade or business).[63] The remainder of the credit, including the credit for retail purchasers, is treated as a non-refundable personal credit that can offset regular tax liability but not alternative minimum tax.[64] However, if a portion of the personal credit cannot be used, it cannot be carried back or forward to other years.[65] The provision contemplates a potential recapture of the credit if the property ceases to be eligible for the credit, but no regulations have been released on recapture for qualified fuel cell vehicles.[66]

The §30B credit is set to expire on December 31, 2021, unless it is further extended.[67] However, legislation to extend the effective date until 2026 is currently pending.[68]

### Alternative Fuel Vehicle Refueling Credit

Purchase and use of hydrogen-powered vehicles cannot become commonplace without an ability to drive them somewhere. In recognition of this need,

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Act, only 85% of the credit amount is allowed to be treated as a direct payment.

[55] H.R. 1062, 117th Cong. (2021). The initially proposed 10-year extension was to an earlier date but, as reintroduced in H.R. 8858, the provision would be extended to 2034.

[56] §30B(b)(3).

[57] §30B(b)(1)(A). The credit can be increased if the fuel efficiency amount of the vehicle exceeds certain percentages of the 2002 model city year fuel economy. §30B(b)(2). The 2002 model year fuel economy is determined by using a table in the I.R.C. and finding the vehicle's weight class. The additional credit for fuel economy ranges from $1000 for 150-175% increases in fuel economy to $4000 for greater than 300% increases in fuel economy.

[58] The credit ranges from $4,000 to $40,000 depending on the size of the vehicle. §30B(b)(1).

[59] §30B(b)(3), §30B(h)(7).

[60] §30B(b)(3). Notice 2008-33 sets out the process for a manufacturer to certify a qualified fuel-cell vehicle.

[61] *See* Canada Newswire, *First of Toyota's Latest Hydrogen-Fuel Vehicle 'Mirai' Makes a Debut in Lancaster California*, Bloomberg (Feb. 22, 2021); Daniel Golson, *2020 Hyundai Nexo Review: This Hydrogen Fuel-Cell SUV deserves your Attention*, Road show (Nov. 27, 2020).

[62] U.S. Department of Energy, Alternative Fuels Data Center, Alternative Fuel and Advanced Vehicle Search, https://afdc.energy.gov/vehicles/search.

[63] §30B(g)(1).

[64] §30B(g)(2), §26(a).

[65] §26(a). See also Instructions to Form 8910 (2021), p. 2. Because the credit amount reduces a taxpayer's basis in the property (even if the taxpayer is not able to take the full amount of the credit), the provision allows taxpayers to elect out of the credit and not receive a reduction in basis. §30B(h)(9).

[66] §30B(h)(8).

[67] §30B(k)(1).

[68] H.R. 848, 117th Cong., §404 (2021).



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§30C provides a credit for 30% of the cost of building a refueling property for certain alternative fuel vehicles, including hydrogen-powered vehicles.[69]

In 2018, Shell and Toyota announced the beginning of development of the world's first hydrogen truck refueling station in the Port of Long Beach in California.[70] As more fuel cell vehicles hit the roads, more refueling property will need to be installed to meet the demand. Currently, there are 46 publicly available hydrogen stations for fueling fuel cell vehicles in the United States, a number that has grown from 39 at the end of 2018.[71]

The §30C refueling property credit is capped at $30,000 for depreciable property per location (or $1,000 for non-depreciable property, including property used at the taxpayer's principal residence).[72] So, for depreciable property, taxpayers are only able to recognize a benefit on the first $100,000 of property placed in service at a location. The credit is available for qualified alternative fuel vehicle refueling property (QAFVR), which is defined as property for selling fuel that has a volume comprised of at least 85% of one of several specified gases, including hydrogen.[73] QAFRV property does not include buildings, and it must have an original use beginning with the taxpayer and must not be predominantly used outside of the United States.[74]

No regulations have been issued under §30C, but the IRS has issued Notice 2007-43 to provide additional guidance, including that QAVFR be property used for storing alternative fuel or for dispensing alternative fuel (in each case, at a refueling station where the fuel is delivered into the fuel tank of a motor vehicle that is propelled by that fuel).[75] Therefore, a fuel wholesaler's property that stores and ships alternative fuels to retail stores would not qualify as QAVFR property.[76]

For property converted from conventional refueling property, if the property is reconditioned or rebuilt property, only the cost of reconditioning or rebuilding the non-QAFVR property is eligible for the credit.[77] However, if the QAVFR property is treated as being placed into original use when first used as QAFVR property, the cost of the QAFVR property includes the adjusted basis of the non-QAVFR property immediately before the conversion.[78]

In the case of dual-use property that is used to store or dispense both alternative fuels and conventional fuels, the cost taken into account to calculate the credit is generally the excess of the total cost of the property over the cost to build property that could store or dispense an equivalent amount of conventional fuel.[79] In the case of property that stores alternative fuel that is dispensed both at the location where it is stored and at other facilities, the cost of the project only includes the cost that exceeds the cost of an equivalent storage facility that is used solely for the transport of fuel to other locations.[80]

Much like the alternative energy vehicle credit, the credit is be included in the general business credit under §38 to the extent it is attributable to depreciable property.[81] Any remaining portion is a personal credit which can offset both regular tax liability and alternative minimum tax.[82] The credit reduces the taxpayer's basis in the property, and the taxpayer has the option to elect out of the credit.[83]

The I.R.C. provides for recapture by reference to the recapture rules under the former §179A deduction for certain clean-fuel vehicle refueling property.[84]

The §30C refueling property credit is set to expire on December 31, 2021, unless it is extended.[85] There is pending legislation to extend the credit to 2026 and increase the credit for QAFVR property that is intended for certain general public use or for use exclusively by fleets of commercial or government vehicles.[86]

## Tax Credit for Liquid Hydrogen Fuel

Section 6426 provides for a credit of $0.50 per gallon of alternative fuel sold for use or used as a fuel to

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[69] §30C(a).

[70] Elsevier, *Shell, Toyota to Build Truck Hydrogen Station at Port of Long Beach*, 5 Fuel Cells Bulletin 8 (2018).

[71] U.S. Department of Energy, Alternative Fuel Data Center, https://afdc.energy.gov/stations/states.

[72] §30C(b); Notice 2007-43, §4.01(1)(ii).

[73] §30C(c)(2)(A). The credit is also available with regard to ethanol, natural gas, and other qualified mixtures.

[74] §30C(c)(1), §30C(e)(3); Notice 2007-43, §4.01(1).

[75] Notice 2007-43, §4.01(1)(iv)..

[76] Notice 2007-43, §7.01.

[77] Notice 2007-43, §6.01.

[78] Notice 2007-43, This determination is made under the principles of Reg. §1.48-2.

[79] Notice 2007-43, §6.02.. For example, if a dual-use facility can store/dispense x amount of alternative fuel and y amount of conventional fuel, the cost of the project will be reduced by the costs of a fuel storage/dispensing facility that can store y amount of conventional fuel in determining the credit.

[80] Notice 2007-43, §6.02. Therefore, if a storage facility stores x amount of alternative fuel that is dispensed at the location and y amount of alternative fuel that is transported to other locations, the cost of the project will be reduced by the costs of a fuel storage facility that can transport y amount of alternative fuel to other locations.

[81] §30C(d)(1).

[82] §30C(d)(2)(B).

[83] §30C(e)(1), §30C(e)(4).

[84] §30C(e)(5) (referencing §179A(e)(4) before its repeal). See, generally, former Reg. §1.179A-1.

[85] §30C(g).

[86] H.R. 848, 117th Cong. §405.



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operate a motor vehicle against the alternative fuel excise tax imposed by §4041.[87] Further, §6427 allows for a refundable alternative fuel credit for credit amounts determined under §6426 that exceed the excise tax imposed by §6041.[88] Therefore, the two provisions act as one refundable credit that is first applied against fuel excise taxes. Alternative fuel includes liquified hydrogen.[89] To claim the credit against the excise tax, the fuel must be certified as having been derived from coal produced at a gasification facility which separates and sequesters at least 75% of such facility's total carbon dioxide emissions.[90] The credit expires on December, 31, 2021, but there is a proposal to extend the credit to 2025 with a phase-out over the years until 2025.[91]

## APPENDIX – STRATEGIES FROM OTHER JURISDICTIONS

In recent years, several countries have adopted specific strategies and plans to incentivize the development of hydrogen energy. Below are a few examples:

- **Australia:** In 2019, the Australia Renewable Energy Agency (ARENA) announced a Renewable Hydrogen Development Funding Round of up to $70 million for renewable hydrogen projects in Australia,[92] and seven projects were shortlisted for this funding.[93] The Clean Energy Finance Fund (CEFC) of Australia also has an ''Advancing Hydrogen Fund'' which has $300 million available to support the growth of the Australian hydrogen industry.[94]

- **European Union:** In December of 2019, the European Union (EU) announced the European Green Deal, which aims to make Europe carbon-neutral by 2050. In July of 2020, the EU announced its Hydrogen Strategy which aims to help implement this goal.[95] In the first phase of the strategy, from 2020 to 2024, the objective is to install at least six GW of hydrogen electrolyzers in the EU that will produce up to one million tons of hydrogen.[96] The strategy notes that through 2050 investments in production capacities could be as high as €470 billion.[97] A new European Clean Hydrogen Alliance will ''identify and build up a clear pipeline of viable investment projects.''[98]

- **Canada:** In December 2020, Canada released a report describing its hydrogen strategy.[99] The strategy asserts that clean hydrogen has the potential to deliver up to 30% of Canada's end-use energy by 2050.[100] In the next five years, the strategy aims to lay the foundation for rapid growth within the hydrogen sector by encouraging the development of high potential projects, employing regulations and a new clean fuel standard to encourage near-term investments, and forming additional policy measures necessary to reach net-zero carbon emissions by 2050.[101]

- **Germany:** Germany also instituted a National Hydrogen Strategy in 2020 apart from the European Union.[102] The strategy is made up of two phases, starting with the initial market ramp-up from 2020-2023. The second phase will focus on ''[stabilizing] the newly emerging domestic market, [molding] the European and international dimension of hydrogen, and using it for German industry.''[103] Furthermore, in connection with the strategy, the government will invest €7 billion in the ramp-up of hydrogen technologies in Germany, and a further €2 billion has been made available for international partnerships.[104]

- **Japan:** In December 2017, Japan formulated a basic strategy for promoting hydrogen.[105] The strategy calls for establishing a commercial-scale hydrogen supply chain by 2030 to procure 300,000 tons of hydrogen annually and putting hydrogen-generated electricity into commercial use.[106] Japan also aims to increase the number of

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[87] §6426(a).

[88] §6427(e)(2). *See also* Notice 2006-92.

[89] §6426(d)(2)(D).

[90] §6426(d)(4).

[91] §6426(d)(5); H.R. 848, 117th Cong., §202.

[92] *Renewable Hydrogen Development Funding Round*, ARENA (2020).

[93] *Seven shortlisted for $70 Million Hydrogen Funding Road*, ARENA (2020).

[94] *Advancing Hydrogen Fund,* CEFC (2020).

[95] European Commission, A Hydrogen Strategy for Climate-Neutral Europe (2020).

[96] See Note 95, above.

[97] See Note 95, above.

[98] See Note 95, above.

[99] Hydrogen Strategy for Canada: Seizing the opportunities for Hydrogen (2020).

[100] See Note 99, above, at 69.

[101] See Note 99, above, at 101.

[102] German Federal government, The National Hydrogen Strategy (2020).

[103] See Note 102, above, at 16.

[104] See Note 102, above, at 3.

[105] Ministerial Council on Renewable Energy, Hydrogen and Related Issues Basic Hydrogen Strategy (Dec. 26, 2017).

[106] See Note 105, above, at §4.1.



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fuel cell vehicles to 800,000 and the number of fuel cell buses to 1,200 by 2030.[107]

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[107] See Note 105, above, at §4.5.



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- **Norway:** Norway unveiled its national hydrogen strategy in June 2020.[108] Norway targets greenhouse gas emissions in 2050 to be reduced by between 9095% of 1990 levels.[109] As part of this strategy, the government will contribute to developing technology for the capture, transport and storage of carbon dioxide and build cost-effective solutions for full-scale carbon capture and sequestration.[110]

[108] Norwegian Ministry of Petroleum and Energy & Norwegian Ministry of Climate and Environment, The Norwegian Government's Hydrogen Strategy (2020).

[109] See Note 108, above, at 5.

[110] See Note 108, above, at 9.



ISSN 0148-8295

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# It's Elemental: Hydrogen Tax Incentives to Fuel the Energy Transition- Part II

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This is Part II of a two-part article discussing tax incentives relevant to a hydrogen energy transition. Part I provided background information regarding hydrogen production and projects and also described existing federal tax incentives supporting hydrogen development in the United States. This Part II will provide a description of certain proposed federal tax legislation that would impact hydrogen investment and will also describe certain state-level incentives. Finally, this article will conclude with some comments on the role of tax incentives in transitioning to the hydrogen economy, including a comparison to the role such incentives have played in stimulating investment in renewable energy sources such as wind and solar.

## PROPOSED FEDERAL TAX LEGISLATION RELATED TO HYDROGEN

We describe below certain Biden Administration tax proposals that would affect hydrogen as well as other legislative proposals introduced in the House or Senate in recent months that, if enacted, would affect the tax treatment of hydrogen and hydrogen-related investment.

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### Biden Administration Proposals

The Biden Administration has made clear that it expects to use federal tax incentives to stimulate hydrogen investment. Prior to the election, Biden's Clean Energy Plan emphasized hydrogen development[1] and a report on clean energy by Senate Democrats discussed the many benefits of hydrogen and stressed the need to build up hydrogen infrastructure.[2]

In August 2020, Clean Energy for Biden, a group of ''clean economy leaders'' supporting President Biden's campaign, released a set of 48 policy papers containing recommendations for the Biden campaign with respect to clean energy. With respect to hydrogen investment, the policy recommendation called for creation of a production tax credit for clean hydrogen and hydrogen carriers (such as ammonia) produced in the United States.[3] The proposed tax credit would be available to both green and blue hydrogen but the rate of the credit would be dependent upon the carbon emissions intensity of the production process. The report also called for the creation of a manufacturers' production tax credit of $500 per kw of capacity for manufactured electrolyzers.[4] The group asserted that a scale-up in electrolyzer manufacturing and hydrogen production is the best way to decarbonize industry and achieve the goal of clean hydrogen at fossil hydrogen costs.[5]

On March 31, 2021, President Biden introduced a $2 trillion ''American Jobs Plan.'' The American Jobs

[1] Joseph R. Biden Jr., The Biden Plan to Build a Modern, Sustainable Infrastructure and an Equitable Clean Energy Future (2020). Although the Clean Energy Plan as released did not list any specific proposals, it noted that renewable energy sources can be used to produce carbon-free hydrogen.

[2] Special Committee on the Climate Crisis, The Case for Climate Action: Building a Clean Economy for the American People 36 (Aug. 25, 2020).

[3] Clean Energy for Biden, Building Back Better 373 (2020), accessed at https://www.cleanenergyforbiden.com/policysummit.

[4] An electrolyzer is a system that produces hydrogen by using electricity to break water into hydrogen and oxygen in a process called electrolysis.

[5] Clean Energy for Biden, Building Back Better 373 (Aug. 2020), accessed at https://www.cleanenergyforbiden.com/policysummit.

Plan, as outlined by the Biden Administration in a simultaneously-released fact sheet,[6] proposed a sweeping set of provisions to increase investment in infrastructure while offsetting those provisions with a ''Made In America Tax Plan'' that would, among other changes, increase the corporate income tax rate. In May of 2021, the Treasury department released its so-called ''Greenbook,'' providing a more detailed explanation of the proposals in the American Jobs Plan.[7] The American Jobs Plan and the Greenbook contain many proposals that are the same as, or similar to, the proposals seen in the previously introduced legislative proposals described below, as well as those floated by the Clean Energy for Biden release. The Greenbook explains that the Biden clean energy tax proposals would not only expand and extend the existing clean energy tax credits but would also add a direct payment option for many of them. The plan would propose some new tax credits, as well.[8] Although, as of this writing, negotiations are under way in Congress to determine the extent of implementation, with slim Democratic majorities in the House and Senate, passage of these proposals in some form can be considered likely.

The main features of the American Jobs Plan (as detailed in the Greenbook) that are relevant to hydrogen are:

- **A New Hydrogen Production Tax Credit (PTC)**: In terms of incentivizing the transition to a hydrogen economy, a core feature of the plan is the addition of a new six-year PTC for production of low-carbon hydrogen that is produced for an end use application in the energy, industrial, chemicals, or transportation sector and that is produced from qualified facilities that begin construction before the end of 2026. The credit would be indexed for inflation but would initially equal $3 per kilogram for 2022-2024 and drop to $2 per kilogram for 2025-2027. Low-carbon hydrogen would be defined to include hydrogen produced using renewable energy or nuclear energy and hydrogen produced using natural gas with respect to which the carbon by-product is captured and sequestered.
- **Section 45Q[9] Carbon Capture Tax Credit Expanded and Enhanced:** The proposal would extend the deadline for construction of qualified facilities from January 1, 2026, to January 1, 2031. The credit amount would be increased by an additional $35 per metric ton (for an increase to a total of $85 per metric ton in 2026) for the capture and disposition in secure geological storage of ''hard-to-abate industrial carbon oxide capture sectors such as cement production, steelmaking, hydrogen production and petroleum refining'' but would not be increased for ethanol, natural gas processing or ammonia production facilities.
- **An Expanded Investment Tax Credit (ITC) for Clean Energy Generation and Storage**: The ITC would revert to 30% for solar energy and certain other energy projects (including qualified fuel cells, among others) that begin construction in 2022 through 2026. Beginning in 2022, the ITC would be expanded to include certain standalone storage technology that stores energy for conversion to electricity and has a capacity of not less than five kilowatt hours. Although the Greenbook does not specify the qualifying storage technology, other proposed legislation references to standalone storage have been clear that hydrogen storage is included.[10] The ITC rate would phase out over five years beginning in 2027 (reduced 20% each year).
- **Section 48C Advanced Energy Project ITC**: Effective in 2022, the Biden Administration would authorize an additional $10 billion in funding for this 30% credit for investment in qualifying advanced energy projects, the definition of which would be expanded to include projects for manufacturing facilities for solar and wind equipment, fuel cells, energy storage systems for vehicles, carbon capture and sequestration equipment and grid modernization equipment, among others. A portion of the allocation ($5 billion) would be specifically directed to projects in coal communities.
- **A New Tax Credit for Medium-and Heavy-Duty Zero-Emission Vehicles**: The proposal would provide a business tax credit for new medium- and heavy-duty zero emission vehicles purchased in 2022 through 2027, including fuel cell vehicles, which would range from $10,000 to $120,000 depending upon vehicle size and year of purchase.
- **Residential Energy Efficient Property (REEP) Credit**: The §25D REEP credit (a nonrefundable

[6] The White House, Fact Sheet: The American Jobs Plan (Mar. 31, 2021), https://www.whitehouse.gov/briefing-room/statements-releases/2021/03/31/fact-sheet-the-american-jobs-plan/.

[7] United States Treasury, General Explanations of the Administration's Fiscal Year 2022 Revenue Proposals, 33 (May 2021).

[8] See Note 7, above, at 33.

[9] All section references herein are to the Internal Revenue Code of 1986, as amended (the ''Code''), or the Treasury regulations promulgated thereunder, unless otherwise indicated.

[10] *See* Energy Storage and Tax Incentive Deployment Act, S.627 and H.R. 1684, 117th Cong. (2021).



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credit for the purchase of certain residential energy-efficient property, including residential fuel cells) would revert to 30% for systems placed in service in 2022 through 2026, subject to phase-down under a schedule similar to the ITC described above.

- **Enhancement of Alternative Fuel Vehicle Refueling Property ITC**: The §30C credit would be extended for five years, to the end of 2026, the current cap on the credit of $30,000 would be raised to $200,000 and the cap would be applied on a per-device, rather than a per-location, basis.[11]

Each of these credits, with the exception of the REEP credit, would be available, at the taxpayer's option, as a direct payment in lieu of the credit.[12]

## Other Proposed Tax Legislation Related to Hydrogen

### Clean Energy for America Act

Introduced this April by Senate Finance Committee Chair Ron Wyden (D-OR), the Clean Energy for America Act proposes to create emissions-based incentives that would be agnostic to the type of energy technology used and would instead determine eligibility for (and the amount of) the incentives based on the extent of greenhouse gas emissions of the facility or property.[13]

#### *PTC and ITC for Clean Hydrogen*

The bill, as modified by the Senate Finance Committee on May 26, 2021, would add a new clean hydrogen production credit of up to $3.00 per kg of hydrogen produced, adjusted for inflation.[14] The amount of the credit is an ''applicable percentage'' of $3.00 per kg, determined by comparing the emissions of lifecycle greenhouse gases from the production process at the facility to the lifecycle greenhouse gas emissions from a hydrogen facility that uses steam methane reformation.[15] The percentage reduction in lifecycle greenhouse gas emissions at the facility (as compared to a steam methane reformation process) would affect the ''applicable percentage'' as follows:

- Less than 50% reduction: no credit
- 50-75% reduction: 20% applicable percentage
- 75-85% reduction: 25% applicable percentage
- 85-95% reduction: 34% applicable percentage
- 95% or greater reduction: 100% applicable percentage (full $3.00 per kg credit).[16]

Because this credit applies when there is a reduction in lifecycle greenhouse gas emissions as compared to a steam methane reformation production process, both blue and green hydrogen production could be eligible for the credit—a lifecycle assessment would recognize the emission reduction achieved through carbon capture and sequestration.

Under the proposed legislation, a clean hydrogen production facility could alternatively be eligible for a revised §48 ITC.[17] The investment credit percentage would be subject to a similar sliding scale based on the percentage decrease in lifecycle greenhouse gas emissions from the hydrogen production at the facility as compared to a facility that produces hydrogen through steam methane reformation—the credit would be 6% for a facility that generates a 50-75% reduction in greenhouse gas emissions, 7.5% for a 75-85% reduction in greenhouse gas emissions, 10.2% for a 85-95% reduction in greenhouse gas emissions, and the full 30% for a 95% or greater reduction in greenhouse gas emissions.[18] Treasury would be directed to issue regulations providing for credit recapture if the stated reduction in lifecycle greenhouse gas emissions is later determined not to have been satisfied.[19]

Qualification as a clean hydrogen production facility for both of the PTC and ITC credits would depend upon satisfying certain wage and workforce requirements.[20] These credits would be phased out beginning in the second year after the EPA determines that speci-

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[11] See Note 7, above, at 33-58.

[12] See Note 7, above, at 33-58.

[13] S. 1298, Clean Energy for America Act, 117th Cong. (2021). The Joint Committee on Taxation provided a description of the Chairman's mark of the bill: Joint Committee on Taxation, Description of the Chairman's Mark of the ''Clean Energy for America Act,'' (JCX-26-21), (May 24, 2021) (hereinafter ''JCX''). On May 26, 2021, the Senate Finance Committee modified and added to the bill and advanced the bill out of committee to the full Senate. Joint Committee on Taxation, Description of the Chairman's Modification to the Provisions of the ''Clean Energy for America Act,'' (JCX-28-21), (May 26, 2021) (hereinafter ''JCX2''). Senator Wyden has proposed prior versions of this legislation in previous Congresses.

[14] JCX2 at 12. The applicable amount of $3.00 is adjusted for inflation by multiplying the $3.00 by the inflation adjustment factor, which is the GDP implicit price deflator for the preceding calendar year divided by the GDP implicit price deflator for 2020. *See* JCX2 at 12, n.8.

[15] *See* JCX2 at 12. The credit applies to each kilogram of qualified clean hydrogen produced by the taxpayer during the 10-year period beginning when the facility is placed in service and sold to an unrelated person or used by the taxpayer.

[16] *See* JCX2 at 12.

[17] *See* JCX2 at 5.

[18] *See* JCX2 at 5.

[19] *See* JCX2 at 5.

[20] See JCX2 at 12-13, referring to wage and workforce require-



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fied annual greenhouse gas emissions are less than 25% of such specified annual U.S. greenhouse gas emissions in 2021. The credit is reduced by 25% percent for facilities that begin construction in the second year after such determination, by 50% percent for facilities that begin construction in the third year, and by 100% for subsequent years.[21]

The legislation would prohibit a facility from claiming both the new clean hydrogen ITC and renewable power or carbon capture credits by defining a ''qualified clean hydrogen facility'' to exclude any facility for which a general business credit has been allowed for the taxable year or any prior taxable year under §48 (other than for the new clean hydrogen ITC) or §45, §45J, or §45Q.[22] Although not specifically stated in the Act as modified on May 26, 2021, the new clean hydrogen PTC would presumably include a direct pay election on the same basis such election is made available to all the other clean energy tax credits in the Act.[23]

### *New Technology-Neutral Credits*

The Clean Energy for America Act also proposes to add a new technology-neutral PTC and ITC in new §45U and §48D, respectively.[24] Taxpayers would have a choice between a 2.5 cents per kilowatt hour PTC[25] or a 30% ITC. A power-generating facility could qualify regardless of the technology or resources employed, so long as the facility's lifecycle greenhouse gas emissions rate is zero or less. Therefore, these proposed new credits could be relevant to power producers using blue or green hydrogen.

The proposed credits would start phasing out based on the timing of a reduction in overall national emissions from electricity production, rather than on specific dates.[26] These credits are phased out for facilities that begin construction in or after the second year after the EPA determines that annual greenhouse gas emissions from the production of electricity are less than 25% of the annual U.S. emissions in 2021.[27] The credit is reduced by 25% for facilities that begin construction in the second year after such determination, by 50% for facilities that begin construction in the third year, and by 100% for subsequent years.[28] The credit amounts would also be enhanced by 10% for facilities located in certain communities, by 10% for facilities which certify that the steel and other products used in the facility were produced in the United States and by 10% for use of nascent clean energy technologies that have less than 3% market penetration.

These new credits would not be available to a facility claiming other clean energy credits. The legislation would prohibit a facility from claiming both the new PTC and the new ITC with respect to the same facility.[29] The legislation would provide that a ''qualified facility'' would not include any facility for a which a credit determined under §45, §45J, §45Q, or §48 has been allowed for the taxable year or any prior taxable year.[30]

The above-described credits would be eligible for a direct payment election, pursuant to which taxpayers could elect to have the credits treated as payments against their tax liability (regardless of whether such tax would have been imposed). Under the proposed legislation, however, taxpayers would be required to provide notice of the election to the IRS before the facility is placed in service and direct payments would be phased out beginning in 2024 (zeroed-out in 2026), for facilities not meeting certain domestic content requirements.[31]

The Clean Energy for America Act also would create a new §45V, which would provide for a technology-neutral incentive in the form of a credit for the domestic production of clean transportation fuels, for which hydrogen fuel could be eligible.[32] A fuel would qualify for the credit if the fuel's lifecycle emissions are less than a baseline rate of 75 kg $CO_2e$ per mmBtu.[33] The amount of the credit is based on the extent to which the lifecycle emissions are below

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ments contained in JCX at 8, 12.

[21] JCX2 states that the phase out rule that applies to the clean fuel production credit, discussed below in the text at Notes 36-38, would apply to the clean hydrogen PTC and ITC as well, although it is not entirely clear whether this cross-reference means the benchmark emissions standard would look only to emissions from the transportation of persons and goods in the United States. *See* JCX2 at 6, 13. It is also unclear whether the phase down for the hydrogen PTC and ITC would be dependent on the year of the beginning of construction (in a manner similar to the phase down of new §45U PTC and §48D ITC, discussed below).

[22] *See* JCX2 at 5.

[23] *See* JCX2 at 5. See discussion below regarding the direct pay election restrictions described with respect to the other clean energy credits that would be introduced or modified by the Clean Energy for America Act.

[24] *See* JCX at 7-15.

[25] The PTC amount stated in the bill is 1.5 cents per kilowatt-hour, adjusted for inflation based on the GDP implicit price deflator in 1992. The formula is the same as that of the current §45 PTC, which is a credit amount of 2.5 cents per kilowatt hour for 2021.

[26] *See* JCX at 8, 13.

[27] *See* JCX at 8, 13.

[28] *See* JCX at 8, 13.

[29] *See* JCX at 7.

[30] *See* JCX, at 7.

[31] *See* JCX2 at 2-3; JCX at 10, 14.

[32] S. 1298, Clean Energy for America Act, 117th Cong., §201.

[33] ''$CO_2e$,'' as defined in proposed new §45V(e)(2), would mean, with respect to any greenhouse gas, the equivalent carbon dioxide amount as determined based on relative global warming



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such baseline and only zero-emission fuels would qualify for the maximum incentive of $1.00 per gallon,[34] indexed for inflation for years after 2023.[35] This credit would phase out over three years beginning after the year the EPA determines that the transportation sector emissions are at or below 25% of 2021 levels.[36] The full credit amount would be available in the year following such determination.[37] In the second and third years after such determination, the credit amount would be 75% and 50%, respectively, of the full amount, and the credit amount would be zero in all subsequent years.[38]

***Modification of Other Credits***

The Clean Energy for America Act includes other proposals that have relevance to hydrogen production, similar to those identified in the Greenbook, such as expansion of the §30C alternative fuel refueling property credit. Under the Clean Energy for America Act, the §30B alternative motor vehicle credit for fuel cell vehicles would be extended and would begin phasing out only after the total annual sales of new fuel cell vehicles and new qualified electric vehicles are greater than 50% of the sales of all new passenger vehicles in the United States.[39] The Act would also modify the §6426 alternative fuel production credit so that hydrogen fuel does not have to be liquefied to qualify for the credit.[40]

The Clean Energy for America Act would also make unique modifications to the §45Q credit for carbon capture and sequestration. It would eliminate enhanced oil recovery as an eligible use of captured carbon but it would increase the payment for carbon from direct air capture facilities to $175 per ton for carbon oxide stored and $150 for carbon oxide that is utilized (with such amounts adjusted for inflation beginning in 2027).[41] The proposal would also add requirements that at least a minimum percentage of carbon oxide (that would otherwise be released) be captured — 75% in the case of an electricity generating facility and 50% in the case of another industrial facility.[42] The credit is phased out for facilities that begin construction in or after the second year after the EPA determines that annual greenhouse emissions from the production of electricity are less than 25 percent of the annual U.S. emissions in 2021.[43] The credit is reduced by 25% percent for facilities that begin construction in the second year after such determination, by 50% percent for facilities that begin construction in the third year, and by 100% for subsequent years.[44]

The legislation would also revise the Residential Energy Efficient Property credit in §25D by restoring the credit amount to 30% for eligible generation and storage where anticipated greenhouse gas emission rates are zero or less.[45] Similar to several of the other proposals, this revised credit would only begin to phase out after emissions from production of electricity are at or below 25% of 2021 levels. Fuel cell property that is used in a home could continue to qualify for this enhanced credit.

## GREEN Act of 2021

The Growing Renewable Energy and Efficiency Now (GREEN) Act of 2021 proposed several tax incentives to encourage green energy. It had been originally introduced in the prior Congress (where it passed the House and died in the Senate), but was reintroduced on February 4, 2021 by Rep. Thompson (D-CA) and co-sponsored by Ways and Means Committee Chair, Rep. Neal (D-MA).[46] The bill was supported by 21 energy, environmental and other organizations, including the American Council on Renewable Energy, the National Wildlife Federation, and the Environmental Defense Fund.[47]

Almost all of the GREEN Act's tax incentives that would affect hydrogen have now been included in some form in the Biden Administration proposals described in the Greenbook, as discussed above, and therefore are not recounted in detail here as well. The GREEN Act did not propose a new PTC for clean hydrogen such as is proposed in the Greenbook. The GREEN Act's tax incentives that would affect hydrogen but that have also been described in the Greenbook include:

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potential. S. 1298, Clean Energy for America Act, 117th Cong., §201.

[34] Fuels with emissions between the baseline rate and zero emissions qualify for a pro-rata portion.

[35] The baseline would decrease over time, requiring fuels to have progressively lower lifecycle emissions in order to qualify.

[36] *See* JCX at 25-26.

[37] *See* JCX at 26.

[38] *See* JCX at 26.

[39] S. 1298, Clean Energy for America Act, 117th Cong., §202(a)(2).

[40] S. 1298, Clean Energy for America Act, 117th Cong., §203(b).

[41] S. 1298, Clean Energy for America Act, 117th Cong., §103(c).

[42] S. 1298, Clean Energy for America Act, 117th Cong., §103(c)(1). These requirements would replace current minimum volume thresholds of captured carbon in order for a facility to be eligible.

[43] *See* JCX at 19.

[44] *See* JCX at 19.

[45] *See* JCX at 15.

[46] H.R. 848, 117th Congress (2021).

[47] Alexis Gravely, *House Democrats Renew Push to Expand Green Energy Tax Breaks*, Tax Notes Today (2021).



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- Reverting to a 30% §48 ITC for qualified fuel cell projects (although with continuation of current caps on amounts) beginning construction through 2026, with step-downs thereafter to 26% (2027) and 22% (2028);
- Expanding the 30% ITC available to energy storage technologies beginning construction through 2026, with step-downs thereafter to 26% (2027) and 22% (2028);
- Allocating new funding for §48C advanced energy projects;
- Extension of the §25D REEP credit;
- An extension of, and an increase in the cap on the amount of, the §30C alternative fuel vehicle refueling property credit; and
- Making the ITC, the PTC, and §45Q credits available, at the taxpayer's election, as direct pay (at 85% of the credit amount for most taxpayers).

The GREEN Act also proposed to extend the §30B alternative fuel vehicle credit and the §6426 alternative fuel excise tax credit but the Greenbook did not speak to these provisions.

## Energy Sector Innovation Credit Act

The Energy Sector Innovation Credit (ESIC) Act, introduced in the Senate Finance Committee by Sen. Crapo (R-ID) and Sen. Whitehouse (D-RI) in April of 2021, is designed to incentivize new clean energy technologies.[48] It would add new ITCs and PTCs for qualifying generation, storage, carbon capture, and hydrogen production technologies. The credit amount would be based on the ''market penetration'' of the applicable technology — the credits would phase out as the technology matures.[49] Once market penetration for a technology reaches 2% the credit would no longer be available.[50]

An ITC of up to 40% (at the lowest level of market penetration) would be available for qualified production facilities, carbon capture equipment, and energy storage technology (including certain hydrogen storage facilities).[51] A PTC for qualifying electricity generation could be as high as 60% (at the lowest level of market penetration) of the lesser of (i) annual gross receipts from the sale of electricity generated at the facility to an unrelated person or (ii) 150% of the national average wholesale price of electricity (in the prior calendar year) multiplied by amount of electricity produced at the facility.[52]

A PTC for clean hydrogen would be up to 60% (at the lowest level of market penetration) of the national average wholesale price of a kilogram of hydrogen (in a prior calendar year) multiplied by the amount of clean hydrogen produced at the facility and sold to an unrelated person.[53] The process must emit less than 2 kg of $CO_2e$ per kilogram of hydrogen produced to qualify and, for a production process with zero emissions, the credit would be doubled.[54]

## ACCESS Section 45Q Act

The Accelerating Carbon Capture and Extending Secure Storage through §45Q Act (the ''ACCESS 45Q Act''), would extend the §45Q credit for carbon capture and sequestration for 10 years (by revising the deadline to begin construction to 2035) and add an elective direct pay option to the provision. It was introduced by Representatives McKinley (R-W.Va.) and Veasey (D-TX) in December 2020 in the previous Congress and was reintroduced in February 2021.[55]

## Energy Storage Tax Incentive and Deployment Act

The ''Energy Storage Tax Incentive and Deployment Act,'' reintroduced in March, would expand the ITC to additional storage projects.[56] Under current law, the ITC is only available for storage technology integrated with certain eligible energy systems (largely limited to solar). The proposed legislation would extend the ITC to other energy storage technologies, including batteries, pumped hydropower, thermal storage, and hydrogen storage, installed in connection with other (non-solar) energy systems.

## Summary of Proposed Federal Legislation

It is unclear at this time which, if any, of these proposed provisions designed to encourage development of the hydrogen economy will be enacted. The only thing that is certain is that there appears to be a clear desire on the part of many federal legislators to implement incentivizing legislation for low-carbon hydrogen project development.

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[48] Discussion draft of Energy Sector Innovation Credit Act, 117th Cong. (2021).

[49] See Note 48, above.

[50] See Note 48, above.

[51] See Note 48, above, at §2 (adding §48D(b)(1)).

[52] See Note 48, above, at §4 (adding §45U(a)).

[53] See Note 48, above, at §5 (adding §45V(a)).

[54] See Note 48, above, at §4 (adding §45V(a)(2), §45V(d)(1)).

[55] H.R. 1062, 117th Congress (2021).

[56] S. 627 and H.R. 1684 (2021). This legislation has been proposed in previous Congresses.



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## STATE-LEVEL INCENTIVES AND PROPOSALS RELATED TO HYDROGEN

State and local tax (SALT) planning for hydrogen-related projects could yield rich opportunities for possible tax benefits and savings. Over the past several decades as hydrogen technology advanced, states have experimented with a variety of approaches to incentivize hydrogen investments. Depending on the project location, possible tax benefits for hydrogen-related projects may include full or partial property tax abatement for the project site, sales tax exemptions or rebates applicable to equipment or technology investments, and/or credits against income or franchise tax on revenue from hydrogen power generation. Some such benefits were adopted as many as 20 or 30 years ago but have been amended and tweaked over time to accommodate new advances in hydrogen technology. Newly emerging state-level incentives, fueled by more recent growth in hydrogen technology investments, offer additional tax benefit opportunities.

Here, we discuss both new and established hydrogen-related SALT incentives. For purposes of this summary review, hydrogen-related incentives are roughly grouped by region because site location decisions for prospective projects often focus on a specific region. As highlighted below, there are some regional trends in how states approach hydrogen incentives but, in general, states vary widely in the type of activity or industry incentivized or in the type of benefit offered. While not the focus of this article, most major capital investments in hydrogen would also likely qualify for other common tax abatements, rebates, exemptions, or benefits available to industrial investment. Depending on a project's location, additional targeted incentives may be available for industries in manufacturing and production, research and development, and other renewable energy or efficiency systems related to carbon capture.

### Western Region

In line with its commitment to becoming a leader in clean fuel for vehicles, California has significant precedent-setting laws and regulations related to alternative fuels and zero-emission standards, although such provisions are not, strictly speaking, tax provisions.[57] For example, California's Low Carbon Fuel Standard program regulates transportation fuels and establishes an emissions trading market through which fuel or power entities are assigned credits and deficits based on greenhouse gas emissions and related factors.[58] Amendments to the program made in 2018 introduced additional credit opportunities for hydrogen refueling infrastructure and for hydrogen which is produced in California and dispensed to alternative fuel vehicles.[59]

A recently-introduced tax credit bill currently under consideration by the California legislature, AB 1312, would further incentivize hydrogen investments.[60] The first-of-its-kind legislation is targeted directly at establishing a hydrogen-fueling network in California. If adopted, AB 1312 would allow credit against California personal and corporate income tax for certain investments to build hydrogen fuel production facilities or hydrogen vehicle fueling stations. Other related distribution costs may also be eligible for the credit. Allowable credits would be calculated based on a percentage of the taxpayer's qualifying investment, with rates lowering over time as state-wide production of hydrogen fuel increases. In effect, the credit is most valuable to early investors. AB 1312 would further require a percentage of all hydrogen which is produced or dispensed in California for motor vehicles to be derived from green hydrogen sources. The bill ramps up the green hydrogen production and distribution requirement to 100% by the end of 2045.

Most Western-region states offer some form of consumer-level limited tax incentives for alternative fuel vehicle purchases or conversions and many have expanded the definition of alternative fuel to include hydrogen. Some states expanded their alternative fuel vehicle tax benefit programs to cover infrastructure expenses for hydrogen production and fueling stations. Washington was the most recent state to do so in 2019 when it expanded its renewable energy sales tax exemptions to include purchases of machinery and equipment integral to renewable hydrogen production facilities and fueling stations.[61] Washington also recently adopted several pieces of legislation intended to promote transition of state transportation systems away from fossil fuels, including a pilot program pro-

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[57] Current programs in California include consumer-level rebates for alternative fuel vehicle investments and regulations related to transportation emission standards. *Cf.* Cal. Health & Safety Code §44274.9 (Zero Emission Assurance Project offering rebates for purchases of batteries and other zero-emissions components for vehicles); Cal. Veh. Code §27156 (Alternative fuel and hybrid electric vehicle retrofit regulations).

[58] Cal. Code Regs. Tit. 17, §95480-§95490 (Low Carbon Fuel Standard).

[59] Cal. Code Regs. Tit. 17, §95483(b)(E) (regarding eligibility), §95486.2 (hydrogen regulation, providing credits for hydrogen transported in gaseous or liquid form, produced via steam methane or electrolysis, and from renewable or fossil-derived feedstocks).

[60] AB 1312, 2021-2022 Reg. Leg. Sess. (Ca. 2021).

[61] Wash. Rev. Code §82.08.816 (defining qualifying infrastructure to include renewable hydrogen production facilities). *See also* Ariz. Rev. Stat. §43-1026 (providing a limited Arizona income tax credit for investments in hydrogen infrastructure).



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viding consumer-level sales and use tax exemption for fuel-cell electric vehicles.[62]

Hydrogen-related tax benefits in California, Montana, and Washington are drafted with emphasis on incentives for renewable or green hydrogen energy systems. For example, Montana's property tax exemption for machinery and equipment used in certain energy generation facilities only applies if the facility is powered by an alternative renewable energy source without hydrocarbon fuel.[63]

In contrast, other states, such as Oregon and Utah, adopted tax benefits which incentivize hydrogen energy systems powered by both renewable and nonrenewable sources including natural gas.[64] On March 22, 2021, Utah Governor Cox signed into law H.B. 223 which enacts refundable corporate and individual income tax credits for production of hydrogen.[65] Utah's refundable tax credit incentive will be applicable both to renewable or green hydrogen production systems and also nonrenewable hydrogen production, such as blue hydrogen, to a limited extent.[66] Eligible taxpayers may apply credits at a rate of $0.12 per kilogram of hydrogen, for up to 5,600 metric tons produced per taxable year.

## Central Region

In 2013, the Texas legislature enacted franchise tax credits for power plants which generate electricity using natural gas or fuel cells which use hydrogen.[67] To be eligible for the credit, new construction projects must capture at least 70% of the carbon dioxide resulting from generation of electricity and have signed an interconnection agreement with ERCOT. Sales tax exemptions and significant property tax abatements are also available in Texas for purchases of equipment used in connection with blue hydrogen projects and related carbon capture activities.[68] North Dakota and Tennessee similarly provide a full sales tax exemption for purchases of machinery and equipment related to hydrogen production facilities.[69]

Alternative fuel motor vehicle incentives for hydrogen are more limited in the central U.S region. Arkansas is one of the few states in the central region which provide tax rebates for both alternative fuel motor vehicles and refueling infrastructure.[70] Texas exempts hydrogen-powered motor vehicles from the state motor vehicle tax but does not extend the benefit to hydrogen distribution infrastructure.[71]

Alabama, Iowa, and South Dakota offer hydrogen-related incentives under each state's respective green energy program and limit tax benefits to green hydrogen production. Alabama allows a credit against income tax calculated based on the amount of qualifying capital investment while Iowa allows a credit against income which is calculated based on kilowatt-hour of energy produced.[72] South Dakota's benefits are offered in the form of property tax exemptions, applicable to facilities which produce and dispense renewable alternative fuels.[73]

## Eastern Region

A few Eastern-region states expressly contemplate and incentivize hydrogen-related investments, with some offering tax incentives targeted specifically at certain blue or green hydrogen opportunities. Compared with the Western states, fewer Eastern-region states have hydrogen-related incentives, even limited ones for consumer purchases of alternative fuel motor vehicles. In many such states without hydrogen incentives, such tax benefits have expired or have been repealed only in the last few years.

Blue hydrogen incentive opportunities may be available in some states which either do not restrict tax benefits to hydrogen produced using renewable energy sources or which specifically contemplate the use of natural gas or other carbon sources as the energy source for hydrogen production. For example, Kentucky allows taxpayers to negotiate with state and local authorities for significant sales and use tax credits available for investments in specific industries in-

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[62] Act Relating to Hydrogen Fuel Cell Electric Vehicles, SB 5000, Chapter 171, 2021 Wa. Laws (effective July 25, 2021).

[63] Mont. Code Ann. §15-6-225(1)(a) (granting exemption), §90-4-102 (defining ''alternative renewable energy source'' to include ''fuel cells that do not require hydrocarbon fuel'').

[64] *Cf.* Or. Rev. Stat. §307.175(1) (allowing property tax exemption for hydrogen energy systems, including nonrenewable hydrogen production). Utah also recently expanded its investment tax credit program to include infrastructure costs related to construction of facilities, including fueling stations, used for the storage, production, or distribution of hydrogen fuel which is used for transportation, electricity generation, or industrial use. Utah Code Ann. §59-7-619(1)(a), §63M-4-602(3). Utah also provides a severance tax exemption for natural gas used in the production of hydrogen fuel for motor vehicles. Utah Code Ann. §59-5-102(8).

[65] H.B. 223, 2021 Gen. Sess. (Utah 2021).

[66] See H.B. 223, 2021 Gen. Sess. (Utah 2021), at §1 (amending the state Renewable Energy Systems Tax Credit program to include hydrogen production) and §2 (enacting a new section incentivizing nonrenewable hydrogen production).

[67] H.B. 2446, 83d Leg., Reg. Sess. (Tex. 2013) (amending the definitions of advanced clean energy project and related franchise tax credits under Subchapter L, Chapter 171, Tax Code).

[68] Tex. Tax Code §11.31(k), §151.334, §151.318(a)(5), §151.318(a)(10).

[69] N.D. Cent. Code §57-39.2-04; Tenn. Code Ann. §67-6-346.

[70] Ark. Code Ann. §15-10-903.

[71] Tex. Tax Code §152.090.

[72] Ala. Code §40-9B-3(a)(10)(i); Iowa Code §476C.2.

[73] S.D. Codified Laws §10-4-44.



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cluding alternative fuel, gasification (converting any carbon material into a synthesis gas composed primarily of carbon monoxide and hydrogen), and carbon dioxide transmission pipelines.[74] Kentucky also exempts from sales tax purchases related to the construction, repair, or modification of a coal-based zero-emission power plant.[75] West Virginia similarly offers a limited incentive: receipts from the sale of natural gas are exempted from the state business and occupations tax if the purchaser will derive hydrogen or carbon oxide from the purchased gas and use the hydrogen or carbon oxide in manufacturing.[76]

Additional hydrogen-related tax benefits available in the Eastern region vary widely: Virginia provides an income tax credit on a per-job basis for each person a taxpayer employs in certain industries including those related to hydrogen and related fuel cell technology.[77] New York allows a complete sales tax exemption for commercial fuel cell electricity generating systems and then further exempts such systems from property tax.[78] Connecticut provides a full sales tax exemption for materials, tools, fuel, machinery, and other equipment used in the manufacture of fuel cells powered by either hydrogen or hydrocarbon fuel.[79] South Carolina provides a sales tax exemption for any device, equipment, or machinery that is (a) operated by hydrogen or fuel cells, (b) used to generate, produce, or distribute hydrogen and designated specifically for hydrogen applications or fuel cell applications, and/or (c) used predominantly for the manufacturing of, or research and development involving, hydrogen or fuel cell technologies.[80]

[74] Ky. Rev. Stat. Ann. §154.31-010(17). *See also* similar related incentive opportunities available under the Incentives for Energy Independence Act at Ky. Rev. Stat. Ann. §154.27-010-154.27-095.

[75] Ky. Rev. Stat. Ann. §139.537.

[76] W.Va. Code §11-13-2d(a)(4).

[77] Va. Code Ann. §58.1-439.12:05(A).

[78] N.Y. Tax Law §1115(kk); N.Y. Real Prop. Tax Law §487(2). The New York Department of Taxation and Finance also recently released a redacted advisory opinion for a taxpayer creating a network of charging stations to supply vehicles powered by fuel cells. The Department concluded that because New York tax law exempts the sale of hydrogen fuel sold directly and exclusively for consumption in a vehicle engine, the taxpayer's sale of hydrogen would not be taxable to consumers. N.Y. Dep't of Tax'n & Fin., TSB-A-20(54)S (Oct. 27, 2020).

[79] Conn. Gen. Stat. §12-412(113).

[80] S.C. Code Ann. §12-36-2120(71). South Carolina did, at one point, have a robust incentive program targeting hydrogen infrastructure development and still has a limited infrastructure tax credit for investments in hydrogen fuel. S.C. Code Ann. §12105(C) (defining qualifying infrastructure to include hydrogen fuel). However, other related South Carolina hydrogen incentives have expired and the state has not expanded its definition of incentivized alternative fuel sources to include hydrogen for fuel cell technology.

## SALT Planning Considerations

In addition to SALT benefits which specifically target hydrogen power, many hydrogen-related projects may also benefit from a growing volume of tax incentives for carbon capture equipment and infrastructure. As many as 20 states are currently considering legislation which would complement the federal §45Q tax credit to promote emerging CCUS technology. Just as with hydrogen-related incentives, states have proposed a variety of different approaches to incentivize carbon capture and sequestration, including income tax rebates or credits, exemptions from sales tax or property tax for certain carbon capture equipment, and related mineral tax reductions and abatements.

With proper tax planning, significant SALT benefits may be available for any given hydrogen project but may vary significantly depending on the location of the investment. Businesses looking to make a hydrogen investment should monitor the status of pending legislation and plan to take advantage of tax incentives available at the state and local level.

# TAX POLICY – KEY TO THE HYDROGEN ECONOMY

Hydrogen investment in the United States is on a growing trajectory but seems to be outpaced by investment in the EU and Asia, a result of favorable government policies in those jurisdictions supporting the hydrogen industry.[81] To meet President Biden's goal of a carbon-free power sector by 2035, support for hydrogen investment will be indispensable.

Federal tax credits have been essential in scaling the deployment of wind and solar generation;[82] similar incentives are likely key to growing the U.S. hy-

[81] See generally Part I of this article for a discussion of recent and ongoing U.S. projects. See Appendix (in Part I) for a description of hydrogen incentives in certain other countries. Last year, the Hydrogen Council projected that the cost of blue and green hydrogen production could fall by up to 60% over the next decade. Hydrogen Council, *Path to hydrogen competitiveness: A cost perspective* (2020). *See also* J.Bartlett and A. Krupnick, *The Potential of Hydrogen for Decarbonization, Resources for the Future* (Feb. 4, 2021), https://www.resources.org/common-resources/the-potential-of-hydrogen-for-decarbonization-reducing-emissions-in-oil-refining-and-ammonia-production/.

[82] See Note 84 and Note 85, below. Costs for electricity from utility-scale solar photovoltaics (PV) fell 82% between 2010 and 2019, and costs for onshore and offshore wind have declined 39% and 29%, respectively, during that same period. International Renewable Energy Agency, Renewable Power Generation Costs in 2019 (2020). Renewable power generation costs have been driven down as a result of steadily improving technologies, economies of scale, competitive supply chains and growing developer experience.



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drogen industry.[83] The ITC could clearly play a significant role in growing the U.S. hydrogen economy; it has been very successful in spurring investment in solar projects.[84] Although current §48 offers an ITC for qualified fuel cell property which is defined to include certain fuel cell power plants that convert hydrogen fuel to power, it does not apply to investment in facilities that solely produce hydrogen. Accordingly, enactment of an ITC that covers not just investment in fuel cell power plants but also investment in low-carbon hydrogen facilities is needed if construction of such facilities is to be incentivized.

Completely missing from the currently available energy-related federal tax incentives menu is a PTC for the production of clean or low-carbon hydrogen. The §45 PTC has been seen as central to the growth of U.S. wind power capacity,[85] which has doubled since 2010.[86] As of 2019, wind power accounted for 30% of utility-scale power capacity additions over the prior decade, and in 2019 alone $14 billion was invested in new projects.[87] Enactment of a new PTC for the production of clean hydrogen (specifically, one based on the amount of hydrogen produced, not the amount of power produced using hydrogen), as has been proposed in both the Clean Energy for American Act and the Greenbook, would provide a clear, direct incentive for clean hydrogen production. In tandem with enactment of an ITC for investment in clean hydrogen facilities, enactment of a PTC for clean hydrogen production would allow investors in hydrogen to determine which credit provides the greatest value given a particular facility's expected cost/production profile.

In either case, since green hydrogen is produced using electricity from renewable sources such as solar or wind that may have already benefitted from tax credits under §45 and §48, consideration will need to be given to coordination between availability of tax credits for the power production under §45 or §48 (or for carbon sequestration under §45Q in the case of blue hydrogen) and availability of tax credits for the clean hydrogen production or power production from clean hydrogen. Certain of the legislative proposals described above, such as the Clean Energy for America Act, show that legislators have already recognized the need for coordination and may propose to resolve it by restricting availability of the PTC for clean hydrogen production to facilities that have not taken the credits applicable to renewable energy or carbon capture.

Pipeline transportation and storage of hydrogen should not be forgotten when incentives are being considered. Incentivizing development of the infrastructure that can move hydrogen, perhaps by repurposing existing natural gas pipelines, is an essential part of the hydrogen economy. Pipelines will allow transport of hydrogen without the negative carbon footprint of transport by truck. In addition, the existing natural gas infrastructure assets also function as long-term storage assets. Converting natural gas pipelines and storage assets to allow them to transport and store hydrogen can occur for much less cost than construction of new pipelines and tanks. Such conversions could be incented with a tax credit, but no introduced legislation has yet proposed a credit targeted directly at pipeline transportation.

Experience with the credits offered to wind and solar investors has shown that incentivizing tax equity investment with credits works best when the credit does not have a quick sunset. As pointed out in Treasury's report on the Made in America Tax Plan, the PTC for renewable electricity producers lapsed and was retroactively extended five times between 1999 and 2015,[88] leading to uncertainty for both developers and investors in such projects. The seemingly endless cycle of one or two year-extensions of the credits for wind and solar investors had a chilling effect on investment each time renewal of the credits was in doubt.[89] Hopefully, whatever hydrogen tax incentives are eventually enacted will not be similarly handi-

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[83] See Stephen Lee, *Green Hydrogen Backers See Opening in Biden Climate Ambition* (Feb. 3, 2021), https://news.bloombergtax.com/daily-tax-report/green-hydrogen-backers-see-big-chance-for-sector-development; Emma Penrod, *New Tax Credits are Best Option to Spur Clean Hydrogen, Resources for the Future Analysis Finds*, Utility Dive, (2021), https://www.utilitydive.com/news/new-tax-credits-are-best-option-to-spur-clean-hydrogen-resources-for-the-f/596438.

[84] According to the Solar Energy Industries Association, after its passage in 2005, the solar ITC led to the doubling of installed solar electric capacity by 2007. Solar Energy Industries Association, *The Case for the Solar Investment Tax Credit* (2021), https://www.seia.org/case-solar-investment-tax-credit-itc. In 2019, the United States was the second largest solar panel market in terms of installations. *See* Globe Newswire, *The United States Solar Energy Market is Expected to Grow at a CAGR of 17.32% during 2020-2025,* Markets Insider (2020).

[85] *See* Congressional Research Service, The Renewable Electricity Production Tax Credit: In Brief 9 (Apr. 29, 2020), https://fas.org/sgp/crs/misc/R43453.pdf (citing several studies that suggest the PTC has driven investment and contributed to growth in the wind industry).

[86] Mary Pressler, *2019 Outlook for the US Wind Power Industry*, Energy Central (2019).

[87] American Wind Energy Association, Wind Powers America: Annual Report 2019 (2019).

[88] U.S. Department of the Treasury, The Made in America Tax Plan (2021), https://home.treasury.gov/system/files/136/MadeInAmericaTaxPlan_Report.pdf.

[89] Erin Dewey, *Sundown and You Better Take Care: Why Sunset Provisions Harm the Renewable Energy Industry and Violate Tax Principles,* 52 B.C. L. Rev. 1105, 1132 (2011) (''[U]ncertainty about the actual existence of the PTC (which is required to make renewable projects cost competitive) chills private investment in



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capped.

the renewable energy industry.''). *See also* World Resources Institute, *What the Clean Energy for America Act Gets Right — And How it Can Improve* (2021) https://www.wri.org/insights/what-clean-energy-america-act-gets-right-and-how-it-can-improve (noting that ''short-term extensions have historically led to boom and bust cycles of clean energy technologies'').



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The Biden Administration appears poised to implement sweeping new incentives for hydrogen investment. With enactment of such proposals, hydrogen can be expected to take its place beside wind and solar as a significant contributor to attainment of the country's ambitious climate goals.



ISSN 0148-8295