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Internal Revenue Service
CC:PA:LPD:PR (Notice 2022-49)
Room 5203
P.O. Box 7604,
Ben Franklin Station
Washington, DC 20044

RE: Comments on Notice IRS-2022-0049 and IRA §13102

The Fuel Cell and Hydrogen Energy Association (FCHEA) appreciates the opportunity to respond to the Department of Treasury's Request for Comments on Certain Energy Generation Incentives.

FCHEA is the national industry association representing over eighty-five leading companies and organizations advancing innovative, clean, safe, and reliable hydrogen energy technologies and solutions. FCHEA's members represent the entire global supply chain of the fuel cell and hydrogen industry including fuel cell and electrolyzer stack and system manufacturers, component suppliers, vehicle manufacturers, aviation companies, hydrogen producers, transporters, fuel distributors, utilities, end-users, and more. For over 30 years, FCHEA has provided a consistent industry voice to policymakers and regulators, working with Congress and administration officials to educate decisionmakers and support hydrogen-focused tax and policy incentives.

FCHEA is a longtime advocate of hydrogen, its potential uses, and its contribution to a clean energy future. For years, FCHEA has provided advice, guidance, and served as a resource for the DOE, Department of Transportation (DOT), Department of the Treasury (Treasury), federal policymakers, and other industry leaders. FCHEA appreciates the Biden Administration’s commitment to developing an investment tax credit for hydrogen storage property and looks forward to being a resource to IRS and Treasury throughout the guidance process. FCHEA offers these comments leveraging its leadership, mentorship, and expertise within the hydrogen industry.

The Biden Administration has set bold national decarbonization goals, including 100 percent carbon pollution-free electricity by 2035 and net-zero GHG emissions by 2050. Hydrogen energy is increasingly viewed as an essential decarbonization option across the United States and around the world for a wide range of sectors. The Road Map to a US Hydrogen Economy report found that hydrogen could constitute 14 percent of the US energy demand, resulting in a 16 percent national reduction in CO$_2$ emissions and 36 percent reduction in NO$_x$ emissions, a significant win for mitigating climate change and improving public health. In addition, the Road Map further estimates that by 2050 the hydrogen sector would generate $750 billion per year in revenue and create 3.4 million jobs, demonstrating this sector’s incredible economic as well as environmental potential.
Recognizing hydrogen’s crucial role in decarbonization, the Biden Administration has provided critical support for the growing hydrogen economy. A pillar of the Biden Administration’s support for key clean hydrogen programs is the inclusion of $9.5 billion in the Infrastructure Investment and Jobs Act, the centerpiece of which is the Regional Clean Hydrogen Hubs initiative. This program recently announced $7 billion in funding for 6-10 projects to develop holistic large-scale hydrogen production, distribution, and utilization networks across the country. This support, including the recent draft publication of the first National Clean Hydrogen Strategy and Roadmap by the Department of Energy (National Hydrogen Strategy), shows the commitment that the executive branch has made to the hydrogen economy. Another pillar of the Biden Administration’s support for key clean hydrogen is Section 13204 of the IRA, which created the clean hydrogen production tax credit under Section 45V of the Internal Revenue Code. A third pillar that has not received as much attention as the first two pillars is the new investment tax credit for energy storage technology that includes hydrogen under Section 48(c)(6)(A)(i).

Hydrogen storage is a critically important feature of the hydrogen economy and our national decarbonization plans. To understand why, it is helpful to review some basic properties of both electricity and hydrogen. Electricity is ephemeral, gone in an instant like a flash of lightning. This means electricity must be converted to chemical energy (such as a lithium-ion battery) or mechanical energy (such as pumped hydro) in order to be stored in time. By contrast, hydrogen is itself a form of energy storage: one kilogram of hydrogen contains the energy equivalent of between approximately 33.6 kilowatt-hours (using the lower heating value) and 39.4 kilowatt-hours (using the higher heating value).1 As a molecule, hydrogen can be handled in either gaseous or liquid phase. And as the simplest, most abundant element in the universe, hydrogen is also a building block for other molecules, including compounds which can store and convey hydrogen’s energy. As the National Hydrogen Strategy (page 17) states, “hydrogen [is] a versatile energy carrier and chemical feedstock [that] can couple baseload power with variable generation to offer resiliency and energy storage [and] then be used as a fuel or feedstock for applications that lack competitive and efficient clean alternatives.” These three key features of hydrogen – (1) its versatility as an inherent energy carrier itself, (2) its ability to shore up intermittent renewables as a form of decarbonized baseload power, and (3) its chemical properties as a building block for low-carbon and fully decarbonized fuels like methanol and ammonia – make hydrogen a perfect complement to electrification through renewables. Thus, hydrogen storage is central to the hydrogen economy and our national decarbonization plans, and the hydrogen storage investment tax credit under Section 48(c)(6)(A)(i) merits our close attention to ensure maximal impact.

Congress was certainly aware of hydrogen’s inherent energy storage properties and the need to incentivize hydrogen storage infrastructure when it passed the Inflation Reduction Act. The most obvious evidence of Congress’s intent to incentivize hydrogen storage infrastructure is the legislative text of Section 13102 of the IRA, which amends Section 48(c) of the Internal Revenue Code to create a new investment tax credit for energy storage technology that includes hydrogen by adding a new Section 48(c)(6)(A)(i) as follows (emphasis added):

(6) ENERGY STORAGE TECHNOLOGY.—

‘‘(A) IN GENERAL.—The term ‘energy storage technology’

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1 See e.g., Sandia National Laboratories, “Practical Application Limits of Fuel Cells and Batteries for Zero Emission Vessels,” November 2017, with figure 2.3 assuming a lower heating value of hydrogen at 119.46 MJ/kg, or approximately 33.6 kWh/kg of hydrogen. See, also, National Academy of Engineering, “The Hydrogen Economy: Opportunities, Costs, Barriers, and R&D Needs”, 2004, with Appendix H assuming a higher heating value of hydrogen at 141.9 MJ/kg, or approximately 39.4 kWh/kg of hydrogen.
means—

“(i) property (other than property primarily used in the transportation of goods or individuals and not for the production of electricity) which receives, stores, and delivers energy for conversion to electricity (or, in the case of hydrogen, which stores energy), and has a nameplate capacity of not less than 5 kilowatt hours, and

FCHEA believes that the parenthetical “(or, in the case of hydrogen, which stores energy)” is properly interpreted with respect to hydrogen storage property as if it said “property (other than property primarily used in the transportation of goods or individuals and not for the production of electricity) which receives, stores, and delivers hydrogen, and has a nameplate capacity of not less than 5 kilowatt hours”. This would interpret the words “which stores energy” as though they were describing hydrogen, as opposed to drawing a distinction between hydrogen used in energy applications versus hydrogen used for its chemical properties. FCHEA believes that with the parenthetical, Congress intended to make clear and draw attention to the fact that hydrogen itself stores energy, and therefore any hydrogen storage property which has a nameplate capacity of not less than 5 kilowatt hours and satisfies the other requirements of Section 48(c)(6) qualifies.

Applying the 5-kilowatt hour minimum capacity requirement to hydrogen storage facilities requires making some baseline assumptions about hydrogen’s physical properties, which can differ depending upon physical conditions and applications. Assuming a lower heating value of 33.6 kWh/kg of hydrogen and a higher heating value of 39.4 kWh/kg of hydrogen, a minimum hydrogen storage nameplate capacity for purposes of satisfying the 5-kilowatt hour threshold would be between approximately 125 g and 150 g of hydrogen by weight. The minimum storage volume for a gaseous hydrogen “energy storage technology” for purposes of Section 48(c)(6)(A)(i) depends on the operating pressure and temperature of the storage vessel. As an example, at ambient temperature and 140 bar pressure, the storage volume required to store 125 g or 150 g of hydrogen would be approximately 0.4 or 0.5 cubic feet, respectively. Smaller volumes would be required for storage at higher pressures and larger volumes required at lower pressures. Assuming a hydrogen liquid-to-gas expansion ratio of 1 to 845, the minimum storage volume for a liquid hydrogen “energy storage technology” for purposes of Section 48(c)(6)(A)(i) would be between approximately 0.063 and 0.075 standard cubic feet.

FCHEA is concerned that the parenthetical “(or, in the case of hydrogen, which stores energy)” could be improperly interpreted to impose specific use limitations on the stored hydrogen. For instance, if a hydrogen storage facility was required by the IRS to prove that the hydrogen stored in such facility was used solely in energy-related activities, the investment tax credit would be unworkable and would go unutilized. By way of example, imagine an underground salt cavern hydrogen storage facility under development on the U.S. Gulf Coast that, once constructed, will be interconnected by pipelines into a natural gas power plant, a crude oil refinery and an ammonia synthesis facility. Imagine further that the ammonia synthesis facility is collocated near a rail terminal and deepwater export terminal. Would the hydrogen ultimately used by the natural gas power plant qualify as hydrogen “which stores energy”? Probably, assuming the hydrogen is being blended with natural gas and the blend combusted to spin the power plant’s generating turbine. Would the hydrogen ultimately used by the crude refinery qualify as hydrogen “which stores energy”? Probably not, because despite being an energy-related use case the hydrogen is ultimately being used for its chemical properties as a catalyst to desulphurize the crude oil rather than for the hydrogen’s inherent energy content. Would the hydrogen used as feedstock into the ammonia synthesis qualify as hydrogen “which stores energy”? It would depend upon the ammonia’s ultimate use. Ammonia
loaded onto railcars and used as fertilizer on a Midwestern farm would probably not qualify because the hydrogen is being used for its chemical properties as a nitrogen building block. Ammonia loaded onto railcars and used as fuel to operate next-generation decarbonized farming equipment on that same Midwestern farm probably would qualify. Would ammonia loaded onto marine vessels and shipped to Europe and East Asia qualify? Suppose the hydrogen was to be cracked back out from the ammonia upon arrival overseas and then distributed through a purity hydrogen transmission and distribution pipeline network. Perhaps it would qualify if the ultimate use case was energy-related but would not qualify if the ultimate use case was chemical-related. But who will be tracing, monitoring and recording all of these hydrogen molecules as they expand out into domestic and international markets? And at whose expense? FCHEA hopes that these examples demonstrate to the IRS that imposing any sort of use limitation on the hydrogen stored in “energy storage technology” under Section 48(c) will create hydrogen and ammonia molecule tracking requirements far beyond the capabilities of any potential hydrogen storage developer. As a result, any such use limitation – even one that superficially seems practical, such as a “no less than 50%” bright-line test – would render the parenthetical “(or, in the case of hydrogen, which stores energy)” completely useless, thereby contradicting Congressional intent and the Biden Administration’s goals of incentivizing hydrogen storage as a key component of the National Hydrogen Strategy and the nation’s decarbonization aspirations.

Finally, precisely because hydrogen is so versatile as an inherent energy storage medium itself, is capable of being stored in various phases and forms, and is a building block for low-carbon and fully decarbonized fuels like methanol and ammonia, FCHEA’s members believe that receiving guidance from the IRS setting forth a wide variety of specific real-world examples of hydrogen storage will be critical to the long-term success of the hydrogen economy. Of particular importance will be clear guidance from the IRS describing which of the related equipment should be considered as part of the eligible basis upon which the investment tax credit is to be applied and providing specific examples. To that end, FCHEA and its members hereby provide the following list of hydrogen storage property that the sector believes should be eligible under the hydrogen storage investment credit, consistent with the association’s multi-year discussions with Members of Congress and Senators.

FCHEA proposes the following framework by which the IRS should consider what constitutes hydrogen storage property:

- **First**, use conventional electrical battery storage as an analogue for this framework only and include any hydrogen storage property that is analogous to ITC-eligible electrical battery storage property;
  - This would include the storage receptacle itself, categorized as follows:
    - For surface facilities: storage receptacles of all types, including all pressure vessels, piping, valves, cylinders, and tanks (pressurized or not);
    - For underground salt caverns: all equipment required for the creation and operation of the salt cavern, including leaching equipment, electrical substation improvements, freshwater wells and disposal wells, brine ponds, brine pumps, and related infrastructure as well as the infrastructure and equipment required to maintain the “pad” or “cushion” hydrogen gas that is required to remain in the salt cavern at all times in order to maintain the salt cavern’s minimum operating pressure;
    - For other subsurface facilities: all equipment required to make a depleted oil and gas reservoir, aquifer or other underground formation suitable for hydrogen storage.
This would also include all appurtenant equipment, fixtures, control systems, treating facilities, compressors, pumps, cryogenic systems and improvements necessary and integral to the operation and maintenance of the hydrogen storage receptacle, irrespective of whether located above- or below-ground;

- **Second**, recognize that unlike electricity hydrogen is a molecule and therefore can be more densely stored as a liquid or a solid than as a gas, so include equipment necessary to change hydrogen’s phase of matter from gas to liquid to solid and back again from solid to liquid to gas to the extent such equipment is integral to the hydrogen storage facility;
  - This would include all liquefaction and regasification equipment;

- **Third**, recognize that (a) unlike electricity hydrogen is capable of being stored in massive, seasonal quantities (over 100GWh, which presents a perfect solution to renewables’ key time-and-space limitations, i.e., intermittency in terms of time of generation and geographic limitations in terms of location of the best wind and solar resources, and is over 100 times larger than the largest battery storage facilities) in unique underground geologic features (currently limited to salt caverns, with the potential for future suitable storage sites in depleting oil and gas fields and aquifers), and (b) unlike electrical battery storage which is very easy and flexible to locate, such suitable geologic formations are immobile and in the case of salt caverns must be intentionally created through solution-mining, so therefore include equipment and facilities required to transport hydrogen to and from and into and out of hydrogen storage facilities;
  - This would include all dedicated pipelines and associated compression (including electrical power dedicated to such compression), and in the case of underground salt caverns would also include all equipment required for the creation of the salt cavern (including leaching equipment, electrical substation improvements, freshwater wells and disposal wells, as well as the “pad” or “cushion” hydrogen gas that is required to remain in the salt cavern at all times in order to maintain the salt cavern’s minimum operating pressure);
  - This would also include all dedicated hydrogen distribution equipment (including tube trailers, railcars, and cryogenic liquid tanker trucks)

- **Fourth**, recognize that unlike electricity hydrogen is a chemical building block for other molecules which are capable of more efficiently carrying hydrogen, especially ammonia and methanol, so include property that facilitates use of ammonia, methanol and other hydrogen carriers as hydrogen energy storage property;
  - This would include conversion equipment and storage receptacles and all appurtenant equipment, fixtures and improvements necessary and integral to the operation of such ammonia and methanol storage receptacles, and equipment for cracking these molecules back to hydrogen.

Please note that above referenced list of facility equipment is not meant to be exhaustive, but to provide a robust example. As technology in the energy industry continues to evolve it is important that provisions such as this not be overly prescriptive to the detriment of advancements.

With regard to the Clean Electricity Investment Credit, section 48E, FCHEA requests clarification that “qualified fuel cell properties” under the existing section 48 investment tax credit (ITC) are similarly included within the section 48E clean electricity investment credit’s definition of “qualified
facility,” so long as such facilities meet emissions criteria and placed in service requirements of section 48E.

The section 48 investment tax credit is currently available for any qualified fuel cell property beginning construction before January 1, 2025. Following the sunset of the section 48 ITC for qualified fuel cell properties, we are hopeful that section 48E clean electricity investment credit affords similar incentives as the “qualified fuel cell properties” covered under the section 48 ITC. Section 48E solely provides that a “qualified facility” is a

(i) facility “used for the generation of electricity” [emphasis added],”
(ii) placed in service after December 31, 2024,
(iii) which has an anticipated greenhouse gas emissions rate not greater than zero.

We recommend that the lack of limiting language around “used for the generation of electricity” evidences legislative intent inclusive of a wide-range of facility types. Section 48E and its legislative history in no way suggest that this credit is limited to large-scape, grid-connected electricity generating properties. The statutory language is broad, inclusive, and technology agnostic. Furthermore, the coordinated effective dates of section 48E and section 48 ITC further suggest that Congress intended to maintain continuity across these two frameworks.

FCHEA is appreciative of the opportunity to provide these comments on the investment credit for hydrogen storage in IRC sec. 48. The association and its members are dedicated to supporting the Administration however necessary to ensure that the Inflation Reduction Act guidance on hydrogen tax incentives accurately reflects the scientific and business realities of the hydrogen sector. Please feel free to contact FCHEA CEO Frank Wolak at FWolak@FCHEA.org with any comments or questions you may have regarding this submission or any other hydrogen related issue.

Sincerely,

Frank Wolak
President & CEO
Fuel Cell and Hydrogen Energy Association