Xcel Energy Comments on Section 45V Credit for Production of Clean Hydrogen
Docket ID No. IRS-2023-0066/REG–117631–23

Xcel Energy Inc. offers these comments on the Department of the Treasury's ("Treasury's") proposed guidance implementing the tax credit for production of clean hydrogen under Section 45V of the Internal Revenue Code and section 13204 of Public Law 117-169, the Inflation Reduction Act ("IRA"). 88 Fed. Reg. 89220 (Dec. 26, 2023).

Executive Summary

Xcel Energy is a public utility holding company serving over 10 million individual energy consumers across eight western and midwestern states, extending from nearly the Canadian border to the Mexican border. The company is a clean and renewable energy leader and was the first utility to establish a goal to provide its customers with carbon-free electricity by 2050 and Net-Zero emissions in the natural gas local distribution company ("LDC") by 2050. Xcel Energy is also a key participant in the "Heartland Hydrogen Hub" ("HH2H"), which was selected through a competitive process for a grant under the Department of Energy's ("DOE's") hydrogen hub program through the Infrastructure Investment and Jobs Act ("IIJA"). DOE believes our project and its multiple hydrogen production and use pathways will be a catalyst for developing a robust hydrogen market.

As a result of our clean energy leadership, we have long recognized that clean hydrogen will play a critical role in the company's and the nation's quest for a low-carbon, clean energy future. Xcel Energy's strategy is based on adding vast amounts of renewable energy to the grid and retiring coal and other fossil generation, but we cannot achieve a carbon-free electric system with renewable energy alone; we need cost effective, low- or carbon-free dispatchable resources, including electric generation powered by hydrogen and hydrogen-derived clean fuels. These resources will help

ensure that we transition to clean energy without affecting system reliability. In the same way, in Minnesota, Colorado, Wisconsin and other cold climates we serve, we cannot rely solely on electrification to achieve our net-zero vision for our gas LDC; we also need hydrogen or hydrogen-derived clean fuels as part of a portfolio of clean energy resources. Finally, through our leadership in hydrogen, we can support carbon reduction in other sectors of the economy; we can produce hydrogen to provide a direct supply to other, hard-to-decarbonize sectors like agriculture, steel, heavy-duty transportation, and other energy intensive industries in our service territories.

Consistent with the spirit and the letter of Section 45V, Treasury's guidance should maximize the flexibility necessary to promote the creation of the infrastructure and ecosystem necessary to develop a hydrogen economy. Unfortunately, Treasury's proposal falls far short of that goal. In these comments, we offer several suggested changes to the 45V guidance that are consistent with the IRA's legislative language and intent, while preserving the environmental integrity of the guidance and providing a reasonable pathway to the development of clean hydrogen in the U.S. Specifically:

- Treasury should modify its incrementality provisions so that the use of ten percent of clean electricity from existing wind, solar, nuclear and other existing clean electricity generators would qualify for the hydrogen credit, with a process for allowing a higher percentage in instances of sustained curtailed renewable energy resources.
- Treasury should delay the transition to hourly matching of clean energy generation and hydrogen production until the industry has time to develop hydrogen technologies and build the infrastructure necessary to support a hydrogen economy and drive down the cost of production. Treasury should move away from annual matching to hourly matching no earlier than 2032. Treasury should allow hydrogen production assets that qualify for the tax

credit under an annual matching regime to retain annual matching for the duration of their 10-year credit applicability. A switch from annual to hourly matching partway through an asset's 10-year credit life increases project risk and uncertainty unnecessarily and will adversely affect adoption and cost of hydrogen technology.

- Treasury should clarify that there must be a closer interconnected relationship between the clean energy generator and the hydrogen production facility to ensure that regional emissions would not increase because of greater distances between facilities.

Our comments present more details on these and other recommendations associated with the guidance.

Xcel Energy is committed to clean energy, but its commitment has always been bounded by the guardrails of affordability and reliability. As described in our comments, Treasury's rigid approach to its 45V guidance would dramatically increase the cost of hydrogen production and delay large-scale clean hydrogen implementation. The proposed guidance would impede the near-term adoption of hydrogen and other clean fuels not only in the gas and electric sectors but also in other, hard-to-decarbonize sectors. Ultimately, the guidance would result in more greenhouse gas emissions by slowing the development of a clean hydrogen economy and delaying the reduction in emissions associated with the nation's fossil fuel generation and heating assets.

Our internal analysis shows that the proposed 45V guidance would increase our cost of hydrogen production in Minnesota by a minimum of 70% and restrict the development of some of the lowest-

cost, "ready-now" hydrogen projects. Other studies have shown a much higher impact.[1, 2] Given that Minnesota and all of Xcel Energy's service territories are in regions of the U.S. with access to some of the most abundant and lowest cost renewable resources, we expect the impact of the proposed guidance to be much greater in other parts of the country.

Our customers and our economy rely upon access to readily available, low-cost energy. And our clean fuels strategy is premised on the belief that the "clean hydrogen premium" over other gaseous fuels would be dramatically reduced through time as scale and technology benefits accrue to end use customers. The 45V tax credit is a critical "bridge" to that reduction. Unfortunately, if Treasury advances the guidance as proposed, the company, our customers, policymakers, and other stakeholders would be compelled to undertake a reevaluation of our clean hydrogen strategy, including our commitment to the HH2H. Other companies and hydrogen developers would have to make similar calculations.

For these reasons, we urge Treasury to adopt the changes set forth in these comments and help ensure that the implementation of 45V is both environmentally credible and supportive of the development of the nascent hydrogen economy.

Xcel Energy and Hydrogen

Xcel Energy, a public utility holding company headquartered in Minneapolis, Minnesota, provides electricity to 3.8 million electricity customers in eight states and 2.1 million natural gas customers in

[1] E3, E3 and ACORE Publish New Report Comparing Hourly and Annual GHG Emissions Accounting and Associated Costs for Clean Hydrogen, (April 25, 2023), available at https://www.ethree.com/e3-and-acore-publish-new-report-comparing-hourly-and-annual-ghg-emissions-accounting-and-associated-costs-for-clean-hydrogen/

[2] Wood Mackenzie, Green Hydrogen: What the Inflation Reduction Act Means for Production Economics and Carbon Intensity, (March 14, 2023), available at https://www.woodmac.com/news/opinion/green-hydrogen-IRA-production-economics/

Minnesota, Colorado, Texas, Wisconsin, North and South Dakota, New Mexico and Michigan, ultimately serving over 10 million individual energy consumers in those states. We were the first energy provider in the nation to announce comprehensive goals to deliver net-zero energy across the most significant ways our customers use energy – electricity, heating and transportation. We are well on our way to achieving these goals, having already reduced carbon dioxide emissions by 54% from the electricity that serves our customers, compared to 2005 levels. Excluding hydrogen, we expect more than $25 billion in new generation assets to be deployed in our service territories by the end of this decade to reduce emissions more than 80% from 2005 levels and more than double our renewable capacity, adding more than 20,000 MW of wind and solar energy across our territory.

Our clean energy strategy is bounded by two guardrails: affordability and reliability. We can make amazing progress toward our carbon goal by building out our renewable portfolio, but renewable energy alone cannot achieve a carbon-free system. We need low cost, zero carbon dispatchable resources to balance the grid. We also need clean fuels like hydrogen – in combination with efficiency, electrification and other strategies – to help enable our net-zero goal for our natural gas system.

For that reason, low cost, clean hydrogen is an important part in our strategy to achieve our clean energy goals. We anticipated applying the benefits of the hydrogen production tax credit to ensure we can meet our carbon reduction goals reliably while managing customer costs.

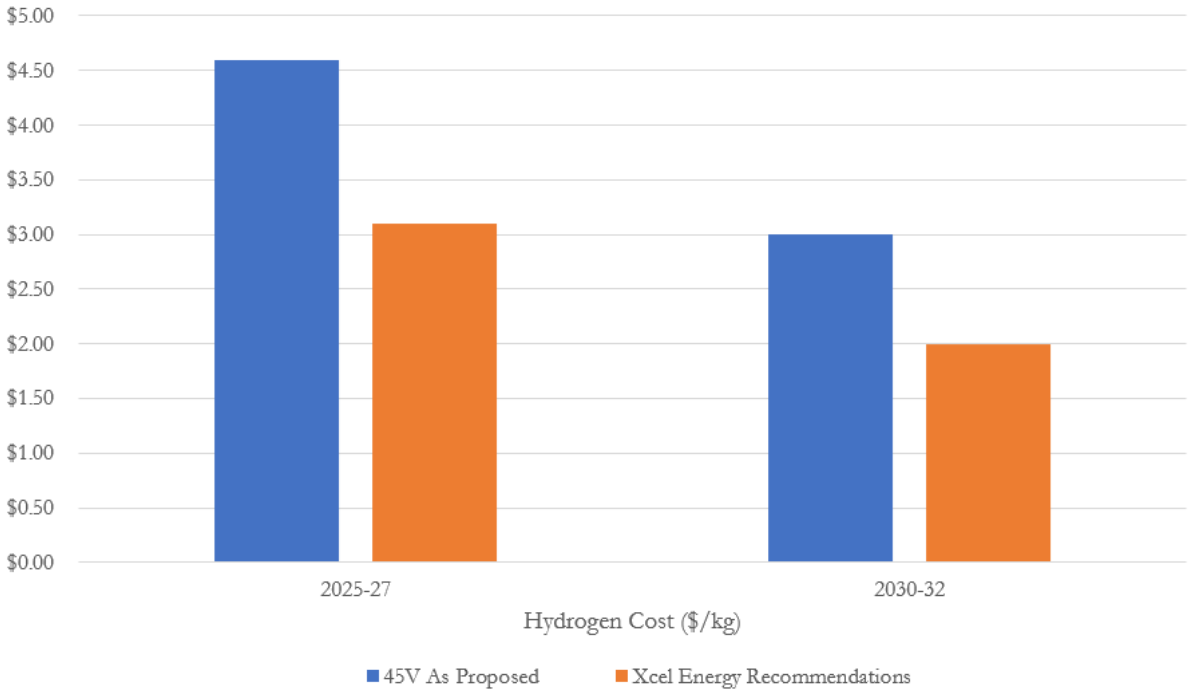
Xcel Energy is a key project partner in the HH2H, which was selected for award negotiation in the DOE's Hydrogen Hub program under the IIJA. The HH2H in the Upper Midwest involves Minnesota, North Dakota, Wisconsin, and Montana. Our participation in this hub project takes

advantage of our existing and growing renewable (green hydrogen) energy generation portfolio and our existing nuclear (pink hydrogen) generation in Minnesota. We similarly proposed a hydrogen hub in Colorado, and we continue to work to develop our plans for clean hydrogen infrastructure there and across our service territory.

While the DOE grant is beneficial in reducing new technology cost and risk of the HH2H, an important consideration for our customers and our regulators, it is not enough to make the hydrogen produced by our projects cost competitive. Without changes to the 45V tax credit so that we can couple the tax credit and the grant, these projects are unlikely to advance as proposed.

The chart below shows our internal projection of the cost of hydrogen under the 45V proposal and compares it to the cost of hydrogen as modified by our comments. This estimate does not include the cost of storage or transportation. As the chart makes clear, the cost of hydrogen under the proposed guidance would be substantially higher under the proposal:

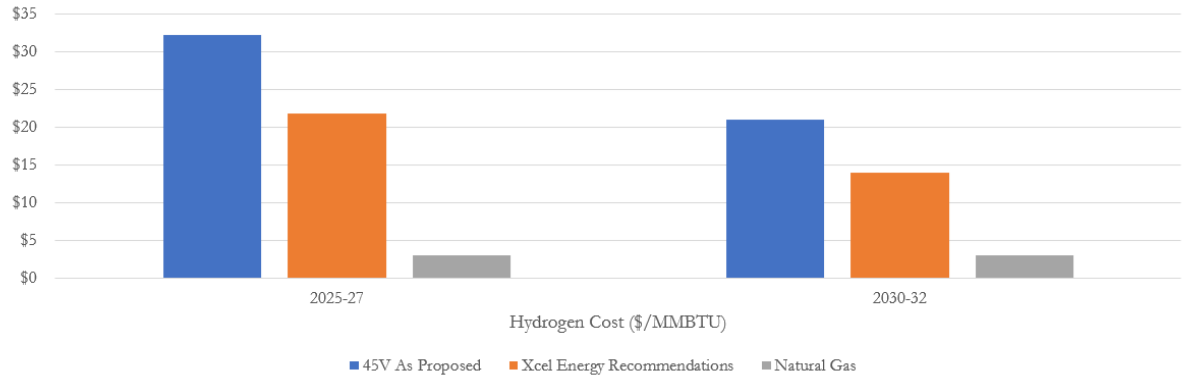
Figure 1 - Effect of Proposed 45V Rule on Hydrogen Cost
(Includes $3/kg PTC but excludes transportation and storage)



The 45V proposal would result in substantially higher hydrogen costs than the approach advocated by Xcel Energy. Treasury's proposed approach in the guidance would slow the development of a hydrogen economy to a crawl; electric generation companies would not voluntarily adopt, system operators would not dispatch, and state Public Utilities Commissions would not approve, more than a small number of pilot projects at the costs resulting from Treasury's guidance.

This fact is made clear by the energy cost of hydrogen. Energy cost is a critical comparative price point for Xcel Energy but is often overlooked in the hydrogen debate. Xcel Energy's planned hydrogen consumption will blend with and displace natural gas usage on our generation and LDC system (as opposed to many agricultural and industrial processes that are displacing grey hydrogen). Hence the "clean hydrogen premium" – the comparison to the cost of natural gas – is critical from a customer affordability perspective and needs to be minimized to encourage widespread adoption. The below graphic shows that potential premium:

Figure 2 - Green Hydrogen Premium is significant when Compared to Cost of Natural Gas (Includes $3/kg PTC but excludes transportation and storage)



Under the proposed 45V guidance, the energy cost of clean hydrogen remains over $30 in the near-term and close to $20 per MMBTU in 2030, more than an order of magnitude more than the cost of natural gas,[3] and is further exacerbated when the transportation and storage costs of hydrogen are included. The modifications set forth in these comments would not fully alleviate this problem but would reduce the cost of the investments and encourage the innovation necessary to drive hydrogen costs to a competitive level.

This cost differential ripples throughout the economy and would affect other sectors as well. Xcel Energy's clean fuel vision extends beyond just clean hydrogen. We recently joined a first-of-its-kind coalition with Delta Airlines, Ecolab, Bank of America and others in Minnesota to scale sustainable aviation fuel ("SAF") with the urgency commercial aviation needs to reach net zero by 2050. Clean hydrogen is a key building block of this vision, but the proposed rules will greatly delay hydrogen implementation and put our SAF vision at risk.

[3] Natural Gas prices from EIA, EIA Energy Annual Outlook 2023, (March 16, 2023), available at Annual Energy Outlook 2023 - U.S. Energy Information Administration (EIA)

For the nation and for Xcel Energy, the scale of hydrogen production and use in the future is dependent on many near-term activities and advancements. Congress recognized the challenge of building a hydrogen economy from scratch and designed the IRA and IIJA incentives to work together to kickstart the clean hydrogen economy. In addition to lowering the cost of produced energy from clean hydrogen, a more flexible 45V framework for hydrogen production – a framework that is permissible under the language of the IRA – will provide other carbon-intensive non-energy sector participants like heavy duty transportation and agriculture the opportunity to decarbonize more rapidly and more cost-effectively.

Finally, a more flexible structure for 45V would encourage the development of a domestic industrial base that can support the manufacture of the electrolyzers and associated equipment that are critical to the hydrogen economy. A more flexible 45V would help make the United States, instead of China, Southeast Asia or Europe, the leader in this new economy rather than forcing the country to come from behind in technology development due to our restrictive policies.

The changes we advocate in these comments will help ensure that the broadly defined "hydrogen economy" can advance without material environmental impacts.

Comments

1. Treasury Should Adopt a Formulaic Approach to Incrementality for Existing Clean Energy but Should Set the Formulaic Target at 10% of Annual Generation.

Although not contemplated in the legislative language, under Treasury's proposed guidance, only green hydrogen produced from energy from "incremental" renewable and other clean energy generators will receive the 45V production credit. The proposal would define "incrementality" so that only clean energy assets with a commercial operation date not more than 36 months before the hydrogen facility begins operation would qualify.

This approach would severely limit the development of a robust hydrogen economy. It stands in the way of the use of the 45V credit in a way that allows for more efficient utilization of the nation's growing renewable generating capacity. To enable the efficiency and savings that hydrogen production using existing clean energy assets can achieve, we support Treasury's proposed alternative formulaic percentage approach to allow for use of some existing clean energy. However, as discussed below, we believe this approach is too restrictive and should be set initially at a minimum of 10 percent of owned and purchased annual generation and include all low-carbon generating assets (wind, solar, nuclear and hydroelectric). Treasury should leave open the possibility of increasing this percentage in later years based on analysis of curtailment trends across the industry.[4]

With the current 45V proposal, our analysis indicates that projects we have proposed in our hydrogen hub – some of the first to market – will not be eligible for the 45V credit and would not proceed. To be successful, these projects require energy from either (1) curtailed or heavily congested energy from existing renewable facilities; or (2) existing nuclear. From our proposal to DOE for the hub program, we showed how these projects could produce hydrogen at a cost 25-40% less than projects that rely solely on energy from new renewable energy as set forth in the 45V proposal. The cost of hydrogen produced from these projects is lower because they can immediately access lower cost and higher volumes of clean energy from existing clean energy generators (as well as access hydrogen hub grant funding). They would also benefit our customers by creating value (in the form of green hydrogen with multiple potential applications) from renewable energy that is otherwise being wasted.

[4] The formulaic approach should apply only to existing renewable energy. Xcel Energy supports Treasury's proposal to make all hydrogen produced from new renewable energy generation (built in the preceding 36 months) eligible for the 45V credit.

As Xcel Energy adds more renewable energy to the grid, we are seeing an increasing number of hours when existing and new renewable generation is curtailed (*i.e.* when the generating asset is taken out of service because its energy cannot be delivered). This phenomenon is not just a function of market price; it occurs because wind and solar resources generate electricity at levels above customer energy demand or because transmission congestion prevents delivery of the renewable energy to customers. The inefficiencies and cost of curtailment are already affecting our system.

For example, in our Midwest service territory, in 2022 alone we curtailed 10% of our total wind generation, over 1.6 million MWhs. This has grown from 5.1% in 2020 and is expected to continually grow as we plan to add 8,400 megawatts of new wind capacity and 1,500 megawatts of new solar capacity by 2040. This is valuable energy that today is wasted. Although we are planning and building new transmission to help deliver this energy to customers, as our renewable penetration grows, so will our curtailment.

Xcel Energy Territory Curtailment Estimates			
Year	**Midwest**	**Colorado**	**Southwest**
2020	5.1%	5.7%	1.2%
2021	11.3%	12.8%	4.0%
2022	10.0%	10.0%	4.6%

The time to site, permit, and construct transmission to allow larger volumes of new renewables to interconnect onto the grid can be long. In the periods before the next wave of transmission build is

complete, there is a limit to the total number of renewables that can cost-effectively interconnect for electric system consumption, including hydrogen production. Transmission investment lag could "crowd-out" some renewable investment within the 45V credit qualification period; the 45V proposal's strict incrementality provisions would result in wasted clean energy that could be used for production of clean hydrogen under our more flexible approach.

The production of green hydrogen using curtailed renewable energy from existing wind and solar would clearly be "incremental." It is using energy that otherwise would be wasted; no other system resources would increase production because of the use of curtailed energy to generate hydrogen. Grid studies examining the impact of the nation's growing renewable energy portfolio outlined the benefits of hydrogen production during high levels of renewable generation, both for renewable utilization and reliability. These include:

- National Renewable Energy Laboratory ("NREL") Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035[5]- This study by NREL shows the seasonal mismatch challenge of the different peak demand and oversupply of renewable generation and the need for seasonal storage. This analysis offers a solution by utilizing hydrogen-fueled generators during the peak times, fueled by hydrogen created during the oversupply of renewable generation during other seasons. The study points out that in scenarios with lower carbon capture, more hydrogen is needed, with a corresponding increase in new renewable capacity. This expansion is constrained by transmission expansion and availability. All existing renewable oversupply must be utilized to maximize the benefit of seasonal storage.

[5] Denholm, Paul, Patrick Brown, Wesley Cole, et al. 2022. Examining Supply-Side Options to Achieve 100% Clean Electricity by 2035. Golden, CO: National Renewable Energy Laboratory. NREL/TP-6A40-81644. https://www.nrel.gov/docs/fy22osti/81644.pdf

- Midcontinent Independent System Operator ("MISO") Renewable Integration Impact Assessment (RRIA)[6] – This study shows the benefit of using seasonal curtailed renewables to create hydrogen to combust during high load periods. As renewable penetration reaches higher and higher levels, the amount of seasonal curtailment can get quite high. Curtailment is likely to remain high even with the planned significant buildout of transmission. The ability to use curtailed energy for hydrogen production will reduce the cost of curtailment to customers and, by storing clean energy in hydrogen for later use, enhance utilities' ability to generate carbon free electricity even during periods of low renewable production.

Xcel Energy plans, constructs, and operates windfarms with 10-year production tax credits ("PTC") built into project and generation costs. Once the 10-year PTC expires, generation from older wind farms that can no longer claim PTC credits is far less valuable than generation from a PTC wind farm. System operators like MISO and Southwest Power Pool ("SPP") see lower bid prices from PTC-eligible resources versus those beyond the initial 10-year operating period. At times, bid pricing can go negative for newer facilities to ensure they are not curtailed and lose the value of the $27.50-$28.00/MWh wind PTC. As a result, system operators like MISO and SPP curtail older, non-PTC eligible wind farms first. If the vast majority of curtailed wind comes from non-eligible 45V resources, the 45 V proposal would greatly inhibit utilities with aggressive carbon reduction goals from using "wasted" renewables and converting them into carbon-free fuels like green hydrogen, generating cost savings and decarbonization benefits for their customers.

[6] MISO, MISO's Renewable Integration Impact Assessment (RIIA), (February 2021), available at RIIA Summary Report520051.pdf (misoenergy.org)

We believe the best way to address this problem would be through the formulaic approach contained in the proposal. The formulaic approach avoids the administrative burden of attempting to identify actual curtailment on a facility-by-facility basis every year. It also provides certainty to hydrogen developers and utilities regarding the energy that will be available in future years for hydrogen production. As curtailment data from Xcel Energy's system set forth above demonstrates, however, five percent is too low to effectively capture the value of current levels of curtailment; the formulaic target instead should be set at 10 percent. This is especially true given the nationwide growth of the renewable energy portfolio. As substantial additional renewable energy is added to the nation's energy system, the percentage of curtailment will grow.[7] Much like VRBO and AirBNB have allowed more efficient use of existing housing stock, and UBER and LYFT have increased utilization of existing automotive stocks, so too can Treasury allow for a more efficient utilization of the nation's renewable energy stock through a formulaic approach to curtailment and congestion from the nation's utilities and other generation providers.

2. The 10 Percent Formulaic Approach Should Also Apply to Nuclear Facilities.

In its 45V proposal, Treasury would all but exclude hydrogen produced from clean electricity generated by existing nuclear facilities from credit eligibility. The proposal offers a narrow potential exception to this exclusion, requiring a showing that the nuclear plants would have retired but for the availability of hydrogen production. This proposal would significantly impair the development of a hydrogen economy and is unnecessary and inconsistent with the broad legislative language of 45V. If this provision is included in the final rule, the "pink" hydrogen included in the H2HH would be uneconomic, and the hub would have to be scaled back or cancelled altogether.

[7] In fact, because the level of curtailment is likely to grow significantly in some regions of the country over the next decade, Treasury should periodically reevaluate the 10 percent formulaic limit in the rule and apply a higher limit in regions with high levels of curtailment.

The exclusion of nuclear energy from 45V swims upstream against Congress's energy priorities and the Administration's energy policies. The IRA included 45V to promote clean hydrogen. IIJA created a policy framework that directs DOE to support the use of nuclear generation in hydrogen production. The Environmental Protection Agency has relied on widespread availability of hydrogen for its proposed power sector greenhouse gas rules under Section 111 of the Clean Air Act. Despite the clear federal policy direction to encourage access to all forms of hydrogen, the 45V proposal would exclude hydrogen production that uses electricity generated from existing nuclear plants from eligibility for the 45V credit. This exclusion would limit the industry's ability to develop the hydrogen market, including pink hydrogen produced from nuclear plants, which has tremendous potential.

Xcel Energy operates 1,700 MW of nuclear capacity through its Monticello and Prairie Island Nuclear Generating Plants. In 2023 the company renewed the operating license on the Monticello plant and is seeking to re-license the Prairie Island plant. We are extending the lives of these plants because their output is core to the service we provide to our upper Midwest customers and accelerating the company's carbon free strategy. However, as our system changes with the addition of more renewables, these nuclear facilities will play an additional role: they will help us integrate both renewable energy and hydrogen production in the most efficient, cost-effective way.
As the company increases renewable capacity on the system into the future, baseload units like nuclear generators will need to run differently. They will need to move flexibly to meet customer energy needs as wind and solar production rises and falls intermittently. But existing nuclear plants cannot ramp up and down easily, and hydrogen production offers a way to more efficiently utilize both nuclear and renewable energy on the system. For example, Xcel Energy has been assessing a

market product for our nuclear plants whereby a part of the capacity could be bid into the MISO market as a more flexible load and tied to electrolyzer capacity. MISO could then "ramp" down the nuclear production during period of excess renewables. In this case, the thermal output of the plant would remain the same, but part of its electricity would be diverted to hydrogen production, while the market would see it as a flexible grid resource.

Allowing nuclear energy to produce hydrogen along with curtailed wind and solar allows the entire system of carbon free generation to be optimized and nuclear generation to be delivered to its fullest capability in a safe and reliable manner. We are currently piloting hydrogen production at our Prairie Island Nuclear Generating Plant in Minnesota in partnership with Idaho National Labs and DOE. This pilot will demonstrate the value of hydrogen produced by existing nuclear facilities at a time when little or no additional new renewable generation would be available for hydrogen production.

The value shown in this study will directly impact the DOE's "Hydrogen Shot" goal to reduce the cost of hydrogen to $1 per kg. by 2030. To achieve this goal, there needs to be a large increase in clean hydrogen production. Electrolysis is an energy intensive process, and nuclear plants can help achieve the necessary hydrogen scale more efficiently. Furthermore, utilizing technology like high temperature electrolyzers, which requires a steam source that can be supplemented from nuclear generation, can increase production efficiency by up to 30%. In the past decade only one new nuclear plant has gone online in the United States, and with uncertainty about the timing of future advanced nuclear deployment, existing nuclear is key to unlocking this value. By allowing the use of the 45V credit for hydrogen produced from existing nuclear energy, Treasury would help prove the viability of pink hydrogen, encourage today's carbon-free nuclear fleet to continue to operate at high-capacity factors in the future, and maintain an additional market for much needed dispatchable

resources as intermittent renewable resources are added to the grid. Hydrogen production is a solution to enable these "always on" clean energy assets to run efficiently. Including existing nuclear generation in the 10 percent formulaic approach will help enable the benefits that Congress sought to develop in the IRA and IIJA.

3. Treasury Should Implement Exclusions for Incrementality Requirements Based on Grid Intensity Thresholds.

Beyond the formulaic approach outlined above, we believe that there is another opportunity to demonstrate zero or minimal induced grid emissions from hydrogen production: the 45V guidance should allow hydrogen producers to utilize grid emission intensities to prove an exemption for the incrementality requirement. Treasury should adopt the EU's emission intensity threshold as an exception from incrementality requirements.

Xcel Energy operates in states with some of the most aggressive state policies that drive clean energy deployment and greenhouse gas emissions reductions while maintaining safety, reliability, and affordability for customers. These policies and the company's emission reductions are supported by resource plans approved by state regulators. For example, the Colorado Clean Energy Plan[8], already approved by regulators, will reduce emissions from our Colorado system by at least 80% compared to 2005 levels and end use of coal by 2030.

On our way to achieving carbon free electricity, the emission intensity of our grid will become quite low in the interim years. The likelihood of induced emissions occurring when using existing resources for hydrogen production declines along with the carbon intensity of the electric grid. The

[8] See Xcel Energy's Colorado Clean Energy Plan, available at Xcel Energy - Colorado Clean Energy Plan

European Union recognizes this in its recent rules for hydrogen production. These EU rules closely track the "three pillars" contained in the proposed 45V guidance: temporal matching, incrementality, and deliverability.[9] The EU rules exempt hydrogen production from the incrementality requirement if the production is located in an electricity bidding zone where the emission intensity is lower than 18 gCO2e/MJ in a calendar year. This emission intensity threshold translates to roughly 142 lb/MWh. Our resource plan approved in Colorado would achieve emissions intensity lower than this threshold in 2031 – 101 lb/MWh – after our coal generation is largely replaced by renewable generation. Our Upper Midwest resource plan recently submitted to the Minnesota Public Utilities Commission would also achieve an intensity lower than this threshold beginning in 2031 – 132 lb/MWh. Although this approach does not address the problems with the 45V proposal in the critical early years, it is an additional tool in Treasury's toolbox: Under these standards, Treasury would no longer require any incrementality showing in either Colorado or the Upper Midwest beginning in 2030.[10]

4. Treasury Should Delay Hourly Matching Until the Hydrogen Market and Infrastructure Can Function Cost-Effectively, with a Soft Target of 2032.

Xcel Energy supports Treasury's proposal to eventually transition to hourly matching to ensure hydrogen production from qualifying generation. However, Treasury's proposal to require hourly matching under 45V beginning in 2028 is too restrictive and could significantly impede hydrogen deployment. Our internal analysis shows that in Minnesota, this 45V guidance would increase our cost of production by at least 70% and would be expected to be higher elsewhere in areas of the

[9] European Parliamentary Research Service, EU Rules for Renewable Hydrogen, (April 2023) available at EU rules for renewable hydrogen (europa.eu)

[10] This concept pairs well with our suggestion to reduce grid regions considered to meet the deliverability requirement, as described in Section 5.

country with more limited access to lower cost renewable generation. A Wood Mackenzie study calculated 68-175% levelized cost of hydrogen ("LCOH") impacts between annual and annual match scenarios.[11] Similar to the development of the wind, solar and battery storage market development (which took more than a decade), a three-and-a-half-year deadline of 2028 to move from annual to hourly matching does not provide nearly enough time for supply chains and project developers/constructors to gain scale and efficiencies to drive the hydrogen production cost down. The 45V guidance should allow for annual matching until Treasury determines that the market is mature enough to make the move to hourly matching without excessive costs for all market participants nationwide, with 2032 as the earliest date to make this transition.

As the 45V proposal itself recognizes, hydrogen producers need time to adapt to an hourly-matching regime. Overall, producers need time to integrate production facilities into their operations and learn how to operate and maintain them. Because the hydrogen economy is in its infancy, initial equipment deployments will be smaller, and it will be important to allow the systems to run without the complications and limitations of hourly matching. While we support Treasury's long-term ambition to implement hourly matching, Treasury should implement guardrails to ensure that hourly matching is implemented *after* there is a national infrastructure in place and Treasury has had an opportunity monitor the scale of hydrogen production and the state of hourly matching capabilities. Specifically, for producers to have market assurance, Treasury must have clear proof that producers can achieve hourly matching nationally for at least two years before implementation. Therefore, Treasury should delay the hourly matching requirement until it develops information that the cost of moving to hourly matching is reasonable. That market condition is unlikely before 2032.

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[11] Wood Mackenzie, Green Hydrogen: What the Inflation Reduction Act Means for Production Econoomics and Carbon Intensity, (March 14, 2023), available at https://www.woodmac.com/news/opinion/green-hydrogen-IRA-production-economics/

External analysis validates that the hydrogen market would be small for several years into the 2030s and would trigger minimal, if any, impacts to overall grid emissions even with annual matching. By preserving annual matching until the market develops, the 45V guidance would have little impact on the environment but would allow for the creation of a broader hydrogen industry that would drive much more significant emissions reductions in hard to decarbonize sectors in the long term.[12]

Our proposed approach – delaying hourly matching until Treasury finds that the hydrogen market has sufficiently developed – aligns with other studies and federal agencies' expectations for large-scale hydrogen production. A report by MIT found temporal matching on hourly basis doesn't deliver emissions benefits until there is largescale hydrogen production.[13] The results indicated that with relatively low hydrogen production, annual matching does not lead to significant incremental emissions. DOE and EPA's expectation for large scale hydrogen production is also well after 2028. The U.S National Clean Hydrogen Strategy and Roadmap[14] and EPA's[15] do not anticipate significant hydrogen deployment until the 2030s. Based on these and other analyses, we believe 2032 is the earliest that Treasury should make the transition to hourly matching, but it should be prepared to delay longer based on market conditions.

In addition to this requirement outpacing technology deployment, a 2028 implementation date is also not aligned with other federal expectations for widespread development of technical capabilities

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[12] BCG, Green Hydrogen: An Assessment of Near-Term Power Matching Requirements, (April 2023), available at Green-Hydrogen-assessment-of-near-term-power-matching-requirements.pdf (bcg.com)
[13] MIT Energy Initiative, Producing Hydrogen from Electricity, (April 2023), available at MITEI-WP-2023-02.pdf
[14] Executive Office of the President of the United States, et al, U.S. National Clean Hydrogen Strategy and Roadmap, (June 2023), available at U.S. National Clean Hydrogen Strategy and Roadmap (energy.gov)
[15] EPA-HQ-OAR-2023-0072 (May 23, 2023), available at Greenhouse Gas Standards and Guidelines for Fossil Fuel-Fired Power Plants | US EPA

for hourly matching. Hourly matching capabilities are still in development, not widely available, and will take time to deploy. Xcel Energy has committed to supporting both DOE and General Services Administration ("GSA") in achieving its carbon-free electricity procurement targets outlined in Executive Order 14057, which include 50% hourly matching by 2030. In addition, we are a signatory to the United Nations 24/7 Carbon Free Energy Compact, which will require the use of hourly matching of clean generation and electricity consumption in the future. In these commitments and others, we support further development and examination of appropriate use cases for hourly matching. In addition to the economic and cost challenges of hourly matching, the supportive policy and technology infrastructure necessary to implement hourly matching is not widely available today and is not expected until the 2030s.

In addition to delaying the switch from annual to hourly matching, Treasury should allow hydrogen production assets that qualify for the tax credit under an annual matching regime to keep that qualification methodology for the duration of their 10-year credit applicability. Companies considering hydrogen production facilities in the next few years will be faced with high risks and likely higher costs before the technology and supporting infrastructure matures. A switch from annual to hourly matching partway through an asset's 10-year credit life increases project risk and uncertainty unnecessarily and will impact adoption and cost. By assuring that their investments will receive the certainty of annual matching for the entire 10-year period of the 45V credit eligibility, Treasury would encourage the earlier, riskier investment decisions that will be critical to launching the hydrogen economy.

5. Treasury Should Require a Closer Interconnected Relationship Between a Clean Energy Generator and Hydrogen Production.

While we support establishment of deliverability regions, the guidance should go further to require consideration of availability of physical delivery of the electricity to the hydrogen production. The proposed rule uses DOE's National Transmission Needs Study to determine if an electricity generating facility is in the same grid region as the relevant hydrogen production facility. The grid regions used to determine deliverability are quite large and not representative of power flows and whether energy could physically be delivered to hydrogen producers. There is not enough interregional and intraregional transmission capacity available for large scale transfers of energy to ensure electricity is physically deliverable within these broad geographic areas. This is especially true for regions such as Colorado, where there are mainly lower voltage transmission lines and very limited interregional capabilities. Accordingly, Treasury should require a closer geographic connection that aligns with physical power delivery between the clean energy generation and hydrogen production.

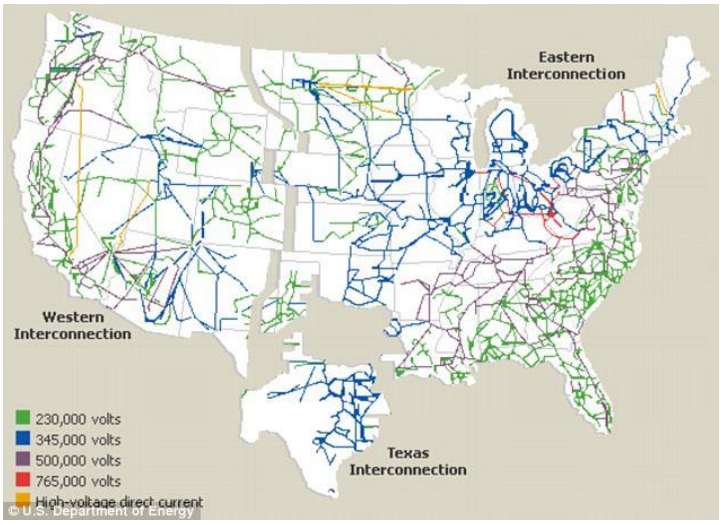

Figure 3. United States Eastern, Western, and Texas Interconnection

The proposal's broad definition of deliverability does not incentivize building the additional transmission and distribution that we need to ensure reliability as renewable generation and hydrogen load is increased. It also increases the likelihood that hydrogen producers could cause an unintended and unaccounted for increase in emissions elsewhere on the grid.

Dispatchable resources, likely natural gas, may ramp up to meet hydrogen load if clean energy claimed by end users via energy attribute certificates ("EACs") cannot meet the end user. Yet these emissions would not be associated with the electrolyzer that caused them. Therefore, it is important to create accurate boundaries for deliverability. We recommend that Treasury utilize Independent System Operator ("ISO") subzones, such as MISO Local Resource Zones or SPP regional groups to establish deliverability. These zones are utilized for studies such as MISO's Loss of Load Expectation Study Report[16] and SPP's Generator Interconnection Manual.[17] These are not firm boundaries that prove deliverability; but can be used as illustrative examples of how these broader regions should be scaled down. These smaller regions could be paired with demonstrations of deliverability from the hydrogen producer in order to satisfy this requirement. Further, the Treasury should not allow delivery between interconnections without very strict deliverability requirements, as import-export capacity between regions is already constrained. This requirement is reasonable as additional transmission is developed the ability to demonstrate deliverability will expand to new resources, but it will be aligned with this expansion and not further congesting delivery pathways in the near term.

Xcel Energy does not believe that the increased deliverability requirements would meaningfully hamper hydrogen development. Tighter deliverability requirements will incentivize better regional transmission planning and construction as hydrogen production can sync up the demand (electrolyzer load) and supply (new incremental renewables) within a region. This ensures that

[16] MISO, Planning Year 2024-2025 Loss of Load Expectation Study Report, available at MISO One Voice Style Guide (misoenergy.org)
[17] SPP, Generator Interconnection Manual (DISIS Manual), (January 2024), Page 12, available at disis-study-manual.pdf (spp.org)

regional transmission systems will have enough capacity to meet increased electrolyzer load. If the regions are too large, a supply and demand mismatch would cause impacts to new transmission planning and construction and market pricing.

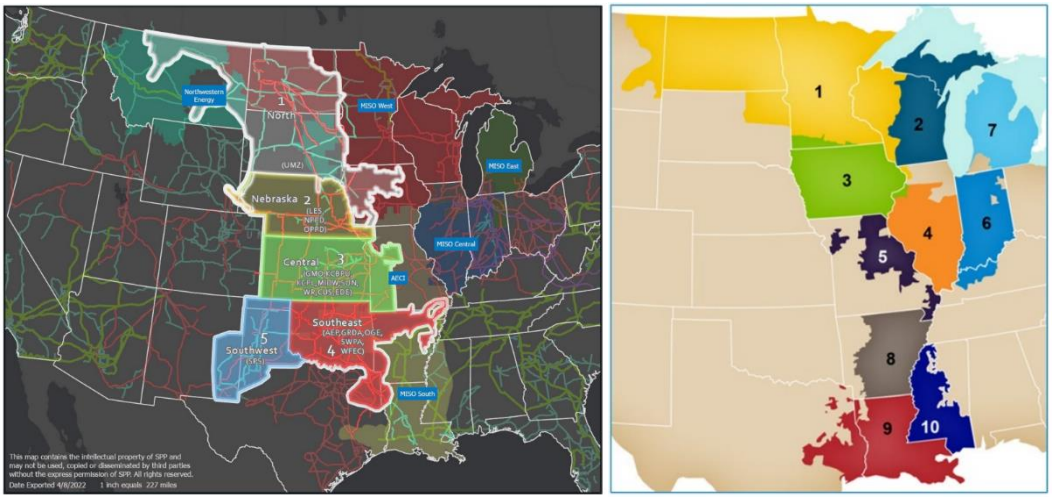

Figure 4. – SPP Regional Cluster Groups and MISO Local Resource Zones. See Footnotes 16 & 17

6. The Federal Government Should Create a Flexible Clean Energy Accounting Framework that Integrates with Existing State and Grid Operator Frameworks.

The EAC tracking approach in the proposed rule could create misalignment with existing state and independent system operator policy; potentially leading to double counting and other accounting issues. States have already regulated in this space with Renewable Portfolio Standards ("RPS") and Carbon Free Energy ("CFE") standards that include use of renewable energy credits, none of which include hourly EAC tracking. Additionally, any proposed use of EACs to track clean energy must consider operation of the electric grid, energy markets and associated rules for energy accounting in tariffs and other guidance. Treasury should coordinate efforts with the White House Council on Environmental Quality and the Federal GSA to create a flexible clean energy accounting framework that integrates with existing state and grid operator frameworks. The federal government should

align accounting methodology governing the appropriate use of EACs with 45V rules and broader efforts to procure 24/7 carbon-free electricity outlined in Executive Order 14057.

A study by the Electric Power Research Institute ("EPRI") discusses the potential role of 24/7 CFE in future decarbonization activities, highlighting issues related to GHG emission accounting and the practice of procuring energy attribute credits to meet regulatory clean energy standards and voluntary emission reduction goals.[18] EPRI was not aware of any state laws that require utilities to incorporate 24/7 CFE principles to comply with clean energy standards.

A Center for Resource Solution ("CRS") Report[19] suggests only one tracking system should exist for a state to avoid over procurement of clean energy to comply with state renewable and clean energy standards. It will be more cost effective when the same quantity of clean energy may be claimed by hydrogen producers and count toward compliance with state standards. Using one tracking system can also help avoid double counting between entities claiming clean energy. In depth engagement with states would be required, which will add to the timeline for implementation.

Treasury should also consider how hourly EAC tracking should be merged within existing annual EAC tracking systems. GHG Protocol and state policies do not incorporate hourly matching or discuss how to do GHG accounting when hourly and annual approaches are both used, which will occur if the 2028 temporal matching timeline is retained. It is not clear that states with ambitious clean energy standards should shift compliance to an hourly basis; this requires additional analysis

[18] EPRI, 24/7 Carbon-free Energy: Matching Carbon-free Energy Procurement to Hourly Electric Load, (2022), available at 24/7 Carbon-free Energy: Matching Carbon-free Energy Procurement to Hourly Electric Load (epri.com)
[19] CRS, Readiness for Hourly: U.S. Renewable Energy Tracking Systems, (June 15, 2023), available at Readiness-for-Hourly-U.S.-Renewable-Energy-Tracking-Systems.pdf (resource-solutions.org)

before it would be advisable. It may prove administratively complex and costly to customers in the interim with little benefit in the long term if/when states achieve 100% carbon free grids. Instead, Treasury should enable hourly tracking of EACs consistent with other federal efforts and existing state and grid operator tracking systems, so that the data is defendable and available to hydrogen producers and other customers that elect to opt in.

Additionally, the use of EACs to track virtually all clean energy production and use as a proxy for greenhouse gas emissions as required in the proposed rule presents significant challenges. Currently, EACs are mainly used in market transactions or green tariff programs to facilitate clean energy claims and avoiding double counting. It is not common practice to generate EACs for all energy, even if behind the meter, as this rule would require. Additionally, we do not generate EACs for our nuclear plants that provide energy to the grid for all customers that is not claimed by individual entities. Implementing credit generation and tracking for nuclear and behind the meter assets will need additional consideration and time. It is not clear if there are benefits to using EACs to track behind the meter generation used to produce hydrogen as it is not grid energy. Separate tracking without use of a market instrument could occur in parallel. Considering this information, a flexible clean energy accounting framework that integrates with state and grid operator frameworks is necessary for any final tracking of clean energy generation for the purposes of this rule.

7. Any Subsequent Lifecycle Analysis Tool Must have Strong DOE Oversight and Allow for User Defined Inputs.

We support the use of the Greenhouse gases, Regulated Emissions, and Energy use in Technologies ("GREET") model as the lifecycle analysis tool. Industry is already familiar with GREET and experts are available to support project developers' use of the tool for modeling and project

planning purposes. Additionally, the associated DOE oversight and standardization ensures the most current and scientifically sound assumptions and methodologies are included. We are not currently aware of any other publicly available tools that would be appropriate for this use case. Any successors to 45VH2-GREET, or alternates if proposed by other parties, need to have same level of oversight from DOE.

We support annual updates to the 45VH2-GREET model to enable production pathways and assumptions to evolve over time. However, this creates significant uncertainty for hydrogen projects that must qualify every year. To counteract this uncertainty, we recommend a stakeholder engagement and comment period be implemented before Argonne National Laboratory finalizes annual updates to the model.

For the use of GREET, user defined inputs should be allowed for certain "background data" – particularly upstream methane leak intensity and default grid carbon intensity – if the user supplies supporting documentation. Responsibly sourced natural gas purchases which provide specific methane intensity data should be considered as this market is emerging and will incentivize reductions in methane, a potent GHG. The default grid should not be locked at a regional level; utility or state level intensities should be allowed when available. 45V needs to give credit to state policies and utilities that operate or purchase clean energy to attract hydrogen production to these areas, thereby decreasing the potential for inducing emissions.

Additionally, we note 45VH2-GREET does not facilitate hourly data or calculations; an annual energy resource mix is the input to calculate emissions associated with electricity use. Additional guidance on how data from hourly EAC transactions should be rolled up and used to create the

annual energy mix is required. We do support this approach, and do not wish to imply GREET could or should be performing hourly lifecycle calculations. This would prove tedious with little value. Doing the tracking on a more granular basis to support the higher-level input into 45VH2-GREET reduces administrative burden and achieves the same intended outcomes.

Additionally, DOE and Treasury should consider publishing standard hydrogen production pathways for optional use to ease administrative burden by reducing calculations and modeling required. For example, if a facility could prove it serves 100% of its annual power needs for electrolysis with EACs, the corresponding carbon intensity should be standardized without the requirement for individual GREET modeling. This is similar to EPA and California Air Resources Board implementation of renewable fuel standard and low carbon fuel standard programs.

8. Stacking of 45Q and 45V Should be Applicable in Cases Where 45Q and 45V are Utilized for an E-Fuel Production that is Co-Located at a Single Facility.

Xcel Energy requests clarification of potential allowances for a facility to receive both 45V (for a qualified hydrogen production) and 45Q (for a qualified carbon capture), in the case that 45Q is not used for the qualified hydrogen production, but for e-fuel production, such as one that utilizes hydrogen and captures carbon dioxide, that is co-located at a single facility. Clarification of this use case is important for the development of a sustainable aviation fuel development pathway utilizing all the energy policies that were established to support it.

Conclusion

Xcel Energy supports reasonable environmental safeguards as the clean hydrogen economy grows. However, this promising new clean energy resource is just at the beginning stages of its

development, and it is important that the 45V guidance imposes environmental requirements that are commensurate with the current state of the hydrogen market and technology. As it is currently structured, the proposed 45V guidance would delay or prevent the development of green and pink hydrogen. The guidance would stand in the way of Congress's desired energy policy outcome of a diverse, affordable hydrogen supply. Over time, as the technology scales, it may be prudent to revisit the standards. At this stage, however, the 45V guidance should not limit the path to a carbon-free future.