

## Podcast 75 – Hydrogen Tax Credits

Hello everyone and welcome to Episode 75 of the **HydrogenNowCast**. This is a revised version of this podcast previously uploaded on July 7<sup>th</sup>. I wanted to incorporate additional ideas sent to me by listeners.

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### Introduction

Part of the US Inflation Reduction Act is provision for what is called the 45V Hydrogen Production Tax Credit. The Production Tax Credit provides up to a \$3 credit per kg of hydrogen-produced for projects with lifecycle greenhouse gas emissions less than 0.45 kg CO<sub>2</sub>e per kg of hydrogen.

The US Department of the Treasury is now being asked to write guidance on how the tax credits will be implemented. The purpose of the guidance for the legislation should be solely to apply the 45V Production Tax Credit to renewable energy transferred between one particular renewable energy supplier to one particular hydrogen generator.

Unfortunately, the rules that are being proposed don't achieve the goal of accurately capturing the true exchange of renewable energy – in fact they can actually miss capturing the exchange in some cases if the time interval is too short. And tragically – they're almost impossible to meet by most businesses.

There are 3 rules that I'm referring to:

- Hourly Matching – Which requires hydrogen producers to match their consumption of electricity from the grid with clean electricity production on an **hourly basis**
- Deliverability – That renewable electricity production must be **nearby** the hydrogen facility
- Additionality – Only using renewable electricity production that has been **recently installed**

It's understandable that these rules "have issues" (I'll say) since this is a complicated and confusing subject to understand because the electric grid is used for that energy transmission, but the electric grid acts like a "Black Box" with multiple Sources and Loads co-mingling not only electric energy **quantities** but **time** of generation and use. But there is a better and correct way to track this renewable energy.

What I'll show in this podcast is that this seeming loss of information can be accounted for simply with an Energy Contract and Electric Metering applied over a billing interval. This is a simple and thorough way to accurately account for the renewable energy produced and used for hydrogen generation so that the tax credit can be applied solely to that renewable energy exchanged. I'll also dispel the notion that the renewable Source and hydrogen Load have to

operate at the same time (they do not) as long as we view our data over an appropriate window of time . . . and a month will do quite nicely.

I'll come back to the topics of Hourly-Matching, Deliverability and Additionality at the end of the podcast and show better ways to do all three. But first let me show you that there's a simple and accurate way to meet the intent of the legislation, and let's start with the concept of a Renewable Energy Contract.

As I mentioned previously, a renewable energy supplier (which is the source) and a hydrogen generator (which is the load) need to use the electrical grid to transfer energy, but the grid comingles energy from many sources and loads. Yet in order for energy to qualify for the tax credit, we need to be able to demonstrate that the Source energy-per-time-interval and Load energy-per-time-interval are matched. The energy contract serves to legally attest that the electrical energy-per-interval being supplied by the Source is not being sold or committed to any other user (or Load). This could be **new** renewable energy or renewable energy **diverted** from some previous use. The important point here is that the source and load are paired by the contract and measured with electric meters and accounted for during some time interval – probably a month.

Various contract vehicles are available for this such as Power Purchase Agreements (PPA) and Renewable Energy Contract (REC). Of course, the PPA or REC could be between the hydrogen generator and either a private renewable energy supplier or the utility if the utility has their own renewable sources.

Second, only the measured energy-per-billing-interval supplied by the Source that matches the measured energy-per-interval used by the Load qualifies for the production tax credit. If the Source supplies more energy-per-billing-interval than the Load uses, the excess energy does not qualify for the production tax credit. If the Load uses more energy-per-billing-interval than the Source supplied, the make-up energy also doesn't qualify for the credit. This accounts for issues such as renewable energy "curtailment" or surges in usage by the Load.

Please notice a very important point here regarding time. The only time interval we need is the billing interval. The source does NOT have to generate energy at the same time as the load is using the energy. This is because energy already contains a time element. I'll explain this in detail later.

## **Electrical Terms**

But first, I think a definition of electrical terms will help us better understand the process to track renewable energy between a particular Source and a particular Load when using the electric grid which comingles energy.

Electrical energy is defined as Power times Time. Power has the units of Watts, and time has the units of hours. Therefore the unit of electrical energy is the Watt-Hour. For convenience, we often talk in terms of thousands or millions of Watt-hours. That is, kilowatt-hours (kWh) or megawatt-hours (MWh) respectively.

It's extremely important we make the mental distinction between power and energy. Power is instantaneous, energy is power over time. We're trying to track renewable energy, not power. The importance of this distinction will become clearer once we cover a few more points.

So energy already contains an element of time. But, for tracking and billing purposes we need to know the amount of energy per some second time Interval – usually a month. In other words, kWh per month or MWh per month. This energy is tracked and reported using electric meters.

So through metering, we have the means to track the quantity-per-billing-interval of renewable energy being put onto the grid by a renewable Source as well as the quantity-per-billing-interval of energy taken from the grid by a hydrogen generator Load. Obviously, the quantity generated and quantity used must match if we're going to conclude that the quantity used applies for the production tax credit. However, what about timing of the energy generation versus the timing of the energy use. Does that matter? And what should our measurement interval be?

### **Next let's consider the measurement Interval**

The purpose of the measurement interval is accounting – to collect the energy quantity (that is Watt-hours) reported by the Source and Load. Only the matching energy quantity during the interval can claim the Production Tax Credit. At first, it may seem they need to match instantaneously. However, that's not the case since time is already accounted for in the units of energy, that is  $\text{Energy} = \text{Power} \times \text{Time}$ . But having too long a measurement interval doesn't make sense either. The hydrogen producers won't want to collect data for years and consequently have to wait years to claim the 45V Production Tax Credit. So what we have here is an accounting issue. How frequently should we tally the renewable energy generated by the Source and used by the Load? Electrical energy is commonly billed monthly and this is an appropriate interval to use for 45V accounting as I'll discuss in a minute.

### **Next let's talk about Asynchronous energy Generation and Usage.**

I've shown that by use of an energy contract and metering we can verify the matching of renewable energy generation and Load usage. But what if, during that billing interval, the energy from a renewable Source is generated at a time different than the Load uses it? As long as the generation and usage fall within our billing interval and quantities match, **it doesn't matter** and here's why.

Let's say that during our billing interval, our Source generates one megawatt-hour of renewable energy and puts it on the electrical grid – a but the designated hydrogen Load doesn't use it at that time. So the utility reduces the amount of non-renewable energy they produce that month by one megawatt-hour. However, that renewable energy **will** be used by some other Load with the effect of decarbonizing one megawatt-hour of energy. Later, (but during the same billing interval) when the hydrogen Load uses one megawatt-hour of energy, that's energy that would have been used by some other load but wasn't, since the other load got the renewable energy. In other words, the two loads exchanged energy usage, with the net effect being the same – one megawatt-hour of electrical energy was decarbonized because it was ordered and

purchased by the hydrogen generation Load and produced by the renewable Source. That renewable energy generation would not have happened if it weren't for the renewable energy contract. Therefore, **it doesn't matter that the renewable energy was generated and used at different times during the billing interval, one megawatt-hour of energy-decarbonization still occurred during the interval.**

Did you follow that? This is an abstract concept to understand, so let me go over it again but this time using an example.

Let's say there are two businesses within some electrical grid, and these two businesses want to attach to this grid to transfer electrical energy from a solar array proposed by Sam's Solar and an electrolysis hydrogen fuel station proposed by Harvey's Hydrogen. The two businesses execute a Power Purchase Agreement (PPA) to agree to transfer 1 GWh of renewable energy per month. In order to qualify for the 45V Production Tax Credit, Harvey cites the PPA to verify that the renewable energy from Sam's Solar is only being sold to Harvey's Hydrogen. The quantity of renewable energy is verified by electrical metering at both businesses. Only the quantity of energy used by Harvey's Hydrogen that is matched by Sam's Solar qualifies for the tax credit.

But what about the time of production and use? As long as the particular production and use applying for the tax credit falls within our billing window (for example a month) timing doesn't matter, and here's why.

Let's say that for some reason, during a billing month, Harvey's Hydrogen never draws electrical energy at the same time that Sam's Solar is producing it. When Sam is producing his 1 GWh per month of renewable energy, the utility supplying our electrical grid needs to **reduce** the amount of non-renewable energy they supply to the grid by 1 GWh – thereby decarbonizing 1 GWh of electricity. Now at a different time during the month, when Harvey's Hydrogen draws his 1 GWh, the utility needs to supply an additional 1 GWh of energy. So during the month, the grid first reduced the amount of dirty energy by a GWh when Sam produced it, but then increased it by 1GWh when Harvey used it. One minus one equals zero, so the net result is that during that month, the utility supplied the same energy they would have if Sam and Harvey were not connected to the grid, and Sam and Harvey have used the grid to transfer their renewable energy even if it was not at the same time. This is why the notion of "hourly-matching" is not necessary. The source and load don't need to supply and use energy at the same time within a billing window. Time is already accounted for in the units of energy which is power times time.

### **Analysis**

So let's switch back to talking about the currently proposed rules. The preceding discussion demonstrates that renewable energy producers and hydrogen generators can qualify for the production tax credit simply by using an energy contract (like a PPA or REC) and electrical metering, over a billing interval.

At the start of the podcast, I mentioned the proposed rules of Hourly-Matching, Deliverability and Additionality.

To review, the rules are:

- Hourly Matching – Requiring hydrogen producers to match their consumption of electricity from the grid with clean electricity production on an **hourly basis**

- Deliverability – That renewable electricity production must be **nearby** the hydrogen facility
- Additionality – Only using renewable electricity production that has been **recently installed**

Regarding Hourly Matching,

This one may come about from the mistaken belief that the source and load have to produce and use renewable energy at the same time – they do not – provided they do so within a billing time interval being used to apply for the tax credit. Time is already accounted for in the units of energy.

As explained earlier, although the Source and Load may not produce and use renewable energy at the same time, by use of the energy contract, **unique** renewable energy was put onto the grid and used, thereby decarbonizing that quantity of energy which would not have occurred without the Contract between the hydrogen user and renewable Source. Using too short of a sampling interval – such as an hour – could miss a majority of this match, therefore producing incomplete accounting of the renewable energy generated and used. Because measuring on an hourly basis mis-states the actual energy match, it has the effect of canceling the intent of the legislation, which is to provide a production tax credit for renewable energy used to generate hydrogen.

If hourly matching is adopted, a majority of hydrogen generators will not be able to access the tax credit. Here's why. Most hydrogen generators will operate continuously, 24/7, in order to minimize the size of their capital equipment. However, renewable energy sources such as wind and solar will only produce energy intermittently. So even though Sam's Solar and Harvey's Hydrogen are producing and using exactly the same amount of ENERGY during a billing window, it often won't be synchronous.

It's inappropriate to use this legislation to attempt to force the Source and the Load to operate at the same time for two reasons. First, that's almost impossible for most businesses to realistically achieve, and second, it's completely unnecessary. As I've shown, hourly matching is completely not necessary because decarbonization is achieved even if the Source and Load operate asynchronously within the billing interval.

Regarding Additionality,

again, this is stated as only renewable electricity production that has been recently installed should qualify for the tax credit. I understand that the intent here is to avoid diverting renewable energy already being supplied to the grid for general consumption over to hydrogen generation simply to qualify for the production tax credit. The Fuel Cell and Hydrogen Energy Association (FCHEA) and over US 50 companies have taken exception to this in a letter to the US Treasury Department, and I do as well. What grounds exist to justify telling a renewable energy supplier who they can and can't sell their electricity to?

Also, there are a lot of unintended consequences to allowing the tax credit to only new sources. For example, what if a solar array is supplying electricity to a hydrogen generator and that generator goes out of business? That solar array would then like to supply energy to a new hydrogen generator but would be prevented from doing so by this rule.

A second example is a nuclear power plant that would like to supply energy to a hydrogen generator. However, they would be prevented from doing so because they are not a “new” source of energy.

That being said, I see that the European Union in their recent Renewable Energy Directive does adopt the principle of “additionality” insisting that renewable hydrogen are connected to new, rather than existing, renewable energy production.

Regarding the Deliverability rule,

requiring that the Source of renewable energy and the use or Load be located **nearby**. The concept here is that you don’t want renewable energy generation, for example, in Hawaii to be claimed by hydrogen generation in New York. In other words, the energy generator and the energy user should be connected to the same grid. This idea has merit but the wording is vague and unclear. So I would recommend that the word “nearby” be changed to “connected to the same grid”.

Well that wraps up a summary of the method account for renewable energy used to generate hydrogen when using the grid for transmission. Again, all that’s needed is an energy contract (stating that renewable energy from a source is being sold to only one user), energy metering and accounting for the energy over a defined window (such as a month). And to be clear, the source and load should be connected to the same grid.

I hope this helps you understand this abstract concept of energy and how to track it. As always, please feel free to send me your thoughts and comments. And if you enjoy listening to the HydrogenNowCast, consider subscribing to the podcast and also give us a rating in your podcast app. A good rating helps us be discovered by other people. And of course, word-of-mouth recommendations are really important, so consider letting people in your own Network know about the HydrogenNowCast.

If you’d like to contact me, you can reach me through the website at [colorado-hydrogen.org](http://colorado-hydrogen.org) or on Linked-In.

So until next time, this is Brian DeBruine wishing you health and prosperity, good bye.