

Good morning, my name is John Henderson, and I am the Vice President for Doral Group H2. Doral Group H2 is focused on producing clean hydrogen in the United States and is a subsidiary of the Doral Group. The Doral Group is an Israeli renewable energy company that was founded in 2007 and is currently publicly traded on the Israeli stock exchange. Doral has many impressive accomplishments and, through its investments in Doral Renewables, a Philadelphia-based US company, is currently building the largest solar energy facility in the United States.

I would like to begin by briefly discussing hydrogen manufacturing. Hydrogen is currently used in a variety of applications, and is manufactured in a variety of ways. The press is full of stories of green hydrogen, blue hydrogen, and other colors being present. My nephew thought that there were green gases and blue gases being created, and I had to explain to him that these colors only mean how the hydrogen is produced. There is no physical difference in the hydrogen that is green, pink, grey, or blue. Green hydrogen means that the hydrogen is produced via a process called electrolysis, in which a renewable electrical current is placed on water. The water is split into hydrogen and oxygen. Pink hydrogen is made with electrolyzers as well, except that nuclear power is used as the energy source. Grey hydrogen is produced by taking natural gas and uses a process called steam methane reforming to split the natural gas into hydrogen and carbon dioxide. The carbon dioxide is then emitted directly into the atmosphere. Blue hydrogen is produced by the same method as grey hydrogen, except that the carbon dioxide is captured and sequestered, usually by injecting it into a special well. Of these methods of production, green and pink hydrogen have the lowest carbon intensity, grey hydrogen has the highest, and blue is in the middle.

As someone who is committed to the energy transition, I am pleased to see positive legislation such as this bill that Representative Vitali is proposing. One of the items that I fully support is moving away from the labels of “green,” “blue,” and the other various colors as the hydrogen that is produced is the same molecule regardless of the color associated with it. A more sensible definition to describe hydrogen is the concept of carbon intensity as it allows for innovative new production methods. I am also happy that the tax credit thresholds match the thresholds listed in the Inflation Reduction Act. Having these thresholds consistent with the IRA will minimize confusion among operators and will reduce the amount of paperwork required to receive the tax credits.

I believe that this proposed legislation is good; however, there is room for significant improvement. The shared goal that we all have is to minimize and eventually eliminate carbon dioxide emissions. To do so, the Inflation Reduction Act has implemented a sliding scale of the production tax credits, because of the fact that the current production processes to make the lowest carbon intensity hydrogen via electrolysis is far more expensive than the current methods that make hydrogen from natural gas. Current estimates for the manufacture of hydrogen by electrolysis are \$5.00 – 5.50/kilogram, whereas the manufacture of hydrogen by steam methane reforming with sequestration of hydrogen are estimated to be \$1.75 – 2.25/kilogram. Under the IRA, for a carbon intensity ratio of less than 2.5, the production tax credit is \$0.75/kilogram, for a carbon intensity ratio of less than 1.5, the production tax credit is \$1.00/kilogram, and for a carbon intensity ratio of less than 0.45, the production tax credit is \$3.00/kilogram. This reflects the structure the IRA used was designed to encourage the manufacture of the lowest carbon intensity hydrogen – hydrogen made from the electrolysis of water using renewable energy. The proposed legislation from Representative Vitali has a tax credit of \$0.81/kilogram for a carbon intensity ratio of less than 2.5, and a tax credit of \$1.00/kilogram for a carbon intensity ratio of less than 0.45. I believe that this legislation should be consistent with the direction of the Inflation Reduction Act and

that the tax credit for the lowest carbon intensity hydrogen should be increased as the proposed bill appears to not reflect the reality that lower carbon intensity hydrogen currently has significantly higher production costs. As the bill is currently written, it appears to favor the production of higher carbon intensity hydrogen.

The nation is rapidly transitioning to renewable energy. This represents one of the largest job creation and economic opportunities in my lifetime, and Pennsylvania, unfortunately, is falling behind competitively. PJM is overwhelmed with applications for new renewable power as there are literally thousands of applications for renewable energy. An application submitted today for a new renewable energy plant will not be processed until 2030, and this bottleneck will obviously slow the development of low carbon intensity hydrogen. Queue reform is required in order to allow the energy transition to proceed. The development of low carbon intensity hydrogen is further hampered by the proposed requirement that, for hydrogen being produced by electrolysis of water, the renewable electricity must be correlated with hydrogen production on an hourly basis. What this means is that when the sun is not shining or the wind is not blowing, then the production of hydrogen by electrolyzers must cease. To obtain the lowest cost of hydrogen, then the electrolyzers need to be operating 24 hours a day, seven days a week. The only way to relieve the bottleneck of no renewable power is to build dedicated renewable power behind the meter and buy virtual PPA's to supplement the times when the sun isn't shining and the wind isn't blowing. Hourly matching of the power to hydrogen production would prevent this. Wood Mackenzie has estimated that the hourly matching would result in electrolyzer capacity factors of 46-72%, resulting in increases of 68 – 175% in the levelized cost of hydrogen when compared to annual matching that allows operators to reach a capacity factor of 100%. Europe has recently issued a regulation on this and has chosen to adopt monthly matching until 2029, and the appropriate U.S. Government agencies have not issued guidance on this critical issue. Finally, other industries are not required to match their renewable power hourly to be considered green – only electrolysis hydrogen producers. I believe that monthly or annual matching is more fair and would encourage the production of the lowest carbon intensity hydrogen.

Finally, I note that this legislation does not take into account the possibility of producing hydrogen via electrolysis using existing underutilized nuclear power. This is an area in which I believe could provide significant benefits to the state and to the hydrogen industry. I ask that this be considered.

I thank you for your time, and for the opportunity to testify.