DOCKETED

Docket Number:	17-IEPR-10
Project Title:	Renewable Gas
TN #:	220095
Document Title:	Post workshop comments regarding the critical role of hydrogen as one of the renewable gases required by CA
Description:	N/A
Filer:	System
Organization:	ITM Power
Submitter Role:	Public
Submission Date:	7/8/2017 9:22:27 PM
Docketed Date:	7/10/2017

Comment Received From: Steve Jones
Submitted On: 7/8/2017
Docket Number: 17-IEPR-10

Post workshop comments regarding the critical role of hydrogen as one of the renewable gases required by CA

Additional submitted attachment is included below.

ITM Power Inc.
155 N. Riverview Dr, Suite 101,
Anaheim, CA 92808

July 8, 2017

Dear Chairman Weisenmiller,

Comments by ITM Power on Panel 5: Emerging Technologies and Market Opportunities

ITM Power would like to submit the following information in response to questions put forth by the California Energy Commission (CEC) to *Panel 5: Emerging Technologies and Market Opportunities* at the June 27 Joint Agency Workshop on Renewable Gas.
ITM feels that it is imperative to include hydrogen produced via electrolysis in the discussion of renewable gas due to the huge potential for producing massive volumes of renewable gas .
For California to achieve its climate and air quality goals a broad spectrum of renewable gases, including hydrogen will be required. This is in line with the intent and language of Senate Bill 1383.

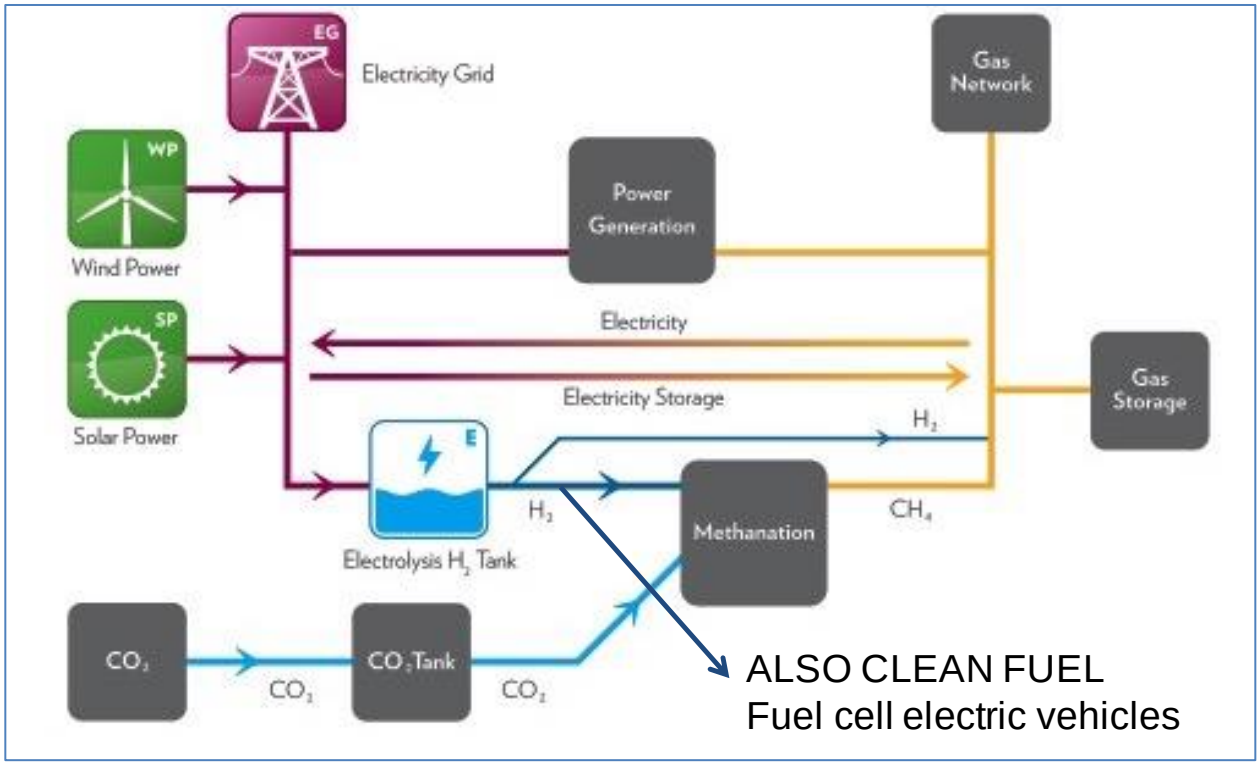
How would you characterize the promise of your fuel/technology and what steps are required to achieve commercial availability?

1. The Promise

ITM firmly believe that hydrogen produced via electrolysis (sometimes referred to as Power to Gas or P2G) has tremendous promise and potential to truly effect the energy landscape of California. Electrolysis is the ONLY technology that can move energy between an increasingly renewable electricity network and the gas grid, no other technology can do this. As the electricity grid increases its level of renewable content the requirement to shift or store energy at times of excess (avoiding curtailment) will be paramount. The energy sector needs to be thought of holistically and not in 'silos' of electricity and gas. Renewable hydrogen increases grid reliability and integration of increasing levels of renewables onto the regional electric grid.
P2G technology turns the "duck curve" challenge into an opportunity. Low or no cost surplus renewable electricity can be repurposed, instead of curtailed, to inexpensively produce renewable hydrogen.
Once generated the hydrogen can be used for electricity production, zero emission vehicles fuel, renewable heat production or industrial gas use including synthetic methane production.
P2G is the only technology capable of providing storage at terawatt-hour scale without location limitations and leveraging the existing energy transfer and storage assets of the gas grid. This is particularly important for seasonal storage, which will be critical as California reaches high penetrations of variable renewable electricity generation.
Renewable hydrogen also has the advantage of providing a climate protective pathway for energy uses that are difficult to decarbonize with electrification only, such as heavy-duty vehicles, shipping, transportation, and residential cooking.

ITM Power Inc.
155 N. Riverview Dr, Suite 101,
Anaheim, CA 92808

Furthermore, P2G can help curb air pollution by providing zero-carbon fuels for a variety of zero and near zero emissions vehicles, such as fuel cell electric vehicles and ultra-low NOx gas engine heavy-duty trucks.
P2G is additionally more cost-effective and geographically efficient than Li-ion batteries at high capacity and more geographically flexible than pumped hydro and compressed air. See the image below as well as Economics of P2G on the Renewable Gas Docket for further details.[1]



The incorporation of P2G into the renewable energy system, the only way to integrate electricity and gas sectors

2. Commercial Availability

Commercial availability of electrolysis is here today, recently a 100MW electrolysis system was ordered in France and more than 40 other projects are in place around the world. Cost reduction will be accelerated by volume production to meet the demand of utility scale projects, at utility scale P2G is the most cost effective form of producing large amounts of renewable gas.
To advance commercial availability in California, the following steps are needed:

[1] http://docketpublic.energy.ca.gov/PublicDocuments/17-IEPR-10/TN219923_20170626T180524_Emanuel_Wagner_Comments_Economics_of_Power_to_Gas.pdf

ITM Power Inc.
155 N. Riverview Dr, Suite 101,
Anaheim, CA 92808

- **Appropriate electricity pricing** - Access to wholesale markets and more aggressive retail rate structures would allow utilities and system operators to fully utilize electrolysis flexibility.
- **Support for MW scale pilot projects –** As with any energy technology, pilot projects are required to show the value in the real world, build understanding of best applications and practices, and test new markets.

What challenges might interrupt development and commercialization of your fuel/technology for any of the following areas:

a. Technology development

No technology development is required, technology validation in the CA grid is what is required with real world projects deployed.

b. Project location

Electrolysers can be located at a huge variety of locations that have access to an electricity grid, and in some situations, access to an existing gas pipeline. P2G has many geographic options. It can be co-located with solar or wind facilities to maximize their electricity generation or it can be blended into the vast existing gas system to be transported wherever that system serves. It can also be sited on a small scale at industrial facilities that use hydrogen or near hydrogen vehicle fueling stations.

c. Pipeline injection

Many projects in Europe have confirmed that hydrogen can be safely injected into natural gas pipelines at volume ratios less than 20% with no downstream impacts to the gas system other than to reduce the carbon intensity of the gas system. UC Irvine has found that hydrogen can be safely injected into the existing gas pipeline at the same leakage rate as natural gas up to approximately 10% mixtures of hydrogen with natural gas. California needs to put in place regulation to allow hydrogen to be injected in certain quantities of the gas network. Hydrogen can also be synthesized by adding CO2, e.g. from a biogas plant, a chemical processing facility or the atmosphere, to make methane, which can technically be injected in virtually unlimited quantities into the gas grid.

ITM Power Inc.
155 N. Riverview Dr, Suite 101,
Anaheim, CA 92808

d. Business models and project financing

As long as wholesale electricity cost can be accessed by electrolysers, successful business models can be realized using hydrogen. The June 2017 EU "Study on Early Business Cases for H2 in Energy Storage and More Broadly Power to H2 Applications" determined that "power-to-hydrogen" projects are already bankable, but require the ability of projects to "stack up several revenues streams from a variety of market applications". The use of hydrogen as vehicle fuel is also a very attractive business case today and would help create a truly zero carbon 'well to wheel' pathway.

e. Institutional/regulatory

This is the area that requires the most change in order to allow hydrogen gas to benefit the Californian energy market. Nations in Europe and other areas of the world are engaging the technology and seeing its benefits and CA needs to follow suit or risk being left behind.
The CPUC needs to reconsider its determination that P2G cannot be used as an eligible storage technology, Utility companies are interested in the technology but at present cannot count installations towards their state mandates for energy storage.
CAISO should consider allowing a rate structure whereby P2G can access wholesale market rates to produce renewable hydrogen in large quantities.
Opening up the regulatory frameworks is required to allow hydrogen projects to be deployed and show the real value that can be created. The market will decide on the technology types that offer the most benefits to ratepayers and the state as a whole but they can only do this is the technologies are allowed to be implemented on a level playing field.

f. Demand and vehicle availability

California has a rapidly growing fleet of hydrogen powered vehicles both of light, medium and heavy duty applications. A key attribute of renewable gas vehicles that use hydrogen is the fact that they are ZERO emission, immediately improving local air quality and saving lives. The main issue holding up vehicle deployment is the availability of large volumes of renewable hydrogen and the subsequent refueling infrastructure.
Regulations such as the energy storage mandate and the renewable gas program can open this gateway and allow rapid deployment of zero emission vehicles.

ITM Power Inc.
155 N. Riverview Dr, Suite 101,
Anaheim, CA 92808

g. Related infrastructure

If utilizing the natural gas grid as a storage resource,

What type of government action is required to support development and use of emerging fuels and technologies?

ITM believes that the following areas are critical to focus on.

a. It is essential that hydrogen remains part of SB 1383, the legislature explicitly directed the Energy Commission to look at "renewable gas" - that both houses of the legislature and the Governor's office understood at the time of the bill's passage to include agency consideration of electrolyzer-produced renewable hydrogen.
b. The CPUC and CAISO need to ensure that wholesale electricity rates are available for hydrogen renewable gas fcilities, as well as low T&D rates for fuel production and industrial process applications.
c. California ought to consider mechanisms to allow for renewable attributes of hydrogen to be tracked and verified, especially in the context of P2G.

Can cost data be provided to the Energy Commission to support the cost-effectiveness and economic viability of your fuel/technology?

Yes. Please refer to the document titled "Economic of Power-to-Gas (P2G)" that was submitted to this docket on June 26, 2017. Also submitted to the docket is the recently released European Commission supported "Study on Early Business Cases for H2 in Energy Storage and More Broadly Power to H2 Applications" by the Fuel Cells and Hydrogen Joint Undertaking.

Kind regards,

Steve Jones

Managing Director
ITM Power Inc.
+1 (714) 453 8141
sj@itm-power.com