DOCKETED

Docket Number:	17-IEPR-07
Project Title:	Integrated Resource Planning
TN #:	216668
Document Title:	SoCalGas Comments on Integrated Resource Planning, Opportunity for Power-to-Gas Technology
Description:	N/A
Filer:	System
Organization:	SoCalGas
Submitter Role:	Public
Submission Date:	3/23/2017 1:08:29 PM
Docketed Date:	3/23/2017

Comment Received From: Cliff Massey
Submitted On: 3/23/2017
Docket Number: 17-IEPR-07

SoCalGas Comments on Integrated Resource Planning, Opportunity for Power-to-Gas Technology

Additional submitted attachment is included below.

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California Energy Commission
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Subject: Comments on Integrated Resource Planning, Docket Number: 17-IEPR-07, Opportunity for Power-to-Gas Technology

Dear Chairman Weisenmiller and fellow Commissioners:

The Southern California Gas Company (SoCalGas) appreciates the opportunity to submit comments in response to the California Energy Commission's (CEC) 2017 Integrated Energy Policy Report (IEPR) draft staff paper entitled *The Proposed Guideline Topics for Publicly Owned Utilities' Integrated Resource Plans* and the two workshops held on the subject on February 23 and March 13, 2017.

Under SB 350, the Integrated Resource Plan (IRP) process requires publicly-owned utilities (POUs) to report at least once every five years on how they are aligning with state goals, including among others greenhouse gas (GHG) reduction, renewable energy procurement and integration, load balancing, and meeting air quality standards. Addressing these issues will require innovation and investing in new technology. Power-to-Gas (P2G) technology can specifically help POUs satisfy the requirements of the IRP process in several ways, such as helping to manage overgeneration, providing flexible energy storage, producing zero and near-zero GHG and air pollution transportation fuels, and decarbonizing electricity production, gas systems, and industrial processes.

P2G is explicitly included as an option for consideration in the 2017 IEPR Scoping Order, which asserts that "[t]he state's portfolio of mitigation measures for integrating renewables could also include using excess renewable energy to power desalinization plants or for power-to-gas" (p.4).

The following comments briefly elaborate on how P2G technology can support POU's in fulfilling their IRP requirements.

P2G Basics
In the P2G process, excess renewable energy is used to electrolyze water to produce hydrogen gas. The hydrogen can be used in fuel cells for transportation or various power applications. It can also be directly injected in limited quantities into existing pipelines, or

combined with CO_2 (methanated) and injected into the pipeline, decarbonizing the gas system and providing energy for later use anywhere over the vast pipeline network. Thus, P2G technology has the potential to provide a large-scale, cost-effective solution for storing excess energy produced from renewable sources.

P2G Technology is Already in Use

SoCalGas is currently demonstrating P2G projects at the National Renewable Energy Laboratory in Golden, Colorado and at the University of California, Irvine. These demonstrations will assess the feasibility and potential benefits of using the natural gas pipeline system to store photovoltaic and wind-produced energy.

Elsewhere in North America, the transmission grid operator in Ontario, Canada (IESO) has procured a large scale (2 MW) commercial project to create methanated hydrogen to store wind power.

In the European Union, there is steady investment in P2G, with more than 35 facilities being planned, constructed, or operated. These are referred to collectively as a "system solution" because of the added benefits of helping balance the grid and providing substantial energy storage capacity.

P2G Supports Attainment of POU RPS, Climate, and Air Quality Requirements

P2G enables achievement of state Renewable Portfolio Standard (RPS), greenhouse gas emissions (GHG) reduction, and clean air goals in multiple ways across sectors.

Supports Procurement and Integration of Renewable Electricity

P2G prevents curtailment of high penetrations of variable renewable generation by making use of surplus renewable electricity that would otherwise be wasted, or by storing it for later use as needed in any of several applications, examples of which are given below.

The hydrogen energy made during the P2G process can be returned to the grid when needed as carbon-free electricity via fuel cell. If large amounts of power are needed, the hydrogen can be synthesized into renewable methane and used to generate very low carbon electricity via peaker generators or gas combined cycle power plants. The renewable methane made by the P2G process can also be used to decarbonize traditional natural gas end-uses, like cooking and heating.

As a storage source, P2G is particularly flexible. It is uniquely able to scale from small, microgrid applications up to terawatt levels of energy storage at the utility scale. When connected to the gas network, P2G is also more geographically flexible than other bulk storage options like pumped hydro or compressed air. At high capacity, P2G has a lower cost and geographic footprint than batteries, which experience a significant increase in both cost and footprint as capacity scales up.[1]

P2G also provides many grid balancing services under a range of conditions and over a

[1] California Hydrogen Business Council White Paper on Power-to-Gas

wide span of durations—from very short to very long. The dynamic responsiveness of electrolyzers enables them to absorb power generation spikes, and by switching on and off, the electrolyzer can flatten out an intermittent resource such as PV at times when generation is variable. The ability of electrolyzers to provide various short-term ancillary services is significantly enhanced when connected to the gas grid and to generation resources that can be quickly dispatched. P2G's ability to provide longer-term grid storage, ranging from several hours to months, derives primarily from the gas grid's ability to receive, store, and distribute extremely large amounts of energy as hydrogen and methane.

P2G technology can also turn the power grids' "Duck Curve" challenge—in which overgeneration and curtailment risk slowing down POU achievement of RPS targets—into an opportunity, as surplus renewable electricity leads to low and negative pricing, which can be used to produce low-cost renewable hydrogen that can be used or stored for later use.

Enables Zero and Near Zero Emissions Transportation
In the transportation sector, which is responsible for the largest share of criteria pollutants in California, P2G provides renewable, emissions-free hydrogen that can be as fuel for fuel-cell electric vehicles (FCEV).

Hydrogen synthesized into renewable methane can help scale up the only commercially-available, low-GHG heavy-duty truck engine that meets the strictest EPA and CARB guidelines on low NOx emissions.[2] Whereas battery and FCEV solutions for this application are likely years, if not decades, away from being on the market, this near-zero emissions engine technology can help cut NOx from heavy-duty trucks and improve air quality in the near term. This is especially important in regions like the South Coast Basin, which consistently fail to meet federal clean air standards, creating a serious health hazard.

Decarbonizes the Industrial Sector
P2G can also can be used to decarbonize refineries and hydrogen production, which, according to CARB, represent the state's largest individual industrial GHG source, contributing 31% of the sector's total emissions.[3]

Additionally, the CO_2 used for methanating hydrogen can be supplied through carbon capture technologies at industrial plants, so that this GHG, which would normally be released into the air, can be repurposed to form clean, renewable gas.

P2G Is Part of a Strategy That Is More Feasible than Electrification Alone
Using the existing gas infrastructure, P2G makes achieving California's ambitious climate and clean energy targets more feasible than a strategy that relies solely on electrification by:

[2] http://www.energy.ca.gov/transportation/tour/cummins/
[3] https://www.arb.ca.gov/cc/inventory/pubs/reports/2000_2014/ghg_inventory_trends_00-14_20160617.pdf

- Decarbonizing end-uses that are difficult—if not impossible—to electrify at scale, such as long-haul heavy-duty vehicles, aviation, residential and commercial cooking, and industrial end-uses, like process heating;
- Implementing a more realistic and cost-effective strategy for long-term, seasonal electricity storage than flexible loads and long-duration batteries, which will be needed in a high renewable electricity generation future;
- Reducing the need for other low-carbon energy infrastructure, such as transmission lines or a dedicated hydrogen pipeline network, by taking advantage of the state's existing gas pipeline distribution system; and
- Diversifying the economic risk that any one particular technology may not achieve commercial success.

Conclusion

SoCalGas strongly believes that a diverse energy portfolio which includes multiple fuels and technologies is needed to meet California's energy needs and environmental targets in a cost-effective manner. Essential among those technologies is P2G, which is aligned with state policies, including SB 350, and may be key to their success. We encourage the POUs to consider P2G as a tool to help meet their SB 350 mandated IRP requirements.

Please do not hesitate to contact us for more information on the opportunity for P2G technology to meet the needs of POUs and all Californians as we move into a cleaner energy future.

Sincerely,

/s/ Tim Carmichael

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