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Document Title:	Ballard Power Systems Comments Comparison of Total Infrastructure Costs for BEV and FCEV Medium- and Heavy-Duty Applications
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Organization:	Ballard Power Systems/Tim Sasseen
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*Comment Received From: Tim Sasseen
Submitted On: 11/30/2018
Docket Number: 17-HYD-01*

Comparison of Total Infrastructure Costs for BEV and FCEV Medium- and Heavy-Duty Applications to 2050

The work done to date by the Advanced Power and Energy Program at UC Irvine on the renewable hydrogen roadmap is to be commended, as it is providing exceptionally valuable information for developing cost-effective renewable hydrogen generation facilities. We propose an addition to this study, leveraging this information to assess the most cost-effective mix of grid-charging and hydrogen-fueling infrastructure for the State of California.

Creating a New Energy System for 40 Million People

The State of California must complete a cost-effective transition to complete transportation decarbonisation by 2045, as required by SB100. This effort is arguably no smaller in scale by cost, effort or time than the development of the interstate highway system, the transformation from analog phones to internet communication, or the Apollo moon missions. It requires installing new, renewable electricity generation equivalent in power or greater to all the power put on California's grid today, and the replacement of all vehicles on the road to electrified versions.

The unique characteristics of this new energy system must be appreciated as well, with highly intermittent power sources (wind, sun, etc.), increased sensitivity to high voltage power lines (wildfires, urban congestion), and entirely new load profiles as entire sectors of the economy such as transportation and manufacturing become electrified. All of this infrastructure will require years of planning, capital investments of billions or hundreds of billions of dollars, and must be cost effective over decades of operation.

The Cost of Uniformed Planning

The California Energy Commission, the California Air Resources Board, the California Public Utilities Commission, and the regulating bodies of California cannot afford to build this new energy system ad-hoc. Ill-informed policy decisions can lead to loss of public and private money on the scale of tens or hundreds of billions of dollars. Commitment to poorly considered strategies and their associated losses can dissolve public support of decarbonisation initiatives, discrediting California's State agencies, and more importantly, greatly decreasing our chances of averting global climate catastrophes for our children and the generations to come.

Grid Infrastructure, Hydrogen Infrastructure: A Perfect Mix, But at What Blend?

We therefore recommend that the California Energy Commission supplement this study with a parallel study that evaluates which technologies are most appropriate for transportation electrification, and where they should be implemented. Two primary technology choices for zero emissions transportation are available to the people of California – grid-charging and

hydrogen-fueled. Whereas grid charged vehicles are most cost effective for distributed vehicles, small fleets and lightly loaded power grids, hydrogen fueled vehicles work best in high density areas of energy consumption, such as medium and heavy duty fleets.

Grid solutions for energy production are very cost-effective when excess grid capacity exists, or where transmission paths are free of conflicts. Hydrogen can provide cost-effective energy transport from remote renewable generation without the cost and risk of new transmission lines. The two technologies can therefore be highly complementary and symbiotic, but a careful analysis is required to determine which technology is most cost-effective for each geography and sector before committing billions of public dollars to creating the infrastructure.

The Study Proposal

We have proposed a study to the University of Irvine which would accomplish this analysis, while leveraging the renewable hydrogen roadmap study they are already creating. The proposal is to develop the total costs for ZEV infrastructure required to support either BEV or FCEV use in medium- and heavy-duty transportation applications, from now until 2050, and to propose a preferred mix of BEV and FCEV in each major market segment for lowest infrastructure costs. This will require a study of renewable power, grid and transportation demand dynamics to determine the total infrastructure costs for the path toward 100% ZEV use in medium- and heavy duty applications in California from now until 2050.

UC Irvine has provided a detailed draft proposal for this study, and we would like to review this draft with the CEC to discuss its merits, as well as funding opportunities to support this study.

Thank you for the important and effective work that the CEC continues to do.

Sincerely,

Tim Sasseen
Business Development Manager, California
Ballard Power Systems

Additional submitted attachment is included below.



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November 30, 2018
California Energy Commission
Dockets Office, MS-4
1516 Ninth Street Sacramento, CA 95814-5512

Subject: Comments on Renewable Hydrogen Generation Plant Deployment Roadmap Webinar, 17-HYD-01

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