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need to analyze additional systems

Dr. Reed:

I enjoyed your presentation yesterday at the CEC seminar. I previously worked in the Department of Energy in renewable energy in Solar Thermal Power, Biomass and then the Hydrogen Program. I was on the telephone and couldn't figure out how to make comments on your presentation. I would like a copy of it too, as I thought I copied it but didn't. I do have the following comments and suggestions for further study that wasn't part of the candidates you included:

1. While in the Hydrogen Program, I was the technology manager of the deployment of hydrogen stations in California. One of those stations was a Molten Carbonate Fuel cell that co-produced electricity, hydrogen fuel and hydrogen storage for grid power at Fountain Valley, CA. MCFCs were not considered as the final answer. Either Solid Oxide FCs or high temperature turbines were to be the final answers. GTI is developing a Compact Hydrogen Generator that is smaller and less expensive than SMRs. They presented a paper on the concept last year at UCI. Also as part of the DOE Fossil program GE and Siemens is developing 3100 F hydrogen turbines due to be available post 2021. I believe this system will be able to achieve \$2/kg hydrogen prior to compression and transportation vs the MCFC system you will be evaluating. There is a seminar today at 1:30 pm by EIN that will present data. I believe it is important for you to evaluate the GTI/GE or Siemens option in your study too.

2. The EIN seminar also will discuss a system of LytEn llc that electrolyses methane or biomethane and somehow produces solid carbon. They too suggest better economics than MCFC systems. This too should be included in your study.

3. Finally, you mentioned the natural gas pipeline as a means to bring in other State resources into California. We should view the natural gas pipeline system as a national treasure. There is no reason biomethane produced in Iowa or Georgia couldn't be attributed to California. This would be a way to nationalize the hydrogen effort. Also, the biggest input for hydrogen fuel cell vehicles appears to be trucks. Nikola has announced a very aggressive national truck deployment program. And what is imperative for trucks is a low cost competitive fuel. Capital investment in the trucks will be low compared to battery powered trucks but that advantage can not be dissipated by the cost of the fuel. Hydrogen at \$5/kg or less will be essential in this marketplace.

I believe your study needs to be broaden to include all the above options. I wish you the best in your efforts and hope the above makes sense for you to include.

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