

**HYDROGEN AND FUEL CELL TECHNICAL ADVISORY
COMMITTEE
PUBLIC MEETING MINUTES
February 15, 2013
Webinar**

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Note: this 1.5-hour meeting was held by conference call with a live webinar.

1. Call to Order and Introduction

The Hydrogen and Fuel Cell Technology Advisory Committee (HTAC) meeting began at 2:04 p.m. EST.

U.S Department of Energy (DOE) Designated Federal Official (DFO) Jason Marcinkoski called roll of HTAC members and members of the public. Mr. Marcinkoski explained meeting rules for the attendees and invited any written comments from the public to be submitted to htac@nrel.gov.

HTAC Chairman John Hofmeister welcomed all attendees and staff. He thanked HTAC member Dr. Joan Ogden for developing the annual report and commended the collaboration and quality of information contained in the report draft as presented. He then invited Dr. Ogden to lead the attendees in a review of the annual report draft.

2. Discussion of HTAC Annual Report

Dr. Ogden began her presentation by giving a brief background of the process to date. After a draft report was assembled from the sections composed by the HTAC members, the draft was circulated within the subgroup for comments. Revisions were made, and the first draft was circulated to all HTAC members. Dr. Ogden received many comments throughout the process, which she incorporated in the draft as they were received. Several key points resulting from the reviewers’ comments require discussion and decision by the full HTAC committee. Dr. Ogden expressed her intent to focus on “big picture” ideas rather than wordsmithing, and requested that the committee make decisions on major issues, leaving grammar issues to be addressed at a later time.

Topics to be addressed during the webinar include the following:

- Address content questions raised through the review process and make decisions
- Agree on the steps and timeline for completing the annual report
- Make assignments to complete production of the report

A. Introduction Section

Two versions of the introduction have been proffered. The committee was asked to consider the message to be delivered in the annual report regarding the changing outlook by DOE leadership with respect to the prospects for hydrogen and fuel cells. Dr. Ogden asked for the committee to vote on which version of the introduction to adopt.

Discussion:

Chairman Hofmeister asked what preference was expressed through email on the two versions of the introduction. Dr. Ogden noted that all email votes were for Version 2. She asked if anyone objected to using Version 2 of the introduction section, which included new viewpoints expressed by senior DOE management. No objections were made. Version 2 of the introduction was adopted.

Dr. Ogden then asked for objections to or comments on specific information contained within the adopted version of the introduction, which included January 2013 announcements on new original equipment manufacturer (OEM) alliances on fuel cell electric vehicles (FCVs), noting that the report is focused on 2012 events.

Dr. Alan Lloyd asked if Hyundai's differing position was mentioned in the report. Dr. Ogden responded that Hyundai's announced timeline was mentioned in Version 2 of the introduction; the introduction uses the same language that was used in the OEM announcements and includes a perspective on what the formation of the new alliances means in terms of creating demand for FCVs, achieving economies of scale within the supply chain, and fostering cooperation among the OEMs. Dr. Lloyd stated that his point was that not all OEMs have announced plans to push back the timeline for FCV introduction.

Mr. Charles Freese suggested the committee should not use text stating "most or all OEMs," because most OEMs are not developing FCVs at all, yet. He suggested using wording that is very specific so as to not imply that all or even most OEMs are involved in every initiative.

Dr. Ogden suggested the report be carefully reviewed for any language that might imply that all or most OEMs are participating in alliances or announcing commercialization dates in the 2017 timeframe.

Dr. Robert Shaw commented that Page 5 of the draft pointed out that Hyundai was planning to introduce pre-production vehicles by 2015 or possibly even as early as 2014. Dr. Ogden verified that she thought Hyundai was mentioned as having a target of 1,000 vehicles on the road by 2015. Dr. Shaw said the information needed to be verified because he remembered hearing that deadlines might move up to 2014. Mr. Freese agreed to double-check the information as he was not sure if it was substantiated with an actual quote or had just been interpreted.

Dr. Shaw stated there are counterpoints to the rolling back of the target (to 2017) by the Daimler/Ford/Nissan consortium, observing that Hyundai seems to be moving even more quickly than before.

Mr. Anthony Eggert noted that he thought the wording indicated an acceleration of Ford and Nissan programs, which was unexpected.

Mr. Shaw agreed that Ford has essentially said it will not participate in the first round of deployments and is just sharing technology among the three consortium participants and planning to participate more fully in the second round. Mr. Freese agreed that Ford has never made a commitment on a production program and now is entering a more focused alliance with Daimler, which already existed through the AFCC [Automotive Fuel Cell Cooperation Corporation]. He stated that Nissan is involved in the Japanese government's arrangement, in which the Japanese OEMs have agreed to produce FCVs in 2015; thus, 2017 represents a delay.

Mr. Robert Rose acknowledged that the report was intended to capture a snapshot of the industry during a time of rapid change and commented that "it might be worth trying to accomplish something of a glissando" on the details of future deployments and alliances, recognizing that current industry challenges are (a) cost reduction, and (b) matching infrastructure deployment with commercial availability.

Chairman Hofmeister agreed with Mr. Rose and suggested that, rather than listing specifics, a more generic statement be included in the report: "There is a dynamic occurring in the rollout phasing of FCVs that is prompting new alliances (without specifying participants) that has also resulted in additional dynamics with respect to the rollout and production schedules among various companies." He suggested that precision in the wording may be detrimental to the message.

Mr. Freese suggested the report might simply state, “OEMs are lining up around these alliances to overcome challenges that industry has faced.”

Dr. Ogden proposed adopting new wording along the lines of Chairman Hofmeister’s suggestion and adding some general trends regarding new alliances. She also proposed requesting volunteers or assigning a member to read through the entire document.

Dr. Shaw suggested that Dr. Ogden, Mr. Rose, and Mr. Freese form an editing group to read the report aloud for clarity, incorporating comments as appropriate and verifying facts. Dr. Shaw opined that the editing group should shorten the report. He also suggested that formatting would help with visual clarity.

Chairman Hofmeister said an exact page limit is not needed and that all substantive content should be included.

B. Financial Climate

Many email comments were received from committee members about the Financial Climate section. Some feel that the level of optimism expressed in that section might not be justified. Dr. Ogden opened the discussion for suggestions to the section.

Discussion:

Chairman Hofmeister commented that it would be inaccurate to say that the funding climate for hydrogen and fuel cells is positive. Research and development, infrastructure investment, and product development require more funding to make fuel cells viable. There may have been positive movement in one or more areas, but funding remains insufficient.

Dr. Kathleen Taylor stated that the funding climate is not under the control of the auto industry or any one particular group. Many factors are involved, and no matter how much money the auto industry has, it cannot succeed without a favorable external environment. The most important point to relate in the report is the complexity of the situation.

Dr. Shaw defended the report’s content, saying that the first paragraph acknowledged the serious problems faced by industry, and the last paragraph illustrated positive news. He couldn’t recall any complete failures or bankruptcies and expressed a desire to commend any companies that remained viable.

Mr. Rose commented that the tone of the section was basically negative.

Mr. Eggert expressed concern that the section seemed almost entirely focused on the non-OEM financial climate.

Dr. Shaw remarked that investments from private sector companies cannot be verified and was concerned about including unverified information in the report. Mr. Freese stated that the only objective source of private sector information is clean-room data gathering activities. Otherwise, information must be inferred from market observations.

Mr. Rose suggested making the last couple of sentences in the first paragraph more negative and letting the editing group determine the best wording. Chairman Hofmeister agreed with Mr. Rose to leave the final wording to the editing group.

Mr. Rose suggested adding a comment in the cover letter to the Secretary identifying scarcity of capital in the industry as a systemic concern that may need to be addressed in the future.

C. Conclusions

Dr. Ogden asked the members if they wanted to make recommendations to DOE based on findings from 2012, and if those recommendations should be contained in the Conclusions section of the annual report.

HTAC members were in agreement that clearly stated recommendations should be made to DOE administration and that all recommendations should be contained in the cover letter to the Secretary rather than in the body of the annual report.

Discussion:

Mr. Maurice Kaya suggested that the annual report should capture the work, discussions, and products that resulted from the HTAC subcommittee and task force efforts.

Chairman Hofmeister was supportive of recognizing the work produced in the Hydrogen Production Expert Panel (HPEP) meeting and highlighting the infrastructure report and the renewable utility report as essential work of HTAC. He suggested the annual report should contain a listing of all the documents produced by HTAC in 2012. Dr. Shaw cautioned that only the HPEP report is publically available and that unpublished reports should not be cited in the report.

D. Terminology

Dr. Ogden asked members to express their preference regarding the use of the term “green” hydrogen. Members agreed to avoid wording such as “green” and “clean” in favor of simple, factually descriptive phrases, including “renewable hydrogen” and “hydrogen produced from natural gas.”

E. Research and Analysis

Dr. Ogden asked members if they felt the Research and Analysis section needed more content or a change of tone. Review comments received to date indicated that the information in the section is either too sparse or gives the impression that research questions have all been solved.

Discussion:

Dr. Richard Carlin said the section seemed to focus primarily on hydrogen and suggested that more content could be added about ongoing work on fuel cells. He offered to submit bullet points regarding work within the Office of Naval Research, including autonomous systems, integration of fuel cells, and biofuel production for fuel cells.

Dr. Bond felt the section did not contain much substantive information regarding progress and direction. He felt the section should contain more results.

Dr. Shaw said a lot of information that could fit in the Research and Analysis section is buried in discussion in earlier parts of report. He also commented that there is a huge amount of research underway in a broad spectrum of technology areas, and every effort leads to a new advancement in a product.

Dr. Taylor suggested that the DOE Annual Merit Review (AMR) is a good source of information on industry research. She suggested adding a citation of the AMR to the Research and Analysis section.

Dr. Ogden solicited volunteers to revise the section.

Dr. Bond agreed to add detail to the section with the help of a summary report from the AMR, which Mr. Marcinkoski agreed to provide.

F. Final Steps to Complete the HTAC 2012 Annual Report

Dr. Ogden reviewed the next steps to finalize the HTAC 2012 Annual Report.

- Members Bond and Carlin will submit their text additions to Dr. Ogden.
- The editing group will meet to incorporate the changes discussed.
- Energetics will help with formatting and grammatical editing.

- The final draft will be sent to Chairman Hofmeister for final review and approval.

Chairman Hofmeister thanked Dr. Ogden for her leadership and hard work on the annual report project.

Dr. Ogden expressed her thanks and said it was a very informative assignment, and she enjoyed it.

Mr. Marcinkoski called roll for any members of the committee or public who joined the meeting after it began.

3. Consultation for Establishing the Criteria for H-Prize Competition

Chairman Hofmeister welcomed Dr. Sunita Satyapal of DOE to the webinar. Dr. Satyapal offered appreciation to HTAC for its effort on the annual report.

Dr. Satyapal presented an update on the H-Prize competition. Sarah Studer of the DOE-EERE Fuel Cell Technologies Program (FCTP) was not available for the webinar but is compiling information for the potential competition topics. Information on hydrogen meters was discussed at the September 2012 HTAC webinar, but it has been determined that hydrogen meters are not a suitable topic for the H-Prize. Some companies are already close to having a viable meter that meets necessary specifications, and there aren't very many manufacturers that would actually produce a meter, so traditional funding was felt to be a more appropriate mechanism for encouraging research in this area. Therefore, a new competition topic must be chosen.

Initial feedback for the topic "home hydrogen refueling systems" was positive. Hydrogen infrastructure is not yet widespread, so, similar to the plug-in hybrid electric vehicle (PHEV) or electric vehicle (EV) approach of home recharging, hydrogen home refueling systems could help reduce the risk and the barriers perceived for hydrogen vehicles. The competition timeframe would align with the 2015-2020 vehicle rollout schedule, providing an opportunity to expand locations for fuel cell vehicle rollout. The home refueling systems could potentially provide hydrogen for stationary power applications as well, and not be restricted to fuel cell vehicles.

Some entities are considering small-scale reformers for home refueling as well as electrolysis units. Potential criteria to develop include capital costs and product costs, refueling rate, delivery pressure, durability, and availability. Dr. Satyapal offered HTAC members the opportunity to provide other suggestions.

Chairman Hofmeister asked if governance of the H-Prize is within Dr. Satyapal's operating group, and if HTAC will serve as an advisory group. Dr. Satyapal verified that the governance of the H-Prize is within her planned activities and that HTAC would serve as an advisory group to provide advice for developing the H-Prize criteria.

Chairman Hofmeister then opened the floor to members for comments on the H-Prize topic suggestion.

Discussion:

Dr. Shaw said various companies have been considering home refueling technology for a long time, and there are many challenges to overcome to be competitive with larger refueling systems. The system will have to be designed to be risk free, trouble free, and cost effective for consumers or it will not succeed. He commented that it may be very challenging to satisfy the requirements that must be met for home refueling systems to become commercial and would hesitate to set criteria that no one can meet.

Dr. Satyapal agreed that criteria requirements have been insurmountable in previous prize competitions. However, Japan has recently deployed 18,000 natural gas based residential fuel cells, and there has been significant progress with both reformers and electrolyzers.

Chairman Hofmeister stressed the importance of economies of scale for developing hydrogen infrastructure and the importance of focusing resources on large scale availability of hydrogen fuel, and he suggested that home reformers might dilute the incentive for investing the capital necessary for development of a retail hydrogen market. He commented that if this topic is worthy of an H-Prize, it sends a message that DOE does not support industrial development of large-scale, retail hydrogen fuel infrastructure.

Dr. Satyapal commented that traditional industrial players that would invest in large-scale infrastructure have not shown interest in this area recently. The prize would open market opportunities to a different segment of the industry.

Chairman Hofmeister speculated that the issue of traditional industry players lacking interest in investing in hydrogen infrastructure is a near-term problem, but not a long-term problem.

Dr. Shaw suggested there may be a parallel in the solar industry, where costs are more competitive in recent years due to increased production volume. He speculated that the same trend could occur in the hydrogen industry. Using SolarCity or Sungevity as a model, the H-Prize could be awarded to a company that would make appliance-level hydrogen generators available to homeowners (at no cost to the homeowner). The company could take advantage of economies of scale and purchasing power to drive down costs for the hydrogen generators, just as SolarCity and Sungevity have for rooftop solar systems, and

could offer customers competitive automotive fuel in the same way that rooftop solar systems offer competitive electricity.

Dr. Satyapal voiced support for the idea, observing that one of the goals of the H-Prize is to get more public visibility for hydrogen. Critics of hydrogen as a transportation fuel point out that it requires investment for infrastructure development, whereas PHEVs and EVs offer the option of home recharging.

Mr. Kaya stated that developing an innovative system that delivers utility services at the homeowner level and takes advantage of existing infrastructure at the same time is a very attractive idea. The competition should encourage people from all localities to stretch their imaginations toward something that they would not normally think could be done.

Dr. Mark Cardillo said anything that increases hydrogen use will benefit all purveyors of hydrogen fuel. He does not believe that certain forms of use will compete or discourage other forms, but expects that starting to use hydrogen in any way will have a big effect on the market. He asked if companies are eligible for the prize.

Dr. Satyapal said companies would be eligible to compete. Eligibility would be restricted to companies and individuals who are not already receiving funding for performing similar work. Foreign companies that do not have a U.S. interest would not be eligible.

Mr. Harol Koyama said he found the concept interesting and would be willing to try to provide information to the H-Prize operating group in terms of parameters, costs, and other useful data from his experience.

Dr. Carlin said his general interest is in biogas and gas reforming, and a concept such as a home refueler might help drive down cost in gas reformers.

Chairman Hofmeister asked if the prize issue would still be open at the time of the April HTAC meeting. Dr. Satyapal suggested that a discussion of the H-Prize be added to the agenda for the April HTAC meeting and that her team would work with HTAC members that expressed interest in the meantime. She also suggested that information may be obtained at the Fuel Cell Expo in Japan that could be incorporated.

4. Public Comment Period

Chairman Hofmeister opened the public comment period at 3:23 p.m. EST.

Mr. Andrew Bermingham, of Montreux Energy LLC, said he had encountered a roadblock for the hydrogen industry in California in that hydrogen is not recognized as a viable medium for energy storage. He asked HTAC members if anything was being done to address the ability of states to choose whether or not to allow the use of hydrogen as an energy storage medium.

Mr. Bermingham received a listing of recent industry presentations from the California Energy Storage Alliance (CESA), and none of the presentations addressed hydrogen as a storage medium option. He asked Byron Washom at University of California San Diego, who is a member of CESA, and was told that hydrogen is not recognized in California as a storage medium. Mr. Bermingham asked how to get hydrogen approved for storage use and if any monitoring of storage mediums from state to state would be done to prevent industry roadblocks.

Discussion:

Dr. Lloyd replied that HTAC has done some work on hydrogen as an energy storage medium. He suggested that education with CESA and the California Public Utility Commission (CPUC) will promote understanding that large scale energy storage will require hydrogen. He suggested Mr. Eggert could be helpful with this issue.

Mr. Frank Novachek asked if California specifically prohibits hydrogen use for energy storage. Other entities besides California have the same opinion; even DOE's program does not focus much on hydrogen as an energy storage option. The perception is that a hydrogen storage system's round trip efficiency is so low that other technologies are more efficient. However, for longer duration storage, hydrogen is more competitive.

Mr. Bermingham offered to research the California legislation to find the actual wording and send the information to the HTAC members.

Mr. Novachek expressed a desire to see recommendations from the HTAC working group to reopen the discussion of hydrogen for longer-duration storage efficiency.

Dr. Timothy Lipman reviewed California storage legislation (Bill 2514:Section 2835.1) for the specific definition of energy storage systems. The definition is very broad and only specifies that a system cannot rely significantly on fossil fuels. Hydrogen is not specifically excluded in the legislation, though the CPUC

may have some regulation. State government may be overlooking hydrogen because of low round-trip efficiencies.

Dr. Carlin suggested that the results emerging from the battery program may provide interesting insights into the value of hydrogen .

No other comments were offered, and Chairman Hofmeister closed the public comment period.

5. Other Business

Mr. Marcinkoski reminded attendees that the dates for the next HTAC meetings at the NREL office in Washington, D.C., are April 23-24, 2013, and October 29-30, 2013.

Chairman Hofmeister asked for any comments on the minutes from the November 2012 HTAC meeting. Hearing no comments, he invited a motion to approve the minutes.

Dr. Shaw moved to approve the minutes from the November 2012 meeting, and the motion was seconded. The motion passed unanimously.

Chairman Hofmeister adjourned the meeting at 3:34 p.m. EST.

6. Action Items

Issues to address for HTAC 2012 Annual Report

- Edit the introduction to include comments expressed by senior leadership at DOE and to include January 2013 announcements about new alliances with OEMs, being careful with wording so as not to imply that all or most OEMs are participating in alliances or developing FCVs, and not all are giving commercialization dates of 2017.
- Edit text to keep it as brief as possible without losing content.
- Edit the Financial Climate section to tone down positive statements and move some of the discussion items to the cover letter for the Secretary.
- Move recommendations from the Conclusions section to the cover letter to the Secretary.
- Remove wording “green hydrogen” and just state factually: “hydrogen from renewables” or “hydrogen from natural gas.”
- Add more examples to the Research & Analysis section—Rich Carlin and Peter Bond will submit updates for the annual report to Joan Ogden and the editing group.

- Add a section with a list of documents produced in subcommittees and include published task force reports.
- The editing group will meet by phone during the week of February 18th to finalize content changes—Bob Rose, Charlie Freese, and Joan Ogden.

Issues to address for H-Prize competition

- HTAC will serve as an advisory group to Sunita Satyapal's H-Prize group to offer ideas for competition criteria.
- Ideas and feedback should be forwarded to Sunita's group.
- Add an item to the April 2013 HTAC meeting agenda to provide final input on the H-Prize.

Mark calendars for 2013 HTAC meetings at the NREL DC office

- April 23-24, 2013
- October 29-30, 2013

7. Participant List

HTAC Members Present

- Peter Bond
- Mark Cardillo
- Richard Carlin
- Anthony Eggert
- Charles Freese
- John Hofmeister
- Maurice Kaya
- Harol Koyama
- Tim Lipman
- Alan Lloyd
- Frank Novachek
- Joan Ogden
- Robert Rose
- Robert Shaw
- Kathleen Taylor
- Joe Triompo
- Jan van Dokkum

HTAC Members Not Present

- Gary Flood
- Geraldine Richmond
- David Taylor

- Levi Thompson
- William Wylam

U.S. Department of Energy Staff in Attendance
Office of Energy Efficiency and Renewable Energy

- Jason Marcinkoski
- Sunita Satyapal
- Joseph Stanford
- Reginald Tyler

Members of the Public in Attendance

- Andrew Bermingham—Montreux Energy LLC
- Mike Caspar—National Rural Electric Cooperative Association
- Mark Monohon—NGK Spark Plugs USA
- Leo Grassilli—Office of Naval Research

Support Staff in Attendance

- Kristine Babick—Energetics, Inc.
- Rachel Davenport—Alliance Technical Services, Inc.
- Melissa Laffen—Alliance Technical Services, Inc.
- Neil Popovich—National Renewable Energy Laboratory
- Dee Scheaffer—National Renewable Energy Laboratory