

**MEETING MINUTES AND ATTENDEES  
HYDROGEN AND FUEL CELL TECHNICAL ADVISORY COMMITTEE**

**November 17, 2006**

The meeting of the Hydrogen and Fuel Cell Technical Advisory Committee (HTAC) was held by conference call on November 17, 2006. An advance meeting notice was published in the *Federal Register* inviting the public to register to participate in the call. The meeting was called to order at 12:06 p.m. EST, by Alan Lloyd, Chairman.

As the meeting commenced, members Uma Chowdhry, John Hofmeister, John Wootten, Jim Reinsch, Mark Chernoby and Geraldine Richmond did not respond the roll call. Dr. Richmond subsequently joined the call in progress. The attached attendee list includes all members and non-members participating in the call.

**Briefing on Meeting between Hon. Robert Walker and Energy Secretary Bodman**

Robert Walker briefed HTAC on his meeting with Secretary of Energy Samuel Bodman. At that meeting, Mr. Walker discussed HTAC's recommendation to elevate the Interagency Task Force (ITF) to the Assistant Secretary level or higher. He got the impression that Secretary Bodman found the proposal appealing. Mr. Walker said that, as the written recommendation was just recently received, no action has yet been taken. Secretary Bodman said he is very interested in the work of HTAC, regrets that he could not be at its first meeting, and hopes to attend the January meeting. He stated that his two main priorities for the DOE hydrogen program are fuel cells and hydrogen storage. He is also very interested in the work being done on codes and standards. As an engineer, he has some skepticism as to how quickly the technical problems can be solved and the build-out of production facilities and infrastructure accomplished. Assistant Secretary Karsner was also present at the meeting and suggested that HTAC visit the General Motors (GM) facility in Rochester, New York.

**Approval of the Minutes of the October 2-3 Meeting**

Chairman Lloyd asked for discussion on the minutes of the October meeting. Byron McCormick and Robert Shaw said that the team had done a remarkable job of capturing the salient ideas that were presented at the meeting, and other members concurred. Dr. Shaw moved, and Jan van Dokkum seconded the motion to approve the Executive Summary. It passed unanimously. Dr. Shaw moved to approve the minutes subject to any corrections that might be noted by members regarding their own statements. Kathy Taylor drew attention to the action items and asked that the staff check to see if they include all requested items. Michael Ramage seconded the motion to approve the minutes as qualified. The motion passed unanimously.

## **Discussion on Subcommittees**

Chairman Lloyd identified two areas that were recommended by Byron McCormick and Larry Bawden for a subcommittee overcoming implementation barriers for: portable power fuel cells and transportation fuel cells. Dr. Lloyd expressed concern about whether infrastructure will develop commensurately with vehicles and suggested that this should be a subcommittee topic. Dr. McCormick stated that he had ad-hoc discussions on barriers to infrastructure development with representatives from Shell, ChevronTexaco, DaimlerChrysler, Air Products, General Motors, and other companies. These representatives accepted the challenge of preparing an industry perspective white paper on these barriers which he will present at the next meeting. He will make every attempt to provide materials to the HTAC members prior to the meeting. Dr. Shaw asked if the report would include portable power issues. Dr. McCormick answered that it would be limited to transportation and that portable power should be a separate presentation. Mr. Bawden agreed to present the issues related to portable power and infrastructure. These presentations will provide the committee with information to determine the scope of this subcommittee.

Dr. Lloyd, drawing on his experience with the California Fuel Cell Partnership, asked that DOE investigate whether infrastructure technologies, such as nozzles, are specific to the contractor building the station. He said that there is a need to examine interchangeable systems for refueling so that different OEM vehicles refuel at each station. JoAnn Milliken reported that DOE is looking into that. Dr. McCormick stated that an agreement may be close on uniform 700 bar nozzles worldwide. Dr. Ramage asked for a brief (15-20 minute) presentation at the January meeting on what DOE is doing on infrastructure.

Chairman Lloyd invited discussion of the subcommittee structure, including consideration of the two lists of possible subcommittees that were developed at the October meeting.<sup>1</sup> Mr. Walker stated that because HTAC now knows Secretary Bodman's priorities (fuel cells, hydrogen storage, codes and standards), the subcommittees could align with them, adding the international issues (since DOE has international partnerships). David Friedman suggested that rather than restricting itself to the Secretary's priorities, HTAC should instead, direct the Secretary toward important issues in these topics and expand his focus, specifically including safety and environment. Mr. Bawden asked Mr. Walker to clarify what would be included in the scope of each subcommittee he previously suggested, including his proposed "program implementation" and "safety" subcommittees. Mr. Walker stated issues such as safety and the environment could be addressed within each subcommittee but need not necessarily be addressed in separate subcommittees. He agreed that HTAC should push the boundaries of DOE's priorities but suggested that it might be more effective to work within the outline of what the Secretary regards as important. Dr. Lloyd stated that the

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<sup>1</sup> Subcommittees proposed by Mr. Walker were: program implementation, safety, economy, environment, and evaluation of the Posture Plan(s) which derive directly from EPLA 2005, Section 807.

category of “program implementation” covers ways to reduce the barriers. He also stated that the issue of codes and standards had been raised within HTAC but that numerous entities are working on codes and standards and that it is not clear what HTAC and DOE could do additionally or differently.

Craig Venter suggested adding biological hydrogen production to the list of important issues for subcommittee consideration. Dr. Shaw said that raises the question of whether the Secretary feels sanguine about production. Mr. Walker concurred, saying that Secretary Bodman’s enthusiasm for hydrogen derives partly from his enthusiasm for the new generation of nuclear plants, which gets back to the issue of centralized vs. distributed production, noting that Honda’s distributed hydrogen generation model should also be considered by the committee. Michael Mudd said that the discussion should include “central power plants,” not just nuclear ones, but coal gasification, hydrogen turbine plants, and others. Mr. Purtle said that the thing he is most uncomfortable about is hydrogen sourcing and how to tie the timing of hydrogen technologies implementation to the ability to source reasonably priced hydrogen. Gregory Vesey agreed.

Chairman Lloyd asked who would take the lead on a production subcommittee. Mr. Vesey volunteered and members Purtle, Ramage, Mudd, Shaw, and Venter volunteered to serve. Mr. Friedman said that everyone will want to be on the production subcommittee. He suggested that the entire subcommittee structure should be set before choosing membership. Dr. Ramage agreed, saying that all subcommittees should have similar numbers of members. He pointed out that transition is critical and must be part of the work of the production subcommittee. Mr. Friedman asked whether HTAC could provide value by laying out some pathways, visions of getting to a hydrogen economy with scenarios for 10, 20, 40 and 50 years, and realistic expectations.

Mr. Purtle asked for someone to write up a charter for the four subcommittees by January 9, 2007. Mr. Vesey identified these as production/infrastructure, storage, fuel cells, and codes/standards/safety/environment, asking where program implementation and review of the Posture Plan fit in. Dr. Lloyd suggested that program implementation and review of the Posture Plan could be rolled together into one subcommittee. Mr. Friedman asked where early applications and transition technologies fit into those groups. Mr. Purtle stated that short term successes in early applications are needed. Dr. Lloyd said that Dr. McCormick and Mr. Bawden are looking into early applications. Mr. Bawden said that a lot can be done in that regard and he would like to lead the effort. Mr. Vesey agreed that non-vehicle uses are important. Dr. Shaw asked if BMW is participating in Dr. McCormick’s group that is addressing the infrastructure barriers, and Dr. Ramage asked about Ford’s hydrogen internal combustion engine. Dr. McCormick said that both are included.

Dr. Shaw raised the question of whether there exists a mechanism to ascertain the actual status of technologies without violating the proprietary nature of technologies – to get a real understanding of what’s really going on in the private sector. He described the desired understanding as cross-cutting, including membranes, storage, generation, and many players, large and small. Dr. Lloyd agreed, as did Mr. Walker, saying that

hydrogen producers don't see a supply problem in the short term and think that they can expand production as needed. He stated that expanding production is not a complete solution because such production does not yield the major environmental benefits desired, but it does allow for early fleet use. Ms. Epping stated that the U.S. Fuel Cell Council has put out lists of products and is in the process of putting out a report on the status of technology — perhaps they could make a presentation. Dr. Milliken said that the U.S. Fuel Cell Council report might address the fuel cell side but perhaps not production and storage. Dr. McCormick said that GM has done work all over the world on production and storage, mentioning an individual in GM's R&D Department (Jim Spearot) who could give a talk at an HTAC meeting.

Chairman Lloyd then raised the question of the trip to the GM Rochester, New York, facility. Dr. McCormick said that GM would like to host a visit by HTAC there but without opening the visit to the public; asking if that would pose a legal problem. Ms. Epping proposed to check with the General Counsel's office, saying that the visit could probably be done outside of a meeting. Dr. Shaw also offered to arrange for a visit to the H2Gen Innovations, Inc. facility for distributed hydrogen production equipment in Alexandria, VA.

Chairman Lloyd said that he likes Mr. Mudd's suggestion to 'kick around' subcommittee ideas and finalize the structure at the January 9 meeting. Mr. Napoli said that addressing hydrogen education is needed early-on and the subcommittee structure should include such a provision, possibly in "program implementation."

### **Posture Plan Update**

Chairman Lloyd then asked Dr. Milliken to give an update on the Posture Plan. The plan is still not approved by Under Secretary Garman or Secretary Bodman, but Mr. Garman's edits have been incorporated into the draft. It was scheduled to go to Asst. Secretary Karsner's office the coming Monday, then back to Garman's office, with hopes for approval within the next few weeks. Dr. Shaw asked about the HTAC timeline for review; Dr. Milliken answered that EPA does not specify a timeline. Dr. Lloyd said he hopes the Posture Plan can go on the agenda for January 9 and asked if a subcommittee could start work prior to that. Dr. Shaw said there is a need to determine what the review will entail. Dr. Ramage said that such a review is a major undertaking. There is a need to determine the "level," the parameters of review. Dr. Lloyd agreed, saying that the HTAC review should not be detailed. Dr. Ramage agreed, voicing that the whole committee with its diversity of experience should undertake the high level review, rather than a subcommittee. Mr. Walker stated that the committee should review the Posture Plan with the intention to point out gaps, to which Dr. Ramage agreed. Dr. Lloyd said he would put a full committee review of the Posture Plan on the agenda for the January meeting.

Mildred Dresselhaus asked what has been changed in the Posture Plan from earlier versions as a result of recent experience and research. Mr. Walker asked the staff to prepare a side-by-side summary. Dr. Milliken said that the new Plan updates the

milestones, adds accomplishments, and provides more detail on the basic science activity. Roger Saillant asked how frequently the Posture Plan will be updated. Dr. Milliken answered that the original idea was to update it every year, but since that is not proving feasible, it may be every two years. Dr. Saillant said that the HTAC review could help to guide the next update. He said that people are trying to think of the hydrogen economy in the same context as the current infrastructure system, but the vision needs to be elevated to see what the end game, a diverse hydrogen economy, would look like – and to make sure it is more efficient than the current system. Mr. Bawden agreed, saying that points to the need to distinguish between short and long term goals. Dr. Lloyd agreed and said this should be put on the agenda for the January 9 meeting. Dr. Ramage said that focusing only on the long term end solution would result in nothing happening. Bob Shaw stressed the importance of not creating institutional barriers that block emerging options and drew the parallel that in about every ten years the DOW Jones turns over about 30% of its companies due to the emergence of new players.

Mr. Friedman pointed out the value in laying out different pathways by which the hydrogen economy could develop. DOE says that hydrogen will not have a major impact for 20-30 years, but that doesn't mean there won't be vehicles on the road before that. Mr. Vesey said that a lot of work has already been done on such pathways and questioned what HTAC should be doing in that area. Mr. Friedman said that there has been a lot of “separate thinking” but no broad consensus on what the diversity of pathways is. Mr. Purtle agreed, saying there may be options other than vehicles to get fuel cells into the market, as well as different hydrogen production pathways. Dr. Lloyd suggested that maybe the DOE staff could report on their pathway studies, including international studies, along with the technology status report. Dr. McCormick pointed out that even if 16 million hydrogen vehicles per year were sold, it would take decades for the overall fleet to turn over into predominantly hydrogen. He suggested that perhaps there was need to adopt common terminology in terms of what was meant by “impact” and other forms of progress. Mr. Friedman said that such a common language would be a major accomplishment by itself. Dr. McCormick agreed.

Dr. Lloyd asked for DOE to get HTAC the Posture Plan for the January 9 meeting so that HTAC could then make a decision on how to review it and at what level.

### **DOE Market Transformation Plan**

Dr. Milliken informed the committee that DOE is developing a market transformation plan based, primarily, on stationary and portable power applications, forklifts, and other non-vehicle applications. The plan will show how these applications could be used to overcome some barriers. DOE would like to make a presentation on a draft of that plan following the January HTAC meeting. DOE invites HTAC input on the plan, and it will also seek input from the U.S. Fuel Cell Council and the NHA. Members expressed approval of this idea.

## **Midterm Elections**

Dr. Lloyd asked Mr. Walker how the results of the recent midterm election affect the work of HTAC. Mr. Walker replied that, if anything, the election results enhance the opportunities since the Democrats campaigned on alternative fuels, although their focus is largely on biofuels, wind and solar. The hydrogen industry needs to show how it integrates all of these other energy sources into the larger economy.

## **Upcoming Meetings**

Chairman Lloyd opened discussion of dates and times for upcoming meetings. Dr. Milliken reported that no information was yet available on Secretary Bodman's January schedule. It was resolved that the January meeting would take place on January 9-10, 2007, commencing at 9 a.m. on January 9, continuing all day; the January 10 session to begin at 8 a.m. and conclude at 3 p.m. All efforts will be made to keep presentations crisp and succinct. If the meeting runs ahead of schedule, it could adjourn earlier than 3 p.m. Members with adequate time could take part in the tour of the H2Gen Innovations facility, located near Reagan National Airport (taking about 45 minutes plus 20 minutes travel). Ms. Epping will investigate legal issues relating to such site visits Dr. Ramage pointed out that future meetings may need to allow time for subcommittees to meet outside the full committee session.

Dr. Dresselhaus asked whether the Posture Plan has a basic research component. Dr. Milliken answered that it does and Dr. Dresselhaus said that she would like to see that section [which was subsequently forwarded].

There was discussion of the Hydrogen Program Annual Merit Review meeting to be held May 15-18, 2007, and planning an HTAC meeting for that week. There is a plenary session of the Program Review scheduled for the morning of May 15; overviews of three major program groups are scheduled in parallel for the afternoon of May 15. The Committee agreed to schedule the spring HTAC meeting for May 16 and 17.

Mr. Purtle then left the call.

## **Committee Tools**

Chairman Lloyd then turned to a presentation regarding "committee tools." Dr. Helena Chum (HTAC staff) presented an option to create an "extranet" for HTAC members with hyperlinked documents for follow-up on HTAC requests, facilitate ongoing revisions to documents, works-in-progress, and pre-decisional materials, and to post requested staff assessments that are not publicly available. HTAC members, DOE staff and HTAC staff would have passwords for access to the site. Mr. Friedman supported the creation of a "dynamic digital library." Notices of meetings, notices of availability of new documents, and some of the more important documents would still be emailed to members but the volume of such email would be reduced to avoid filling up inboxes. There was apparent consensus to proceed with a one-month trial.

## Closing Items

Art Katsaros asked whether the subcommittee structure had been decided. It was agreed that HTAC would set the structure and select members for subcommittees at the January meeting. In the meantime, comments regarding the subcommittee structure should be submitted to Ms. Epping. Mr. Katsaros requested that a memo summarizing the alternative proposals for structures be circulated to members in advance of the meeting. Dr. Lloyd noted that the proposals are in the minutes.

It was suggested that at the working dinner on January 9, tables could be organized by subcommittee. If some members serve on more than one subcommittee, they could move around from table to table. Dr. Lloyd asked the DOE staff to draft an agenda well in advance of the meeting to see how full the time will be. Dr. Shaw asked that the “common language discussion” be included on the agenda and asked Mr. Friedman to draft an outline of that topic, offering to help. Mr. Friedman agreed but said he would be unable to do so for the next three weeks. Dr. Chum said that the key existing studies would be posted on the extranet site.

In conclusion, Drs. Shaw, Lloyd, and Ramage stated the conference call had been very productive. Dr. Lloyd again thanked Mr. Walker for his work in meeting with the Secretary and reporting back on their meeting.

The meeting was adjourned at approximately 1:54 p.m. EST.

### Actions [Status]

#### Presentations requested:

- DOE's work on infrastructure [Scheduled for January Meeting]
- Technology Status Fuel Cells worldwide -- companies and evolving trends (address issues such as durability and membrane life time)
- Technology Status Infrastructure Developments worldwide -- companies and evolving trends
- Technology Status on Production: point source or centralized with distribution
- Technology Status -- Storage worldwide -- companies and evolving trends and research
- Report on pathways studies, including international studies, along with the technology status report
- Outcomes of 2-years of DOE Posture Plan [Scheduled for January Meeting]

#### Topics for future meetings

- Discussion to clarify the potential charter of a subcommittee: Overcoming near-term implementation barriers (includes codes and standards) in the transportation sector. [Scheduled for January Meeting]
- Discussion to clarify the potential charter of a subcommittee on: Overcoming near-term implementation barriers (includes codes and standards) in the

power, portable power, and early applications. [Scheduled for January Meeting]

- Discussion on Vision, Scenarios, Early Transitions, End Game and Back Casting to achieve a common terminology and a consensus shared vision of the committee. [Scheduled for January Meeting]
- Potential subcommittee on Production/Infrastructure. [Scheduled for January Meeting]
- Review of the Posture Plan -- legislative requirement of 2005 EPA Act for HTAC. [Posture Plan, pre-public version to be delivered by December 15 electronically]
- Establish short term and long term HTAC goals including education.

#### HTAC Tools

- “HTAC Collaboration Site” established and disseminated to members for initial testing and evaluation in December/January. [Scheduled for January Meeting]



Hydrogen and Fuel Cell Technical Advisory Committee Meeting (HTAC) by Conference Call on Friday, November 17, 2006 (12 Noon EST)			
	Attendance	Name	Company
<b>HTAC MEMBERS</b>			
1	YES	Bawden, Larry	Jadoo Power Systems
2	YES	Bresland, John	U.S. Chemical Safety Board
	NO	Chernoby, Mark	Chrysler Group Business Unit at DaimlerChrysler
	NO	Chowdhry, Uma	DuPont Central Research & Development
3	YES	Dresselhaus, Mildred	Massachussets Institute of Technology
4	YES	Friedman, David	Union of Concerned Scientists
5	YES	Hofmeister, John D.	Shell Oil Company
6	YES	Katsaros, Arthur T.	Air Products and Chemicals, Inc.
7	YES	Keuter, Dan	Entergy Nuclear, Inc.
8	YES	Lloyd, Alan	International Council on Clean Transportation
9	YES	McCormick, Byron	General Motors Corporation
10	YES	Mudd, Michael J.	FutureGen Alliance, Inc.
11	YES	Napoli, Rand	State of Florida
12	YES	Purtle, Ian	Cargill, Incorporated
13	YES	Ramage, Michael P.	ExxonMobil Research & Engineering (retired)
	NO	Reinsch, E. James	Bechtel Nuclear
14	YES	Richmond, Geraldine	University of Oregon
15	YES	Saillant, Roger	Plug Power
16	YES	Shaw, Robert	Areté Corporation
17	YES	Taylor, Kathleen	GM (retired)
18	YES	van Dokkum, Jan	UTC Power
19	YES	Venter, J. Craig	J. Craig Venter Institute
20	YES	Vesey, Gregory M.	Chevron Global Power Generation
21	YES	Walker, Robert S.	Wexler & Walker Public Policy Associates
	NO	Wooten, John M.	Peabody Energy (retired)
<b>DOE Staff</b>			
22	YES	Epping, Kathi	DOE Hydrogen
23	YES	Milliken, JoAnn	DOE Hydrogen
<b>HTAC Staff</b>			
24	YES	Bechtold, Rich	Alliance Technical Services (ATS)
25	YES	Chum, Helena	National Renewable Energy Laboratory (NREL)
26	YES	Goodman, Mark	ATS
27	YES	Lott, Melissa	ATS
28	YES	Scheaffer, Dee	NREL
<b>PUBLIC INTEREST GROUP REGISTERED FOR THE CALL</b>			
29	YES	Bayer, Judith	UTC Power, Dir. Gov'n't Bus. Development
30	YES	Craft, Joshua	ASME
31	YES	Privette, Rob	Umicore Autocat USA Inc. Fuel Cells, Dir. US Fuel Cell Development
32	YES	Richman, Josh	Bloom Energy Corp.
	NO	Seiff, Hank	Clean Vehicle Education Foundation, Dir of Tech.
	NO	Whitten, Daniel	Platts "Inside Energy Extra," Assoc. Editor