Memorandum

Date: April 3, 1998
To: Fuel Cell Summit II Participants and Interested Parties
From: Dave Conover, PNNL
Subject: Summary and Action Items from Summit II

On behalf of Ronald Fiskum of the U.S. Department of Energy, Office of Building Equipment (OBE), we would like to thank you for your participation at the recent Summit on codes and standards related to stationary fuel cell power plants. An additional thanks is extended to all the presenters during day one. The feedback we received was very positive, several participants remarking that the open interchange of information was extremely useful and greatly appreciated.

Attached is a summary of the discussions and action items identified during the second day of the Summit. There are a number of activities that should help facilitate the acceptance of stationary fuel cell power plants. OBE hopes to foster cooperative completion of these action items. In that regard, we will continue to act as a central point of contact on activities in order to help facilitate timely acceptance of the technology.

Also attached are: a matrix of tasks developed from both Summit I and Summit II, an update of Summit I tasks that was distributed to Summit II attendees, the list of Summit II attendees, and the Summit II final agenda.

As work progresses on action items for which we are responsible, we will keep you updated on progress and seek your input. We will also be in contact with those responsible for other actions and pass on information on their progress and final results.

If you have any comments, questions, information, or suggestions do not hesitate to call me at (202) 646-5252 or e-mail me at dr_conoverg@pnl.gov.

Summary - Fuel Cells Summit II, March 12-13, 1998

The US Department of Energy, Office of Building Equipment sponsored the second annual Fuel Cells Summit March 12-13 in Alexandria, Virginia, designed to help ensure an effective and supportive environment for market-driven adoption of stationary fuel cell power plant technology. Very important aspects of this supportive environment will be buildings codes and standards that recognize fuel cells as a viable and safe buildings technology, and an educated and receptive buildings community. Without a favorable codes and standards environment, fuel cells will be extremely difficult to fully and successfully commercialize for stationary applications. Recognition of this issue enticed nearly 50 attendees (see Attachment l: List of Attendees) from across the spectrum of fuel cell manufacturers, utilities, users, and others to the 2-day working meeting.

The first day of the Summit began with presentations by various manufacturers on the status of their fuel cell technology development; followed by the status of codes, standards, and regulatory activities by building code officials and representatives from the insurance industry and standards organizations (e.g., NFPA, IEEE, ASME, etc.); and case studies of installations and how they were affected by codes, standards, and regulations. The second day was primarily a working session where the status of tasks developed at the first Summit were reviewed, and new tasks needed were identified and assigned to various attendees who volunteered to work cooperatively toward these common goals (see Attachment 2: Summit Agenda).

Several issues were discussed at the meeting, with summary notes recorded on flipcharts. The content of the discussions are reported below under general issue headings. Each issue contains a brief background, a description of the issue(s), what the current needs are to address the issue, and next steps or actions identified at the meeting along with the personnel who volunteered to take the lead on the effort.

Pressure Vessels

Background: Several fuel cell system designs may employ pressure vessels.

Issues: Codes may require 24-hour attended operation for certain equipment. The ASME boiler and pressure vessel code and associated certification and inspection activities may be applicable.

Needs*:*

- Code regulatory criteria should be specific as to if and when fuel cells must be attended, e.g., small kW units should not need attendants

- Need reciprocity with other countries, primarily Europe, as to acceptance of certification marks (someone should identify who is working on these issues and let everyone know)
- Need American Society of Mechanical Engineers (ASME) "stamp" on pressure vessels
- When installed in an ASME "code" state, a certificate of inspection (uniform code) is required, however, these pressure vessel laws may vary from state to state
- Someone needs to develop the rationale as to why certain technologies should not have certain pressure vessel requirements applied to them. - Each manufacturer/installation must be aware of rules regarding pressure vessels and steam generator pressure vessels and required attendance

Next Steps/Actions:

- It was decided that because this issue (pressure vessel code compliance and stamping) was unique to those using pressure vessels as opposed to the entire fuel cell industry, those entities should individually deal with designing to and satisfying applicable criteria. It was also agreed that no industry initiative was likely to change existing ASME practice.
- It was also determined that those with pressure vessels would also have to deal with stationary engineer requirements on an individual basis and it was not likely the "industry" would be able to change them.
- Kelvin Hecht provided the following source of information for state codes and regulations with respect to pressure vessels and unattended operation:

  Uniform Boiler and Pressure Vessel Laws Society
  308 Evergreen Road Suite 240
  Louisville, KY 40243
  (502) 2444029

Synopsis of state and provincial boiler, pressure vessel and stationary Engineer requirements. Available in hardcopy and on disc. The service, which is updated frequently, costs $150.

- An open item is to determine if and to what degree any state/local requirements for 24hour operation would apply to fuel cells without pressure vessels.

US vs. International Standards

Background: International standards and the process of determining compliance with those standards can be a significant trade barrier to US technologies if they are different from standards in the US The most effective time to address possible differences between US and international standards is during the initial

technology development, before other countries begin to develop their own standards. Often a standard developed in one country can be used as the basis for a standard at the international level.

Issues: There is ongoing work in the international arena on standards development for fuel cells and the US is not participating to a sufficient degree. There are also ways for foreign countries to block US products because they are not certified according to rules in those countries.

Needs:

- American standards addressing fuel cell technology (such as ANSI Z21.83) should be put into International Organization for Standards (ISO) format and used as the basis for the development of international standards. Someone in the US needs to step forward and provide support for this to happen.

- The applicable ISO committee needs to be identified and the US needs to get involved with them.
- There is a fast track method that allows someone to submit a document to the International Electrotechnical Committee (IEC), someone needs to get more information on this, including ISO rules for submitting changes. A US Technical Advisory Group (TAG) is needed and possibly a new work proposal prepared if the issue is not being addressed by the IEC.

Next Steps/Actions:

- Kelvin Hecht is to get agreement from the Z2 1 committee to forward the draft ANSI fuel cells performance standard (Z21.83) to the ISO as a basis for the international standard, by this summer.
- Rhett Ross is to see that the US Fuel Cell Council (USFCC) submits a letter to the Z21 committee supporting this effort, also by this summer.
- It was agreed that international reciprocity on the issue of certification and acceptance was a broader issue impacting more than fuel cells and not likely to be resolved by the fuel cell industry.

Micro-Grids

Background: Many large industrial facilities operate their own electricity grids, or "micro-grids," within their facility boundaries. These include energy storage devices, microturbines, etc. Utilities also sometimes operate micro-grids as "secondary networks" in large cities.

Issues: No documentation or standards currently exist for these. Secondary networks any larger than 5 kW are required to have special controls and transformers to prevent backfeed, which drive costs up tremendously and create

an additional market barrier to technologies like fuel cells. The issue is not presently being addressed by the Institute of Electrical and Electronics Engineers (IEEE).

Needs: Standards for micro-grids.

Next Steps/Actions:

Joe Koepfinger is to provide a 2-page write-up to Dave Conover by May 1 as to why a standard is needed in this area.

Terminology and Definitions

Background: The first Summit identified a need to establish common definitions and terminology for fuel cells to help ensure consistency between various organizations and fuel cell users. A good start on such a reference document has been developed pursuant to Summit I.

Issues: This document must be maintained and updated in order to remain current.

Needs:

- This document should be available from a central source, like the DOE or the Fuel Cell Council.
- Does the keeper need to be a standards organization, with updates through some consensus process?
- The document should stick to fuel cell items but stay away from definitions like base load power that would better be covered elsewhere.

Next Steps/Actions:

- Rhett Ross will take the initial draft and update it with any additional definitions needed, and make it available through the Fuel Cell Council by October 1.
- Everyone who has definitions to include should supply them to the FCC.

Performance testing

Background: Potential users of a technology must have means of comparing the performance (e.g., rated and part-load power performance, thermal and electrical power output, transient response, efficiency, etc.) of that technology with alternative, competing technologies (i.e., inter and intra industry comparison).

Issues: No performance standard currently exists for fuel cells.

Needs:

- This issue is presently being addressed by ASME, who is producing a working draft of the new Performance Test Code - 50 (PTC-50).

Next Steps/Actions:

None identified at meeting, those interested in the activities of ASME PTC 50 should contact Jack Karian of ASME and explore becoming a member of the committee or receiving committee mailings.

Grid Interconnection Requirements for Distributed Generation Equipment

Background: Utilities have strict guidelines regarding characteristics of electricity generation technologies that they will allow to be connected to their systems.

Issues: Meeting these guidelines are critical for small-scale power generators like fuel cells, if they are to be grid-connected. However, different utilities may have different guidelines and may require different and/or redundant hardware. Moreover, there is no reason for utilities to adopt and implement uniform criteria (unless some preemptive federal legislation is proposed).

Needs:

- Those who manufacture distributed generation technologies would like to have a complete set of these utility criteria, but it is difficult for small manufacturers to obtain them, particularly as this requires contacts with multiple utilities.
- Most of the specifications used by utilities are patterned after 2 or 3 documents. EPRI is putting together a compendium of these for EPRI members, which should be available in 2-3 months. However this will miss several utilities, both large and small, because less than half of the utilities in the U.S. are being surveyed.
- IEEE is initiating a standards coordinating committee to begin development of standards for grid interconnection and power conditioning.

Next Steps/Actions:

- Wayne Gardner is to check on availability of the EPRI document and report back to the group by May 1.
- Dave Conover is to check on availability of any other documents with the National Association of Regulatory Utility Commissioners, also by May 1.
- It was agreed that this issue is best addressed by the entire distributed generation community.

Education

Background: Education on fuel cells is necessary because most people are still relatively unfamiliar with the technology. These include code officials, people at the grass roots, policy/law makers, and the insurance industry.

Issues: There is not only a lack of familiarity with fuel cells, but also negative misconceptions about hydrogen fuels that will have to be overcome as a condition for fuel cells achieving widespread acceptance.

Needs:

- Misconceptions about fuel cells and hydrogen fuels must be corrected.
- The National Energy Education Development Project has requested some information on fuel cells from the Breakthrough Technologies Institute; this needs to happen more.
- Attempts to educate code officials can backfire if this is attempted too soon and interest is stirred up before the technology is really commercial. There is a window of opportunity and efforts must be timed right.
- Efforts to attend meetings of building inspectors, present information on fuel cells and hydrogen fuels must continue.
- Coordination among fuel cell interests, the hydrogen community, and other interested parties must occur so that the "industry" speaks with one voice.

Next Steps/Actions:

- Some activities are already underway through NHA to dispel the myths about the dangers of hydrogen. (DOE OBE has submitted comments on their document.)
- A traveling museum on fuel cells is being sponsored by the Breakthrough Technologies Institute.
- The Fuel Cell Council sees education as a primary focus of their activities and will volunteer to take the lead on it.
- Bob Wichert is to draw up a draft "Education Plan" and provide to the meeting attendees by June l.

Cost/Benefit Criteria

Background: Similar to the need for performance criteria, potential users of fuel cells must have means of comparing cost/benefit information with alternative, competing technologies.

Issues: There are so many variables that go into assessing the costs and benefits that it is extremely difficult to compare calculations.

Needs:

- EPRI has the Technical Assessment Guide (TAG), one thing needed is the basic information that goes into it, allowing anyone to do the calculations needed for comparative analysis.

Next Steps/Actions:

- Morgantown has issued the Fuel Cell Handbook that is very useful, perhaps develop data for this tool as a first step.
- OBE is to update the existing FEMP [Federal Energy Management Program] Technology Alert publication for fuel cells and "privatize" it for distribution as an information/analytical tool by June l.
- Any manufacturers so inclined can develop information for the EPRI TAG and provide to EPRI

Electromagnetic Interference (EMI)

Background: Fuel cells produce direct current electricity which is typically converted to alternating current through the use of a power inverter. Power inverters can cause interference with radio and television broadcast transmissions and therefore fall under the jurisdiction of the Federal Communications Commission.

Issues: No test standard currently exists for fuel cell power inverters.

Needs:

- Need a definition as to how you test a fuel cell for EMI (would be a standard).
- Need to determine susceptibility of the fuel cell and its control systems to interference from other units/systems (tested to manufacturer specifications).
- Need a consensus-type standard as to how to interpret the test results.
- Perhaps need a two-page document (a brief) that explains this issue and how one goes about addressing it.

Next Steps/Actions:

- IEEE and the industry should be the ones to develop a two-page brief on EMI. –
- Joe Koepfinger is going to provide the numbers of the international (IEC and IEE) standards on this issue and provide these to the industry attendees of the meeting. –
- Yuri Khersonsky is to look into the issue of applicable standards on fuel cell EMI and report back to Dave Conover by May l.

Stationary vs. Portable Uses

Background: One potentially large area of fuel cell applications is backup power generation. Backup power supplies can be mounted on mobile or "semi-stationary" platforms so that they can be transported to a site when needed, particularly those intended for emergency situations. There are also other semi-stationary applications which may offer significant application potential for fuel cells, e.g., recreational vehicles, boats, etc.

Issues: What codes issues are associated with temporary or semi-stationary fuel cell installations? Is there an analogy with diesel generators? Should guidance be provided to code official for these? Are they even going to be under their jurisdiction?

Need:

- Need to define "emergency conditions" (not to be confused with NFPA 110 Emergency Backup Power.
- Other needs may become apparent as the issues above are answered.

Next Steps/Actions:

- Dave Conover is to pulse code officials as to their concerns regarding semi-stationary applications and report back to the meeting attendees by May 15.

Distributed Generation

Background: State regulation is evolving in relation to utilities and requirements for purchasing electric power from distributed generators.

Issues: Regulations may not be established in their optimal form without participation and input by distributed generators and associated organizations, e.g., are fuel cells receiving favorable treatment as "renewable" resources? What form of communication is being required between a distributed generator and the utility?

Needs:

- The industry needs to be looking across these evolving regulations for uniformity and technical correctness (could be performed through a "Lexis/Nexis" type of literature review) and providing comments/suggestions for improvements.

Next Steps/Actions:

- The Distributed Power Coalition (DPC) takes a lead on all kinds of issues related to distributed generation.
- Dave Conover will try to set up a meeting between the various DOE offices involved in distributed generation by April l, and invite Wayne Gardner of the DPC.
- Dave Conover will also look into what is being done on compiling information on current state activities in this area, reporting back to the Summit attendees by May 1.

Year 2000 Issue

Background: The change of the date at the millennium threatens to cause havoc for many computers and integrated circuit chips that use 2-digit date fields, due to potential confusion between the years 1900 and 2000.

Issues: Equipment may shut itself down or otherwise operate incorrectly.

Needs:

- What are the utilities doing about this? What are they requiring with respect to equipment connected to their grids?
- The industry needs to keep abreast of the issue as it applies to utility equipment.

Next Steps/Actions: None identified at the Summit.