

North American SynchroPhasor Initiative (NASPI)  
[Formerly, Eastern Interconnection Phasor Project (EIPP)]

Performance and Standards Task Team (PSTT)

Meeting Minutes

August 29, 2008

By Teleconference and LiveMeeting

A conference call of the NASPI Performance and Standards Task Team was held on August 29, 2008. Twelve (12) participants were in attendance. The attendance list can be found in Appendix A. The following action items and agreements resulted from the meeting.

NEXT MEETING

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**Next PSTT Teleconference is scheduled for September 26, Friday, 8:00am-9:00am PT (1.0 hour). Please adjust for your respective time zones.** Instructions for teleconference and LiveMeeting can be found in Appendix B. Please note there are new LiveMeeting credentials. **See below for setup procedures.**

**Please start your set-up 5 minutes before the start of the teleconference.**

Individual task forces can send request to Teresa Carlon ([teresa.carlon@pnl.gov](mailto:teresa.carlon@pnl.gov)) for setting up additional teleconferences.

ACTION ITEMS AND AGREEMENTS

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1. **Damir Novosel:** request permission from IEEE to posted PMU session presentations on the NASPI web site.
2. **Vahid Madani:** Announced the NASPI Work Group Meeting in October. Make sure to register for the meeting by October 8, 2008 (<http://www.naspi.org/meetings/workgroup/workgroup.stm>).
3. **All PSTT Members:** If (additional) resources are needed to complete 2008 goals please get in touch with Vahid.
4. **ALL PSTT Members:** Please review “Guidelines for synchronization techniques” and “PMU Basic Specification” by Alfredo Vaccaro and Ken Martin respectively. Teresa Carlon emailed the documents to the PSTT members on August 6, 2008. Feel free to send your feedback to Teresa or Vahid and it will be forwarded to the right person.
5. **All PSTT Members:** **Ken Martin’s new email address is kemartin8421@comcast.net**
6. **Jerry Stenbakken and Alfredo Vaccaro:** to coordinate on incorporating the synchronization technique document to the PMU Testing Guide.
7. **Teresa Carlon:** Send Armando’s email to Sushil Cherian. Completed 9/4/08.

**CONTACT INFORMATION**

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- Performance and Standards Task Team Co-chairs – Vahid Madani, PG&E, (510)874-2300, [VXM6@pge.com](mailto:VXM6@pge.com); Damir Novosel, Quanta Technology, (919) 334-3010, [DNovosel@Quanta-Technology.com](mailto:DNovosel@Quanta-Technology.com). Supported by Henry Huang, PNNL, (509) 372-6781, [zhenyu.huang@pnl.gov](mailto:zhenyu.huang@pnl.gov).
- PSTT Resources Website: <http://www.naspi.org/resources/pstt/psttresources.stm>  
Contact: Teresa Carlon, (509) 375-3628, [teresa.carlon@pnl.gov](mailto:teresa.carlon@pnl.gov).
- Prior PSTT Meeting Minutes and Agenda's:  
<http://www.naspi.org/meetings/pstt/psttmeetings.stm>
- PSTT SharePoint Site: <http://www.eippshare.org/prtt/default.aspx>. Contact: Teresa Carlon, (509) 375-3628, [teresa.carlon@pnl.gov](mailto:teresa.carlon@pnl.gov).

**MINUTES**

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Agenda items with some discussion points were sent out to the team prior to the meeting. Notes from the resultant discussion for each agenda item are as follows.

1. Roll call – see Appendix A.
2. Henry Huang et al. IEEE PES General Meeting presentation can be viewed here:  
<http://www.naspi.org/resources/pstt/psttresources.stm>
3. Vahid announced the NASPI Work Group Meeting in October. Make sure to register for the meeting by October 8, 2008  
(<http://www.naspi.org/meetings/workgroup/workgroup.stm>).
4. See notes in table for updates on goals.

<b>2008 Goals</b>	<b>Task Leader (Bold)</b>
<p>1. <b>Define PMU</b></p> <p><b>8/29/08:</b> Ken has not received any comments from the team yet. The definition targeted current and future PMU's, not necessarily older PMU's. Some existing PMUs do not meet the current standard. Comments from team will be forwarded to Ken. Ken's new email address is <a href="mailto:kemartin8421@comcast.net">kemartin8421@comcast.net</a>.</p> <p><b>8/6/08:</b> Document was distributed to PSTT for review and comment.</p> <p><b>6/27/08:</b> Vahid reported that the current version defines an NASPI PMU instead of a general PMU. It is well received by the NASPI Leadership team and the</p>	<p><b>Ken Martin,</b> Sakis Meliopoulos, Harish Mehta</p>

2008 Goals	Task Leader (Bold)
<p>NASPI Working Group. It is ready for NASPI leadership team approval.</p> <p><b>6/11/08 @ NASPI Meeting:</b> Ken to provide a copy of the discussion notes regarding the definition.</p> <p><b>5/30/08:</b> Ken Martin provided an update on the content of the PMU Basic Specification. Document will be sent to the PSTT team for comments before June NASPI meeting.</p> <p><b>4/18/08:</b> The user will be interested in data coming out of the PMU box. The team needs to determine what capabilities the PMU box should have. Should data streaming be included at a requirement in the write-up? From the user perspective, Vahid would like to see guidance as opposed to “requirements.”</p> <p>Vahid asked if Ken and his team can finalize before mid May so it can be sent out to the entire PSTT in preparation for brief discussion at the May conference call, and for report out at the June PSTT meeting.</p> <p><b>3/28/08:</b> Ken discussed the definition of a PMU. A question was asked with regards to what is the driving factor of this document? The team was in agreement that the word “standard” in the title of the goal may present a problem and may not accurately describe what the intention of the document. What is the goal’s objective? If the objective is to provide educational material to users then a name change maybe warranted. The document should help users better understand a PMU. This document may also be helpful to the manufacturers. Vahid suggested maybe there is a need for two documents as opposed to one.</p> <p><b>1/25/2008</b> – Ken reported that the team had not received any comments, and the writing team thinks the final version is in good condition.</p> <p><b>11/2/07:</b> Ken Martin sent out the scope document prior to the teleconference. Discussions were focused on at what level the standard PMU should be defined: at the device level, the function level, or the applications level? With a multi-function PMU, PMU function should not affect other functions, and vice versa. In China, a PMU can also serve as a local PDC with certain phasor applications. The tentative consensus is that the</p>	

<b>2008 Goals</b>	<b>Task Leader (Bold)</b>
<p>standard PMU should be defined considering all levels.  1/25/2008 – Ken reported that the team had not received any comments, and the writing team thinks the final version is in good condition.</p>	
<p>2. Requirements to guide PMU deployment and system architecture needs, locally and regionally</p>	
<p>a) System and device requirements for combined applications</p> <p><b>8/29/08:</b>  Jim Hackett has been out of the loop for the last couple of meetings, but will get updated.</p> <p><b>6/27/08:</b>  No progress reported.</p> <p><b>4/18/08:</b>  User interested in data coming out of the PMU box. Team needs to determine what capabilities the PMU box should have. Should data streaming be included as a requirement in the write-up? From a users perspective, there should be guidance as opposed to “requirements.”</p> <p><b>11/2/07:</b>  A scope document was sent to the team prior to the teleconference. Applications need to be grouped into categories before requirements can be addressed. Chris Anderson will send a related document to Yi and Jim. This task seems to have some overlap with item #7 “Requirements for Protection and Control”. Vahid will look at Yi’s scope document against item #7 to identify commonalities and differences. A question was raised regarding why we need combined requirements if we already have requirements for individual applications. This needs more discussion.</p>	<p><b>Yi Hu, Jim Hackett</b></p>
<p>b) Phasor Tools Listing - Requirements and specifications for phasor tools</p> <p><b>8/29/08:</b>  The Phasor Tool Repository forms and database are built and will be connected during the first week of September. The repository will be available for internal testing the week of September 8 and shortly thereafter available for external testing (those folks outside PNNL’s firewall).</p>	<p><b>Henry Huang, Jim Hackett, Enrique Martinez, Tony Weekes., Sushil Cherian</b></p>

2008 Goals	Task Leader (Bold)
<p><b>6/27/08:</b>  The initial webpage for phasor tools listing was developed with help from Teresa Carlon and Courtenay Turner (PNNL). Ongoing efforts are on the refinement of the design and finalization of some details like tool categories and key words. Henry emphasized the purpose of this webpage is to collect and disseminate phasor tool information so vendors/developers can gain visibility for their tools and users can search/browse phasor tools. This webpage is expected to serve as a bridge between phasor tool vendors/developers and users. Henry expected the beta version would be ready within two months for testing. Rob Folkes suggested to add a function on the web for listing tool user references. The team concurred.</p> <p>Further input from PSTT members on the webpage design, tool categories and keywords is encouraged and should be directed to Teresa Carlon (<a href="mailto:teresa.carlon@pnl.gov">teresa.carlon@pnl.gov</a>).</p> <p><b>6/11/08 @ NASPI Meeting:</b>  Vahid and Robert Folkes described the intent and some good feedback was received – Many of the attendees are interested to participate in the postings. The users welcome the listings as well.</p> <p>After the June meeting, Lisa Beard talked to Vahid and suggested a link to the Research Initiative Task Team to further coordinate the NASPI task team efforts.</p> <p><b>5/30/08:</b>  Henry and Teresa reported on the new web-based database for the Phasor Tool list and provided a description of how the site would function and what it might look like. The database would be used by prospective phasor tool users for information search and learning as well as by vendors to give visibility to their products. A panel will be set up to review and approve or reject submissions to the database. The approval/rejection process will be handled by email. The ad hoc group members are: Henry Huang, Teresa Carlon, Tony Weekes, Vahid Madani, Brian Kirby, Robert Folkes, Alfredo Vaccaro, Ken Martin, and Kevin Richardson. This group will help determine what data needs to be captured and what data needs to be displayed.</p> <p><b>4/18/08:</b>  Henry and Teresa discussed creating a web-based Phasor Tool list in more</p>	

2008 Goals	Task Leader (Bold)
<p>detail. Teresa will prepare a cost estimate for Jeff Dagle and Henry to review. Henry liked to structure of the NASPI Research Project Repository and would a similar web-based format for the Phasor Tool list.</p> <p>Teresa and Henry to provide link if possible in advance of May conference call. If link, not available, provide a proposal with list of challenges in order for the committee members to comment or determine other ways.</p> <p>Henry to follow-up with Robert Folkes and Tony Weekes to gather a list of tools as a starting point based on the experience Psymetrix team has in dealing with their clients. Also, check with Tony Weekes and other team members to help prepare a list before May Conference call. This item will also be on the June PSTT meeting.</p> <p><b>3/28/08:</b> Phasor tool listing: Henry has been thinking about how to move this forward. One of the steps is to survey existing tools and provide categorization/summary. Inspired by the NASPI research repository site developed by PNNL. Maybe we can create a similar web site to collect information on various phasor tools. The site would be accessible by the public and can be filled by tool developers. Incentive for the vendors to provide information is that the site can be an "advertisement" for their tools.</p> <p>If on-line based listing is feasible, Henry will work with Teresa to see how we may set it up.</p> <p>Vahid asked if Robert Folkes would join this group. Robert offered to assist with providing a list of tools as a starting point based on the experience Psymetrix team has in dealing with their clients. Also, Tony Weekes and other team members will help Henry and will add to the list.</p> <p><b>11/2/07:</b> A scope document was sent to the team prior to the teleconference. Accessibility tools were proposed to be added to the scope. Also users should be able to make specifications for phasor tools. Several people provided valuable comments based on their experiences. Vahid encouraged everyone that has developed a tool or has recognized value for a particular tool based on their experience to send a note to Henry for consideration.</p>	

2008 Goals	Task Leader (Bold)
<p>c) Guidelines for synchronization techniques - Accuracy and Availability</p> <p><b>8/6/08:</b> Dcoument was distributed to PSTT for review and comment.</p> <p><b>6/27/08:</b> Alfredo Vaccaro reported that previous comments have been incorporated into the current version of the document. It is ready for another round of review. Jay Murphy will comment. The current document will be distribute to the entire PSTT for comments. Jerry Stenbakken will coordinate with Alfredo regarding how this document may be incorporated into the PMU Testing Guide. One proposed idea is to have the synchronization technique document as an appendix in the PMU Testing Guide.</p> <p><b>5/30/08:</b> Alfredo V. provided background on the Guidelines for Synchronization Techniques. Vahid wants to remove comments and tracking and send to PSTT for review. Feedback will be sent back to Alfredo for consideration.</p> <p><b>4/18/08:</b> Alfredo has received comments from Krish and is updating the Guidelines.</p> <p><b>3/28/08:</b> Krish will send out guidelines out prior to the April meeting.</p> <p><b>2/22/08:</b> Should the testing of the GPS be part of Jerry’s document or should the testing of GPS be a stand alone document? Should we address vulnerability? Henry suggested to start with separate documents then in the future we can combine if needed. This method will allow the Guidelines for Synchronization Techniques can remain stable for a while without opening it backup for comments. Jerry suggested we steered away from the term GPS – instead focus on “time reference.” Alfredo is going to prepare a new version of the document and probably a presentation for the March meeting.</p> <p><b>1/25/08:</b> Alfredo Vaccaro distributed an updated draft document after incorporating Bill Dickson’s comments. Unfortunately, Alfredo was not able to join the conference call due to phone connectivity issues. The draft document will be posted at the SharePoint site.</p>	<p><b>Bill Dickerson,</b> Jerry Stenbakken, Alfredo Vaccaro</p> <p>Sub-team: Krish and Jay to comment and provide feedback to Alfredo</p>

2008 Goals	Task Leader (Bold)
<p><b>11/9/07:</b> Discussion of synchronization codes: GPS, IRIG-B, and 1488. Each type has different errors and issues. A reference sheet listing pros and cons of each would be useful. Also, discuss the requirement for synchronization. Goal would be to develop a guideline. Vahid had started such a document and will send to Jerry Stenbakken.</p>	
<p>d) Requirements for hardware and firmware upgrades</p> <p><b>11/9/07:</b> No progress to report.</p>	<p><b>Shane Haveron,</b> Jim Hackett, Floyd Galvan., Enrique Martinez</p>
<p>3. Procedures for testing PMU at the commissioning level</p> <p><b>11/9/07:</b> Vahid Madani reviewed existing document. If the document has covered all areas, including testing, then the document may be considered complete. Discussion as to whether or not the title of the document needs to be changed or if other information still needs to be added. Other people need to be involved to review and approve document.</p>	<p><b>Vahid Madani,</b> Tony Weekes., Ken Martin, Mladen Kezunovic, Alfredo Vaccaro</p>
<p>4. Standardizing PMU Configuration for IEC 61850 Applications</p> <p>Implementation Agreements (Standards) for Interoperability of the Synchrophasor Values</p> <p><b>6/27/08:</b> Vahid Madani mentioned the goal of this activity is to have a common platform for including phasor data into the operating environment. The 61850 group requested for components regarding phasors. Jialong Wang is interested in participation.</p> <p><b>6/11/08 @ NASPI Meeting:</b> Sushil provided a summary power point highlighting the PSTT progress, focus areas, and coordination with the IEC Standards committee – Vahid and Shushil are working with IEC for the creation of Work Item Proposal for synchrophasors data systems. There is a lot of interest in this area.</p>	<p><b>Shane Haveron,</b> Roger King., Sushil Cherian</p>

2008 Goals	Task Leader (Bold)
<p>After the meeting, Armondo Guzman mentioned he will participate in this effort and will join Sushil's team.</p> <p><b>5/30/08:</b> Vahid provided an update. Develop modules for the WAS (sp). System Integrity protection schemes. Modules would have elements that would be used for uniform applications. Sushil provided a summary of discussion points in a document titled_“Update on standardizing PMU configuration for IEC 61850 Applications.”</p> <p><b>4/18/08:</b> Shane will report at the May meeting what the vendors are doing. Vahid wants to make sure the PSTT is prepared to show the users and vendors a the June NASPI Work Group meeting what the PSTT has to offer.</p> <p><b>1/25/08:</b> Sushil distributed updates on the work plan prior to the teleconference. IEC 61850 has been contacted and they are interested in working with PSTT on this important issue.</p> <p>Action Item: Comments on the work plan are requested and are due Sushil by Feb 22.</p> <p><b>11/30/07:</b> Shushil presented the resource estimate to the attendees.</p> <p><b>11/9/07:</b> The scope document was sent to the team prior to the teleconference. The goal is to develop a companion standard for IEEE 61850. Deliverables need defined so resources can be identified. For example, ESG/NERC financial support to help hire consultants. Action Sushil will develop an estimate by next task team meeting.</p>	
<p>5. Expand guidelines for using devices with Integrated PMU Functionality</p> <p><b>3/28/08:</b> Krish will have a draft before the April meeting for review.</p> <p><b>11/9/07:</b> The goal is to expand a previous presentation to a document, including testing guide for integrated PMUs. Coordinate with Jerry Stenbakken to decide what should reside in which document regarding testing.</p>	<p>Krish will lead, with the team consisting of Anurag, Damir, Jay, Jerry, Jim, Enrique, and</p>

2008 Goals	Task Leader (Bold)
Invited Chris Anderson, Jerry Stenbakken and Roberto Cimadevilla to the team.	Yi.
<p>6. <b>Issues with “Dynamic Phasors”</b></p> <p><b>8/29/08:</b> Jerry Stenbakken mentioned Ken’s group is working to update the standard on dynamic phasors.</p> <p><b>8/6/08:</b> No update at this time.</p> <p><b>6/27/08:</b> Jerry Stebakken updated about dynamic phasors at the June NASPI meeting. Ken Martin has a PAR for expanding the IEEE phasor standard. Ken currently has two working groups: one on dynamic frequency and phasors; the other on PDC.</p> <p><b>5/30/08:</b> Henry indicated more work is needed on dynamic phasors.</p> <p><b>4/18/08:</b> “Reference Values for Dynamic Calibration of PMUs” presentation (<a href="http://www.naspi.org/resources/pstt/stenbakken_kansas_city_2008may.pdf">http://www.naspi.org/resources/pstt/stenbakken_kansas_city_2008may.pdf</a>). PSTT please provide feedback to Jerry Stenbakken.</p> <p><b>11/9/07:</b> The goal is to determine whether the current steady-state based phasor definition would still be applicable with higher sampling rates, transient signals, frequency tracking, etc. Higher sampling rates increase data volume, which may exceed practical technical limits. Identify deliverables so that resources can be determined.</p> <p>Roberto Cimadevilla was welcomed to join the group.</p>	<p><b>Henry Huang,</b> Tony Weekes, Jerry Stenbakken, Bogdan Kasztenny, Mark Adamiak, Ken Martin, Arun Phadke</p>
<p>7. <b>Standards &amp; requirements for Protection and Control Applications</b></p> <p><b>4/18/08:</b> No updates at this time.</p>	<p><b>Shane Haveron,</b> Enrique Martinez, Ken Martin, Jim Hackett, Virgilio</p>

2008 Goals	Task Leader (Bold)
	Centeno, Vahid Madani, Yi Hu, Sakis Meliopoulos, Mohammad Zubair
8. Identify requirements for redundancy (part of architecture)	
<p>9. Discussions with IEEE on COMTRADE file use with PMU – See notes from January 2008 conference call.</p> <p><b>4/18/08:</b> Please let Vahid know if you have any feedback.</p> <p>Feedback from PSRC indicates that COMTRADE standard defines only formats but not contents. An add-on configuration may be developed to satisfy the need when Comtrade is used for phasor measurements. Jim Hackett, as vice chair of PSRC WG H10, invites PSTT members to attend the next H10 meeting at Kansas City on May 13-14, 2008 or give Jim some feedback for discussion at the H10 meeting.</p>	
<p>10. Define Standard requirements for the Phasor Data Concentrator (PDC) Hardware Input protocols, and protocols needed if in the future we want to go to the SE - Whether it is better to have a independent server or independent database etc. for future expansion, what data bases will match what PDCs.</p> <p><b>6/27/08:</b> Tony Weekes stated the objective of this activity is to define PDC requirements and provide educational information to the user community. A presentation was made at the June NASPI meeting, and a meeting with the Data Management Task Team was held to coordinate the efforts on Phasor Gateway. The Data team responded that the Phasor Gateway would not be affected by PSTT PDC requirements. There is no need to coordinate in terms of data structure. Henry commented that given the commonality between a PDC and the Phasor Gateway, a PDC may be used as Phasor Gateway. However, consensus of the PSTT team and the Data team was that the two efforts are complimentary. Only naming convention may need to coordinated. The Data team aims to develop hierarchy and functional definition of a phasor network. Hardware like PDCs will be developed in other groups. Then Alfredo briefly presented different scenarios of PDCs for different applications.</p>	<p><b>Tony Weekes, Jim Hackett, Ken Martin, Yi Hu, Sushil Cherian</b></p>

2008 Goals	Task Leader (Bold)
<p>Henry will check SharePoint posting of Tony's presentation at the June NASPI meeting.</p> <p><b>6/11/08@NASPI Meeting:</b></p> <p>Tony Weekes and Yi Hu provided a power point summary related to the PDC requirements – Presentation is posted on the PSTT SharePoint site. Comments from the attendees will be incorporated in the team's efforts.</p> <p><b>5/30/08:</b></p> <p>Tony discussed the PDC requirements and core functionalities, which need to be expanded and formalized. Tony reviewed Sushil Cherian's input for PDC requirements. Appendix could contain architecture, hardware and functional considerations. Vahid suggested creating a 20 minute presentation focusing on the main points to help facilitate discussions at the June meeting. Feedback will be obtained at the meeting and incorporated as necessary. Henry suggested to coordinate this activity with the Data Management Task Team. The PDC has some commonality with the PhasorGateway currently being developed by the Data team.</p> <p><b>4/30/08:</b></p> <p>Tony Weekes held a meeting with Jim, Yi and Sushil to discuss PDC requirements.</p> <p><b>4/18/08:</b></p> <p>It has been difficult to narrow down the scope. Architecture or requirements do not have to be identified. Is there a relationship between 2A and 10? There may be some similarities. The challenge has been reaching a single acceptable architecture and hardware with continual changes. User need to have a document s/he can use without starting from the beginning. The idea is to provide a blue print that others can draw from because the infrastructure will not be the same from site to site. The information needs to be generalized to meet the different applications. Maybe the title needs to be changed from "Standard" to "Functional" and sub-bullets to discuss PDC security and Role of Hardware with Sytem Integration.</p> <p>If you have any ideas, please share your thoughts with Tony.</p> <p>Action: Tony will have a draft ready one week prior to the PSTT May meeting.</p>	

<b>2008 Goals</b>	<b>Task Leader (Bold)</b>
<b>3/28/08:</b> Tony gave an overview of the Phasor Data Concentrator Standard Requirements document. Form a team: Robert Folkes, Sushil Cherian, Ken Martin, Jim Hackett, Yi Hu; Krish Narendra	

9. Next Meeting: **September 26, 2008, Friday, 8:00am-9:30am PT.**

10. Meeting adjourned.

## **Appendix A: Conference Call Attendees**

<b>Name</b>	<b>Affiliation</b>
Alfredo Vaccaro	Università degli Studi del Sannio, Italy
Anurag K. Srivastava	Mississippi State University
Jay Murphy	Macrodyne
Jerry Stenbakken	NIST
Jim Hackett	MethaTech
Ken Martin	BPA
Kevin Richardson	SCE
Roy Moxley	SEL
Sushil Cherian	Kalki Tech
Teresa Carlon	PNNL
Vahid Madani	Pacific Gas and Electric Co.
Yuchen Lu	Siemens

## **Appendix B: Instructions for Teleconference and LiveMeeting**

### **1. Instructions for conference call participants:**

- **Local participants:** call 376-7411 and ask for the conference title "**PSTT**" (confirmed by Teresa Carlon).
- **Long-distance participants:** call 1-800-664-0771. When you hear the Octel voice mail system answer, please dial 0 and ask the Operator for the conference title "**PSTT.**"
- **International participants:** Please use one of the two ways: 1) call 509-376-7411 (will incur long distance charge to you) and ask for the conference title "**PSTT**"; 2) let Teresa Carlon, (509-375-3628, [teresa.carlon@pnl.gov](mailto:teresa.carlon@pnl.gov)) know in advance that you want to participate, and then Teresa will have PNNL Telephone Service personnel call you and connect you to the teleconference.

(If you need assistance, please call PNNL Telephone Services at 509-375-6400)

### **2. Instructions for LiveMeeting:**

New LiveMeeting keys created for the June 27, 2008 meeting:

Teresa Carlon has invited you to attend an online meeting using Microsoft Office Live Meeting.

<https://www.livemeeting.com/cc/pnnl/join?id=JPGN7J&role=attend&pw=Fc%25%60KH%216m>

Add to my Outlook Calendar:

<https://www.livemeeting.com/cc/pnnl/meetingICS?id=JPGN7J&role=attend&pw=Fc%25%60KH%216m&i=i.ics>

### **FIRST-TIME USERS**

To save time before the meeting, check your system to make sure it is ready to use Microsoft Office Live Meeting.

<http://go.microsoft.com/fwlink/?LinkId=90703>

### **TROUBLESHOOTING**

Unable to join the meeting? Follow these steps:

1. Copy this address and paste it into your web browser:

<https://www.livemeeting.com/cc/pnnl/join>

2. Copy and paste the required information:

Meeting ID: JPGN7J

Entry Code: Fc%`KH!6m

Location: <https://www.livemeeting.com/cc/pnnl>

If you still cannot enter the meeting, contact support:

[http://r.office.microsoft.com/r/rlidLiveMeeting?p1=12&p2=en\\_US&p3=LMInfo&p4=support](http://r.office.microsoft.com/r/rlidLiveMeeting?p1=12&p2=en_US&p3=LMInfo&p4=support)