NORTH AMERICAN SYNCHROPHASOR INITIATIVE
PHASOR TOOLS VISUALIZATION WORKSHOP

FEBRUARY 28, 2012, 1:00 to 5:30 pm
HYATT REGENCY ORLANDO AIRPORT
ORLANDO, FLORIDA

Workshop purpose

In the on-going effort to improve grid reliability for the North American bulk electric system, this workshop will look at visualization and situational awareness applications based on data collected using Phasor Measurement Units. Synchrophasor technology is the most significant control center data improvement tool introduced in the last decade. Collecting phasor data and efficiently delivering it to operators in a structured fashion can enhance the quality, speed and effectiveness of operator actions.

Advanced visualization software allows control room operators to see what is happening on the bulk power system within fractions of a second, rather than the industry standard practice of every four seconds. This technology can give operators precise snapshots of current conditions, provides clear, timely information on unfolding events, and helps operator analyze the situation and take informed mitigation actions to protect and enhance grid reliability.

This workshop is intended to compare the visual presentations offered by several commercially available phasor data visualization software providers. The goal of the workshop is to look at how the visualization tools display specific grid events and will give control room operators the chance to comment on the clarity, effectiveness and intuitiveness of differing displays. Vendors' visualization products will not be explicitly identified during the presentations and all vendors will be present to hear the operators' feedback on the pros and cons of each visualization tool and event. The workshop will allow operators and observers to discuss whether there might be any need or benefit to developing more common elements in a visual vocabulary for the grid.

Workshop format

We will prepare three or four phasor datasets (three for a modified Western grid, one for the East) for specific simulated grid events and invite seven companies and organizations offering widely-used synchrophasor data-based visualization applications to run those datasets through their visualization tools before the workshop. Each vendor will save a two-minute clip of each event as displayed by its visualization tool, and we will organize those into a series of event-specific clips. In the workshop we will view each set of event clips in turn and discuss and compare aspects of the visual presentation across the visualization tools.

Invitees and audience

This workshop is targeted toward grid operators – control room operators and supporting engineers – and the designers and vendors who develop synchrophasor data-based tools to help operating staff manage grid reliability better. The desired audience make-up is 60 to 75 participants, of whom half would be active operations staff and supervisors from reliability coordinators and major transmission operators (including members of the NASPI Operations Initiatives Task Team), a quarter would be visualization tools vendor staff, and a quarter would be NASPI and NERC leadership (e.g., NERC Operating Committee leadership, NERC staffers, SAFNR (Situational Awareness for FERC, NERC and the Regional Entities) leads, and members of the NASPI Leadership Team) who can help pass on any insights gained from the workshop. If space allows we will make room for researchers and others developing new visualization tools.

Discussion format – principal discussion will be limited to those designated as operating staff. Vendors and others (e.g., NASPI and NERC leadership and other observers) will be seated in the back of the room and asked to remain quiet during the discussions of visualization scenarios.

Workshop Agenda

1:00 pm Introduction
- Workshop purpose
- Workshop format
- Round-the-room introduction of participants

1:25 pm Comments from Dr. Jodi Heinz Obradovich (Pacific Northwest National Lab visualization and human factors expert), on what to look for as you watch these displays

1:45 pm Grid Event 1 – large generation outage in the west
- Explanation of event (1 minute)
- Presentation of vendors' visualization clips (12 minutes)
- Facilitated audience discussion (15 minutes)

2:15 pm Grid Event 2 – islanding in the west
- Explanation of scenario (1 minute)
- Presentation of vendors' visualization movies (12 minutes)
- Facilitated audience discussion (15 minutes)

2:45pm Break

3:00 pm Grid Event 3 – growing oscillation in the west
- Explanation of scenario (1 minute)
- Presentation of vendors' visualization movies (12 minutes)
- Facilitated audience discussion (15 minutes)

3:30 pm Grid Event 4 – Feb 26, 2008 Florida oscillation

- Explanation of scenario (1 minute)
- Presentation of vendors' visualization movies (12 minutes)
- Facilitated audience discussion (15 minutes)

4:00 pm Closing discussion

- Big themes and conclusions building from focused questions (What worked, what didn't work, any common elements or major differences that were confusing (shapes, colors, symbols, organization of information, means of calling attention to important changes or conditions, dashboard arrangement, …?) (30 minutes)
- Observations from Dr. Obradovich and other human factors/visualization expert (20-30 minutes)
- Observations from the peanut gallery (back of the room observers, vendors, etc) (10 minutes)
- Next steps? (10 minutes)

5:20 pm Adjourn

Format and structure for comparison of displays

Because the purpose of the workshop is to compare how events are presented and how those presentations serve operators, we will be providing each invited visualization vendor with identical datasets for each of four grid events. We will ask each vendor to produce and send us (by February 14) a movie file that contains one to two minutes of real-time visualization screen shots for each of the four events (beginning each event file about 15 seconds before the event and running for 1:45 minutes after the event). We will ask the vendors to obscure or remove any on-screen identification of the vendor's name or tool from the output clips.

The heart of the workshop will be the side-by-side comparison of the vendors' visualization clips for each event. For discussion of a given event, we will explain the event, then roll the visualization movies from each vendor sequentially (changing the order of vendors in each event presentation, and labeling the vendor source only with A, B, C, etc.) without any verbal commentary. Then we will collect comparable screen shots from each vendor on a single slide and use it as background for a facilitated discussion between the operators about the various displays – comparisons, reactions, and other comments.

Vendors sharing commercially available displays

- Alstom (confirmed)
- Electric Power Group (confirmed)
- OSISoft (confirmed)
- PowerWorld (confirmed)
- Space-Time Insight (invited)
- WECC (invited)

Meeting location and registration

NERC Calendar meeting link -- http://www.nerc.net/meetings/search/details.asp?id=3370

Meeting registration link -- http://www.nerc.net/meetingregistrations/Committee.aspx?meetingdate=2/28/2012&meetingtype=NASPI%20Visualization%20Workshop

Hyatt Regency Orlando Airport – reservations link -- https://resweb.passkey.com/Resweb.do?mode=welcome_gi_new&groupID=8266125

Workshop planning committee

- Jim McIntosh (CAISO)
- Vickie VanZandt (WECC)
- Tony Johnson (SCE)
- Kevin Frankeny (MISO)
- Jeff Dagle (PNNL)
- Alison Silverstein (NASPI)

Description of event scenarios and test dataset

Event scenarios will be illustrative for both Eastern and Western Interconnection operators:

For a hypothetical Pacific Northwest balancing area (five paths and their SOLs (NW-Canada, NW-Montana, NW-Idaho, NW-California, PDCI); 3 large power plants with actual MW and MVAR and capabilities; about 30 busses where voltage, frequency and phase angle are measured)

Event 1 -- Large generation outage in the west (beyond the planning criteria) – large generation outage in AZ leads to voltage collapse, underfrequency, SOL overload, leads to operator switching shut capacitors, operator bypasses series capacitors, leads to oscillations, generation redispatch, leads to system ok

Event 2 -- Islanding – loss of tie lines between NW and Canada leads to system islanding and oscillations in the US portion of the WECC

Event 3 – Growing oscillation – Montana line outage, series capacitor bypass leads to oscillations leads to increased Grand Coulee generation that does not help, leads to drop Colstrip, leads to system ok.

Event 4 -- For the Eastern Interconnection, we are seeking data owners' permission to use the phasor data for the February 26, 2008 Florida grid event.

Phasor data will be provided in comma-separated CSV format that can be read into an Excel program and used in MatLab or 37.118 format for input into the visualization tools.