

<i>December 16, 2003 Electric System Working Group Technical Conference, Philadelphia PA</i>			
Rec Type	Recommendations/Comments	Name	Organization
Communication	The reliability coordinator needs an understanding from others, from a broad perspective, what's going on. Sometimes you may not have all the information, and this is what happens most times in blackout situations.	Michael Calimano	New York ISO
System Operations	Reliability coordination needs to have authority in real time to order actions to be taken by control areas or operators under emergency conditions. Authorities and procedures have to be spelled out well beforehand.	Michael Calimano	New York ISO
Emergency Response	We have to look at how we can do this better, how we can let other people know better and faster. In our shop, when there is an emergency going, everybody's involved in trying to solve the emergency, and the communication with others comes later. I think we have to work as a group to be able to effectively do the communication while we're in the emergency, so we can get the word out as quickly as possible on it. I think that's indicative of everybody's situation.	Michael Calimano	New York ISO
System Operations	One of the questions was should we share reliability coordination -- and share redundancy? I keep coming back to the need for clear lines of communication and clear lines of authority -- it's necessary to know who, point by point, is going to take actions under what conditions, who's going to make a request for changes, and who's going to make an order for changes.	Michael Calimano	New York ISO
Training	What I'm looking for is clarity now that we are in this emergency condition, these are the things that you will follow on with an order to either redispach, take voltage reductions, load shedding, what have you -- they become orders, orders have to be followed, can be discussed later but they have to be followed at the time the order is given.	Michael Calimano	New York ISO
Prevention	Monitoring the critical facilities of neighboring control areas is an area that I constantly get asked about myself, how far into PJM, how far into Ontario, how far into ECAR do we see -- and is it important and will it give me an early warning system.	Michael Calimano	New York ISO
Grid Integration	We should monitor the Lake Erie loop flow at different locations.	Michael Calimano	New York ISO
System Operations	The reliability coordinator has to be staffed at 24 x 7 to allow the system to be securely operated -- all the time with the information both internal and external, and notification.	Michael Calimano	New York ISO
System Operations	I see two areas that need support and usually fall victim to a limitation on staffing but the key things are coordination with or notification of other reliability coordinators, and the ability to monitor other systems, outside your own, far enough in to at least give you an early warning system.	Michael Calimano	New York ISO

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Reliability Standards	I think, as we go forward in developing the standards, we have to define those relationships better so people know that going forward how this operates -- the best I can do is say we've defined the functions. Now we have to define the relationships and that's got to go forward.	Michael Calimano	New York ISO
Communication	I think that there needs to be a greater sharing of accurate data among all companies and that extends to planning and outage data that's used to develop contingency analysis.	Mark Fidrych	Western Area Power Authority (WAPA) and Chairman of the NERC operating committee
Communication	There needs to be exchange programs among the reliability coordinators, i.e., working visits to the neighboring areas, the neighboring reliability coordinators, to promote the personal relationships as well as to the subordinate control areas on an ongoing basis.	Mark Fidrych	WAPA and Chairman of NERC op committee
Analysis	Analyses have got to be shared widely among entities to increase the number of eyes having visibility to developing situations.	Mark Fidrych	WAPA and Chairman of NERC op committee
Reliability Standards	This is analogous with my vertical utility -- there has to be an entity responsible for a specific area and the operation of that area. Again, multiple eyes are better, but for seeing and communicating -- not for directing. This does not however address the issues of wide area versus local reliability responsibilities. I expect that they will continue to exist for some time but should not pose a problem operationally.	Mark Fidrych	WAPA and Chairman of NERC op committee
Reliability Standards	We need to refocus on the reliability plans but not to allow changes that affect reliability to move forward until all the pieces are in place and the system has been demonstrated effective.	Mark Fidrych	WAPA and Chairman of NERC op committee
Investment	We have to develop a greater standardization to our methods and our reviews. We have to broaden the visibility of what is happening on the system to many parties and that includes all system parameters including generation. We need to put our bright people to work and have them develop systems which will give accurate status of the vulnerability of the power system stability or we have to reduce system transfers to a level where we are confident that the system is not in jeopardy.	Mark Fidrych	WAPA and Chairman of NERC op committee
Editorial Comment	I'd like to remind the industry that, in our search for solutions we often try to find easily a one size fits all answer. I want us to really be careful in not do that with this. I don't think that that is necessarily the best way to go.	Linda Campbell	Florida Reliability Coordinating Council (FRCC)
Reliability Standards	I really believe that comprehensive reliability plans are needed.	Linda Campbell	FRCC

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Reliability Standards	Reliability plans should have a common format. This would help reduce inconsistencies between the different reliability coordinator operations. That does not necessarily mean that every reliability plan will look the same and be a cookie-cutter product, but at least every reliability plan should follow some sort of a checklist.	Linda Campbell	FRCC
Reliability Standards	Reliability plans must provide the authority that is needed if the reliability coordinator is to direct actions. This reliability plan should also make the obligation of the operating entities to implement those actions.	Linda Campbell	FRCC
System Operations	We believe it is absolutely necessary for an accurate state estimator model, along with a contingency analysis program to be working and in order at all times. We believe it should run at least every five minutes.	Linda Campbell	FRCC
Planning	Again, for essential tools and functions we believe operations planning analysis is imperative as well.	Linda Campbell	FRCC
Communication	The last thing regarding tools and functions is effective communications and that needs to be under both normal and emergency conditions. You need to have internal communications procedures within the organizations themselves, external with others, and it's got to be timely with everyone.	Linda Campbell	FRCC
Reliability Standards	Redundancy in the functions can be good. But the directives of the reliability coordinator must prevail and you can only get that from having one entity.	Linda Campbell	FRCC
Standards Development	The term 'wide area' can mean many things to many people. We're seeing that in the development of standards, as we try to look at both local areas B65 and a wide area -- so that may cause some problems when people are trying to figure these things out.	Linda Campbell	FRCC
Standards Development	It's really important to determine what needs to be shared, what needs to be monitored, and how to do it. Once you figure all that out, you can make it happen so it really isn't just how many reliability coordinators or control areas that are the answer.	Linda Campbell	FRCC
Editorial Comment	The FRCC does believe that NERC should play a bigger role in developing the structure and the review and implementation of the reliability plans.	Linda Campbell	FRCC
System Operations	We need to go back to looking at really what I believe to be some fundamental system operations basics regarding system monitoring, the operator awareness, being able to continue a system plan for an N - 1 and knowing where your system was and then obviously the internal and external communications.	Mike Kormos	PJM
System Operations	The second point is the need for redundancy, not only in the computer hardware and software but also the redundancy in having more than one set of eyes looking at specific areas.	Mike Kormos	PJM

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Emergency Plans	Emergency preparedness has been also talked about. It needs to be clear up front, the actions that can be taken, the actions that will be taken, what the procedures are, who has the authority to take it. Again, I think that needs to be absolutely clear cut in the minds of all.	Mike Kormos	PJM
System Operations	You really need to have strong tools to be able to look over these wide areas to assess all that data and convert it into something useful.	Mike Kormos	PJM
Reliability Standards	Real time security analysis contingency analysis -- I think we have to challenge what the definition really means and how it has to be implemented and then also have some redundancy in the multiple levels of monitoring and analysis.	Mike Kormos	PJM
Standards Development	Also I think overlapping between reliability coordinators is a good thing but it's also a dangerous thing. As we have all talked about, having clear authority and responsibility is important, and if you are not careful, overlaps can blur the responsibilities.	Mike Kormos	PJM
Standards Development	We support the functional model of NERC but we do have concerns as well as I think do our colleagues in NPCC do regarding how those responsibilities are going to be shared, how that overlapping will happen, and really setting up clear lines of authority and responsibility. We really think that needs to be further worked out in the process.	Mike Kormos	PJM
Investment	As far as size goes I just mentioned cost. I do believe size matters. I do believe that you can in fact justify the cost a lot better looking over a much wider area -- it helps minimize those impacts.	Mike Kormos	PJM
Editorial Comment	We believe once the geographies are established and the clear authorities and functions are established, that in fact this is something that is doable and resolvable.	Mike Kormos	PJM
Standards Development	I support everything with having consistency in our plans but I really think we have got to go beyond just looking at a plan by making sure that the plans are being carried out and are capable of being carried out to the full extent.	Mike Kormos	PJM
Structure of the Market	We found that the functional model does indeed incorporate and accommodate markets. In fact, it's really independent of market structures. It doesn't matter what kind of market is there or whether there is a market at all, the functional model still works.	Don Benjamin	NERC staff
Standards Development	All four of these documents work together. The functional model, the organization registration and certification requirements, the regional reliability plans and the reliability standards that work together that define the obligations of the responsible entities and their inter relationships will develop and define responsible entities.	Don Benjamin	NERC staff

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Standards Development	I think it's up to the regional councils to review the need for more stringent criteria. I believe that also in New York City we have other major concerns and we have more stringent requirements in there due to the state, due to the reliability council or within the state, an N - 2 requirement and the like.	Michael Calimano	New York ISO.
Standards Development	I think we need to look at the standards that are being developed now and apply a much more stringent requirement in those standards than what we've allowed to get by within the existing policies and the old policies.	Mark Fidrych	Western Area Power Authority and Chairman of the NERC operating committee.
Reliability Standards	Reliability is not competitive. I think everybody needs reliability." Do we need to identify some of the best practices that are being done out there among the reliability coordinator folks?" Share those and make sure everyone is learning from what the best practices are. That's how we can move forward.	Dave Hilt	NERC staff
Training	Now the level of operator training on the other hand, it's really tough for me to say if you don't get a very seasoned operator that you're going to have a very difficult time putting somebody in place who's going to be able to assimilate the data that they're receiving visually and auditorially and process it in enough time to be making a good decision.	Mark Fidrych	Western Area Power Authority and Chairman of the NERC operating committee.
Safety Net	I think my transmission owners, their operational knowledge is as good as ours. We overlap each other. I think that overlap is a huge fail safe to the system in that we have two very knowledgeable organizations looking at a part of the system making an assessment, backing each other up, working with each other.	Mike Kormos	PJM
Technical Operating Procedures	I would like the panel to speak to is what suggestions would you have for ensuring that each state estimator throughout the interconnection knows the status of the transmission system -- as lines go in and out of service it is critical that those state estimators have that information and what the effects are going to be. I would like to get some thought how we make sure that everybody knows and everybody knows quickly as to what the transmission status is.	Tim Bush	Consulting
Investment	Every line (inaudible) area which is being covered by the software monitor should be tested and I think those comments made about using new software systems, I think that it is more important to use proven technologies as opposed to using new systems.	Eric Allen	New York ISO.
Editorial Comment	I think that all the engineering in the world can not help you get over a real problem you have which is that load shedding is a tool to be used but is a politically unacceptable tool.	Margie Phillips	PSIC

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Structure of the Market	I think that in a world of diverging utilities you still have blackouts. I would argue that it is a real shame for our market that we have had a slowdown in RTO development. Those of you who are in PJM New York and New England who do have the power to operate these systems, you know that -- the system operator has more information over a wider area than anybody else.	Margie Phillips	PSIC
Standards Development	I think standards need to be put in place that define detailed criteria for real time models particularly in terms of the size of the models required and the fidelity of the models and the upkeep of the models.	Jack Kerr	Dominion
Standards Development	We also need standards to define criteria for proper level of observability of the facility that's being modeled. We need standards to define acceptable levels of performance and solution quality for the tools used in the models in particular status and real time contingency analysis.	Jack Kerr	Dominion
Editorial Comment	Clear accountabilities are essential for the day to day integrity of grid operations.	Kim Warren	IMO Ontario
Emergency Plans	With respect to improvements in emergency response, we need to establish a framework for a coordinated and effective response to emergencies.	Kim Warren	IMO Ontario
Standards Development	Mandatory enforceable standards set the requirements but they establish the minimum requirements.	Kim Warren	IMO Ontario
Training	Operations staff require operating guides and strategies that are robust and sufficiently wide in scope so that they may apply to a wide range of post disturbance configurations.	Kim Warren	IMO Ontario
Training	Continuous review and update of restoration plans and procedures must be carried out.	Kim Warren	IMO Ontario
Emergency Plans	Effective emergency response requires capable and trained personnel implementing actions supported by the right processes, facilities and equipment. High standards for an uninterruptible power supply requirements for equipment such as SCADA systems and phones is essential.	Kim Warren	IMO Ontario
Editorial Comment	The IMO has the local and global perspective and has the authority, responsibility and obligation for determining emergency conditions. We found this practice to work exceptionally well.	Kim Warren	IMO Ontario
Editorial Comment	Regardless of the makeup there needs to be clear delineation in many areas. We firmly believe that an RC should have the authority to declare emergencies within their reliability area.	Kim Warren	IMO Ontario
Reliability Standards	The important factor is the reliability coordinators being aware in detail of the full range of options available to them including load shedding.	Kim Warren	IMO Ontario

Prevention	It is an obligation that rests with all the reliability coordinators to act in the best interest of the interconnections at all times. Satisfying total reserve requirements is not enough. Reserves must be located appropriately to ensure associated operating security limits can be met.	Kim Warren	IMO Ontario
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Training	Practice and training is important but these points need to be included in everyday processes in order for staff to be successful during contingency events.	Kim Warren	IMO Ontario
Standards Development	To maintain proper focus during contingency events, we found that if rules and authorities are well established and documented and overall expectations and priorities are well understood by all parties, then restoration incidents go much smoother with overall objectives being met in a timely way with minimal adverse effects.	Kim Warren	IMO Ontario
Emergency Plans	We need to develop a minimum fail safe criterion for EMS systems to include back up provisions, functional monitoring and assessment and transfer of control to other authorities should the primary and back up systems fail.	Vicky Van Zandt	Bonneville Power Administration (BPA) and a team leader on the technical investigation in the area of operations.
System Operations	Give serious consideration to 24 x 7 IT system monitoring of the EMS tools. It is utilized in some places now and not in others, and it should be separate from the system operations staff.	Vicky Van Zandt	BPA and team leader
Safety Net	If cascading occurs under some contingencies more quickly than an operator can reasonably respond, 30 minutes seems to be the break point, you have to have automatic controls in place to act as a safety net.	Vicky Van Zandt	BPA and team leader
Vegetation Maintenance	Whatever you think the vulnerabilities of the power system are, they don't mean anything if they are obstacles in the transmission rights of way particularly in the summertime. Transmission lines that trip out before overload pretty much render that assessment invalid.	Vicky Van Zandt	BPA and team leader
Standards Development	Control area operators are the first line of reliability defense. They should be the first to declare an emergency, and if their assessment and visibility tools are working well, they should be the entity to take action.	Vicky Van Zandt	BPA and team leader
Emergency Plans	Control areas need to raise the alarm when they're in trouble, so some communication protocol or something other than just dialing the phone, such as a red button that opens communication lines so a reliability coordinator could hear what's going on in the control center is a possible consideration.	Vicky Van Zandt	BPA and team leader
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Reliability Standards	If control areas don't either see that there is an emergency or fail to raise the alarm, reliability coordinators have to have sufficient authority and means to carry out actions to preserve reliability and that needs to be confirmed with regular and rigorous audits.	Vicky Van Zandt	BPA and team leader
Reliability Standards	If the RC sees a disturbance in the making, they need the authority to declare an emergency and order specific relief and conversely system operators need to comply -- if they disagree, comply first then argue about it later.	Vicky Van Zandt	BPA and team leader
Reliability Standards	The reliability coordinator needs enough visibility with enough granularity to assess system problems and determine appropriate responses to shortstop a potential cascading problem.	Vicky Van Zandt	BPA and team leader
Prevention	If it's at too high a level or too aggregate a level then their ability to render aid if the primary line of defense doesn't work is limited.	Vicky Van Zandt	BPA and team leader
Investment	Last, the reliability coordinator needs tools sufficient to determine simultaneous limitations on transmission paths. That's done now in some places and not in others. And it needs to include thermal, voltage and transient stability if that's appropriate.	Vicky Van Zandt	BPA and team leader
Standards Development	The authority to take actions and responsibility to take those actions to prevent a cascading outage -- Industry really needs to support operators exercising that authority.	Vicky Van Zandt	BPA and team leader
Standards Development	Standard protocols and terminology -- in reviewing a lot of the August 14 transcripts, we saw some time used in getting to the point, if you will -- so standard protocols, getting right to the point and using common terms, would be helpful.	Vicky Van Zandt	BPA and team leader
Training	Emergency drills, simulation with both the control area or transmission operators and the reliability coordinator in play -- would be good.	Vicky Van Zandt	BPA and team leader
Reliability Standards	Relevant control area operators and reliability coordinators, which ones matter -- monitoring needs to go far enough into neighboring control areas and footprints so that those facilities whose loss would have an impact on their neighbor will be included and discussed.	Vicky Van Zandt	BPA and team leader
System Operations	Protocols are needed to prioritize the attention of at least one control center dispatcher to determine the course of action if you're in a disturbance and it's progressing. And delegate commercial schedules, hourly commercial schedules or routine phone calls, to others.	Vicky Van Zandt	BPA and team leader
Market and Deregulation	One way of handling it is, putting it right in Policy 9, and actually Policy 9 itself giving it a little more teeth -- you know, there's a lot of criticism of TLR procedure being slow -- well, there's probably ways to jazz it up a little bit.	Ray Kirchow	International Transmission Company

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Training	And I think if you look at other industries, if you look at the nuclear industry, there is a minimum requirement of training dates and I think that NERC needs to look at that in terms of our system operators, those who are dealing with the reliability function. So it's both the amount of training you get and what you get trained in, both locally and from a wide area basis in emergency operations.	Scott Moore	AEP
Prevention	So what we need to look at and what we have in place already is under-frequency load shedding. You know, that last ditch effort to keep the system there. But what we don't have is under voltage load shedding, to the same extent. You could have a special protection scheme that acts if the proper thing to do is to shed load regardless of voltage, regardless of frequency.	Scott Moore	AEP
Training	On best practices, I think there's probably not anything better than simulation of a disturbance you've lived through. That would certainly have the operators' attention, especially if the disturbance had a bad effect.	Vicky Van Zandt	BPA and team leader
Editorial Comment	I think one of the things you have to do is put together some sort of a "lessons learned list" and it's not a short list. It is a long list. In sitting here today I said, "What do I want to comment on?" I probably would have been up to about 100 things but I think you have to put these lists together.	Frank Delea	ConEdison
Standards Development	I think you have to have some measure of good design, good practice -- we've heard the gentleman refer to "a good practice installing computer programs." Well, I think that applies to almost everything you're going to do. It maybe is cross fertilization, one company versus another, but I think you have to have something in place for that.	Frank Delea	ConEdison
System Restoration	I've noticed in the past in post-mortems on blackouts, they tend to involve planners and operators. But I never, hardly ever, hear design engineers get involved and I know when we looked at the ConEd blackout we really dug into some of the engineering issues.	Frank Delea	ConEdison
Investment	I don't know but I suspect that, given the financial crunches that had gone on in the industry over the last few years, it is very, very easy to cut back on training, right of way maintenance, and you can go on and make a laundry list of things, and this is sort of like "well we don't talk about it because my boss won't give me the money" but I think it's critical that these financing issues and personnel issues be addressed.	Frank Delea	ConEdison
System Restoration	Now finally on more technical issues, in reading the report, one major thing that struck me was the "omission," if you would, of any discussion of restoration. I urge that a thorough review of the restoration process be undertaken, again, to learn lessons -- how can it be made quicker? I'll leave it at that.	Frank Delea	ConEdison

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Standards Development	So mandatory rules translated into procedures translated into clear authority, hierarchical authority -- and I know I'm repeating what panelists have said -- but that works and that's what we have in New York.	Meyer Sasson	
Investment	The things we can do for the operators would be to develop tools to add capabilities that would assist them and provide them more information on actions that they can take. Going beyond that, the next step would be to have tools that would not only provide guidance for them but once the operators were comfortable with them, would actually allow the tools to initiate some actions.	Bill Middlestadt	BPA
Safety Net	Special protection schemes that are needed when the time required is so short that the operator even with the best alarms or the best information is not able to take the action. These are the safety nets.	Bill Middlestadt	BPA
Prevention	Even though you may not find a set of incrementing and decrementing generators right available to you, decrementing a unit on the correct side of the problem area can be beneficial while you search for some unit to increment.	Terry Mitchell	Excel Energy
Training	The operator needs to be trained and needs to have the tools available up to and including load shedding to get back within known limits. Those limits need to reflect actual capabilities.	Ed Schwerdt	NPCC
Market and Deregulation	Also in terms of utilization of TLRs, a TLR three for an overloaded line is the incorrect response and we need to address that.	Ed Schwerdt	NPCC
Reliability Standards	Policy nine talks about monitoring key facilities and we were doing that and we continue to do that and I just want to note it may not be adequate although the controllers are required to monitor everything and the reliability coordinators are required to have some level of monitoring.	Dave Zwergel	Midwest ISO
Standards Development	Well, clearly to have good observability, monitoring of all facilities, and contingency analysis of all neighboring facilities that would impact reliability would be required.	Dave Zwergel	Midwest ISO
System Operations	Map boards facilitate quick analysis and decision making about the system conditions, which is essential for emergency response in rapidly changing conditions.	Dave Zwergel	Midwest ISO
System Operations	The list of minimum tools that should be available to the reliability coordinator include back up for each one if one fails and instructions to know when to go to the back up tools, when to go to your back up center or when to call on other entities to monitor for you.	Dave Zwergel	Midwest ISO
Standards Development	Reliability coordinators must have access to a suite of tools that allow them to exercise their accountability and maintain the reliability of their coordination area.	Pat Duran	IMO Ontario

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Analysis	Off line studies and analyses must be performed to define limits and study system conditions both pre and post contingency and finally reliability coordinators must have the training necessary to effectively utilize these tools and interpret their results.	Pat Duran	IMO Ontario
Training	Operators must have the training to (a) be able to interpret the results and (b) be able to independently act if the tools are giving them a suspicious or wrong result.	Pat Duran	IMO Ontario
Reliability Standards	Human process (time delay) and potential human errors may result in less reliability so we may need to make reliability criteria more stringent recognizing this transition problem.	Stephen Lee	EPRI
Structure of the Market	Congestion management needs to expand beyond its own footprint either using LMP or IDC and also be coordinated with other grid displays in the same interconnection, for example, by applying the virtual RTO concept.	Stephen Lee	EPRI
Planning	We need system separation capability. Well defined system separation boundaries can actually speed up system restoration. They can help operators with proper training.	Stephen Lee	EPRI
Analysis	In operator training simulators with snapshot capability for off line studies can be very useful and helpful for operators for doing emergency situation restoration to solve real time problems they have not been trained on before or encountered.	Stephen Lee	EPRI
Investment	And something new that has to be developed is intelligent alarm processing which includes an operator advisor to help operators really understand what is going on in the system. Also in the area of under frequency and under voltage load shedding, these schemes need to be examined and developed and well coordinated.	Stephen Lee	EPRI
Training	Customized OTS replicating EMS will improve operator effectiveness through regular drills and P/C based OTS with small generic power grids. Well develop training exercises will help operators identify, analyze and respond to unfamiliar operating conditions which often appear under emergencies.	Stephen Lee	EPRI
Training	The recommendation that we provide is to apply human factors engineering process consistent with the so- called "graded approach" to derive practical focus benefits. Now the term "graded approach" comes from the nuclear industry actually.	Victoria Doumtchenko	MPR Associates
System Operations	An example that would come out of this kind of evaluation process would include providing a control center-wide indication of multiple alarm system failure, providing an effective functional overview display, also improving alarm presentation and alarm prioritization to make alarms more intelligent and minimize the number of nuisance alarms and alarms that demand an operator response.	Victoria Doumtchenko	MPR Associates

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Communication	Improve crew coordination and in their area the type of recommendations -- the type of benefits I guess we would see is improving procedures, training, improving communications and improving peer checking.	Victoria Doumtchenko	MPR Associates
Training	Use human reliability analysis to identify design teachers to minimize human error, allow detection of human error and also -- very important -- provide an accurate recovery capability.	Victoria Doumtchenko	MPR Associates
Analysis	Help to ensure that both test requirements and human capabilities are appropriately included in the design so what we're talking about here is using task analysis to make sure that requirements for displays that are processing controls displays and alarms communications and operator support aids are identified and appropriately included.	Victoria Doumtchenko	MPR Associates
Editorial Comment	You need to see all data that concerns you and your surrounding area and think outside the box. Resolution, accuracy, inquisitiveness, breadth, and timeliness are critical essentials.	Don Watkins	BPA
Standards Development	There were a lot of problems with timeliness on August 14. A lot of problems. And timeliness is about seeing the same data at the same time. There were a lot of conversations where people were seeing different snapshots of the same data and they were different -- some were really high, some showed huge overloads -- and yet they weren't sure and they didn't trust the numbers because the others didn't have the same number.	Don Watkins	BPA
System Operations	You have a time skew due to your data samplings. Beware. Operators should be probably using raw data and using the SE to check the data.	Don Watkins	BPA
Other	Think on a time skew, I would think that on all of these things, you should move everything in terms of data transmission and sampling rates to the five- second timeframe. Think about that, because that's still going to allow some time skew. It could be ten seconds or so out, but just think in terms of that.	Don Watkins	BPA
Investment	The problem with all of these though, all of the dynamic stuff, is that it's usually driven by the EMS system, as all our strip charts are these days. So if you lose your EMS system -- this is going to answer a later question, too -- if you lose your EMS system, you're often gone, and so you need to think carefully about that. One way would be to provide some alternative paths to seeing a map board and maybe stripping information off of RTUs before they get into the EMS scatter system.	Don Watkins	BPA
Structure of the Market	If we had transaction systems in a standard, common, open system, a real-time operator could go hit a couple buttons, because all the information is there, and send that information to the parties and they take care of it, you know, as far as adjusting generators and so on.	Don Watkins	BPA

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Other	There was some mention of over-dependence on the telephone. We need to get off of that into a dependence on reliable data systems that pass the key information between us in an open, standard way, not a bunch of separate ways.	Don Watkins	BPA
Analysis	So another problem we have is that even though we have models of everything on the system, a lot of it isn't right, how we model our responses to things, how we model what happens with TAPs, and there's just a lot of stuff. When you get into studies, you find out our models aren't really good. We need to work on those.	Don Watkins	BPA
Reliability Standards	We really need to think about voltage stability, and we really need to think about dynamic stability.	Don Watkins	BPA
Analysis	You need to have good offline tools and a study. That means keep your models up to date. If you're responsible for operation, keep your offline, whether it's a PTI or GE database or an IEEE, whatever it is, keep a database that's fairly up to speed so that you can quickly look at your system and study it, because your online tools may not be there when you need them.	Don Watkins	BPA
System Operations	We need tools to accomplish real-time load shedding. You need to be able to dial in -- and this isn't everywhere and you can't do it in some places, but where possible, we need to be able to dial a number into our SCADA system and have it trip that amount of load within sub-minutes. That's important.	Don Watkins	BPA
Technical Operating Procedures	And the last one on the tools is, we need robustness tools, and by "robustness," I mean, is my system healthy?	Don Watkins	BPA
Other	Y'all have given us a great list of tools that everybody ought to have, but particularly for Steve, how many of those tools are ready for prime time in terms of -- they would all be great things, but how many of them can I buy off the shelf or pull out of a box today?	Alison Silverstein	FERC
Investment	The online tools, you know, I think that the three larger of the companies, ABB and ESKA and Siemens, provide good tools, you know, for doing that. I think each utility needs to understand that they need to understand what's involved with managing those tools or implementing those tools. I think that's where we've fallen down.	Don Watkins	Bonneville Power Administration
Market and Deregulation	One of the things that was discussed was the need to make sure that somehow information is brought to a single place so it can be evaluated from the point of view of reliability. And I just wanted to say that's what SMD is all about, that's what the LMP systems are all about. Those systems like in PJM, New York, New England, that have LMP, what's scheduled is what's reliable. And if it's not reliable, it's not scheduled that way; it's rescheduled, maybe at a higher cost, but in a way that it is reliable.	Myer Sasson	ConEdison

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VAR	Install more reactive power resources; ---Following these standards, we recommend the less expensive alternative for dynamic reactive power resources, based on our experience.	Shinichi Imai	Tokyo Electric
VAR	Use alternative for dynamic reactive power resources---Installation of more reactive power resources with dynamic characteristics to EHV systems can avoid too much dependence on operators against extensive voltage disturbances.	Shinichi Imai	Tokyo Electric
Analysis	A number of utilities were using sag calculation methods which were clearly likely to underestimate the sag conditions and the danger of the situation. And what is evident to us is that either NERC, FERC, or DOE must create mandatory procedures for establishing the line ratings to prevent similar occurrences.	Tap Seppa	Valley Group
Analysis	If you note, what we say is that the effective wind speed -- there was a five- percent probability of the wind speed being less than 0.6 foot per second, and 0.6 foot is actually total calm. That's when the cooling goes to the natural convection, and we believe some utilities assumed 4.4 foot per second, a safe wind speed. You can see that that represents a 50-percent probability for that day.	Tap Seppa	Valley Group
Editorial Comment	The big problem is that the operators do not recognize the primary reason for thermal limits. It's safety, public safety.	Tap Seppa	Valley Group
Editorial Comment	The other thing that operators do not recognize is -- and I read 640 pages of transcripts -- that if you have a high pre-load on the line, you are starting from a point where you have essentially no time to react.	Tap Seppa	Valley Group
Reliability Standards	Somebody must set clear procedures for establishing line ratings. And it should be either NERC, FERC, or DOE. I'm not saying that they should establish the line ratings; they should say what is the minimum information required to set the rating.	Tap Seppa	Valley Group
Training	The operators must be trained to understand the reasons behind line ratings and the most important thing, the safety consequences. And, yes, there should be sanctions for operating lines in violation of safety codes.	Tap Seppa	Valley Group
Standards Development	We found issues where three operators had three different ratings for the same line, one, operationally and one in a planning study and such. Part of the problem with our power flow is that it's never benchmarked. We don't have a feedback loop from the actual system operations.	Bob Cummings	Director of Reliability Assessments and Support Services for NERC (NERC Reliability Dir)
Analysis	Another problem we found was inconsistency of data quality and the retention of those data. We found key bus voltages missing from recordings of the system. That makes it really hard to go back and try to back trace.	Bob Cummings	NERC Reliability Dir

Rec Type	Recommendations/Comments	Name	Organization
Reliability Standards	On the thing that I mentioned on the disagreement on ratings, we have to have some method of policing that, some method of transmitting a change, even, in a rating. This has to go between the planning models, the interregional studies, the state estimators and the reliability coordinators. Anybody using these data need to be advised of any line ratings changes.	Bob Cummings	NERC Reliability Dir
Communication	There were omissions, errors, and some non-outage elements that were listed as being outage. That just creates a problem; it creates misunderstandings. Another thing is untimely data entry. There were lines that were out of service for quite some time before they ever were entered into the SDX.	Bob Cummings	NERC Reliability Dir
Structure of the Market	Regional and interregional studies: We need to take all outages, including generation, into account when we're looking at things. We need to do more than just N-1 contingencies. Some severe outage scenarios are obviously necessary. And we need to monitor the entire system, not just regional interfaces. Zonal analysis: If we're just looking at corporate boundaries, we're going to miss the big picture of pockets of the system that regardless of ownership, are going to behave the same way for certain things.	Bob Cummings	NERC Reliability Dir
Analysis	We need to also look at a wider variety of transactions, study the known patterns, analyze the historical trends that are in the tags, and both magnitude and the trends of transactions have to be recognized in a simultaneous nature.	Bob Cummings	NERC Reliability Dir
Analysis	Some modeling improvements are needed: Load power factor, generation reactive capabilities, improved topology awareness, both from SDX and what's happening in transactions.	Bob Cummings	NERC Reliability Dir
Analysis	Be prepared to carry out a full set of sensitivity studies to reflect the operating conditions that are likely to be encountered on the day itself. Don't make any assumptions; study the sensitivity of different power factors, particularly in the summer with air conditioning load and the lower power factors that result.	Frank Macedo	Hydro One and team leader in the Planning and Systems Study Team (Hydro one and team lead)
System Operations	The system should be planned and should be operated so that there is sufficient margin between the normal operating point and the point of collapse. And the best way to do this is to determine the minimum voltage at key buses on the system. And the best way of doing this is to use the traditional or the accepted methods of PV/QV analyses.	Frank Macedo	Hydro One and team lead
Standards Development	It's not good enough to look at the overall footprint of a control area; you've got to look at where the voltage collapse is likely to occur, and then show that the reserves are where you need the reserves. And I'd recommend that the real-time monitoring of these dynamic reactive reserves should also be considered to ensure that the minimum requirements are met.	Frank Macedo	Hydro One and team lead

Rec Type	Recommendations/Comments	Name	Organization
Standards Development	Each control area must review the results of regional and interregional transfer studies and ensure that these studies or their studies capture the impact of external transfers and conditions on adjacent systems. Again, these control areas must really communicate any potential adverse impact of these others who are likely to be affected.	Frank Macedo	Hydro One and team lead
Analysis	One thing I didn't hear mentioned at all was to do periodic surveys of rights of way. You need to know what the clearances are on a right of way, an annual survey of the right of way to determine any obstructions, any limitations on that right of way. To me, that seems to be absolutely essential.	Frank Macedo	Hydro One and team lead
Training	It's just my thinking that planning engineers should be during some time, they should be made to sit with the system operator for one week, two weeks, so that they should see how the system is being operated, because they can -- a planning engineer, planning ten or years down the road, cannot visualize all the contingencies, what the system operator is facing day-to-day.	Masur Han	
Grid Integration	For example, if you were to ask me, how do you avoid the blackout of August 14th through planning criteria, I'd say build the line.	Ray Kershaw	ITC
Planning	I think it's more important to recognize that planning is a probabilistic process. So, it's important to recognize that a probabilistic reliability assessment, as a general term, is what really should be done.	Steve Lee	EPRI
Legislation	First, NRECA strongly supports NERC's possible future role as the ERO. This is, of course, assuming that the appropriate legislation is passed.	Barry Lawson	NRECA
Reliability Standards	Regardless of whether legislation passes, the industry needs to reevaluate its spending priorities, especially in the context of our restructured and more competitive wholesale energy market. According to a recent EPRI report, capital expenditures for transmission since the early '90s, have been flat. However, O&M expenditures during that same timeframe have been significantly and steadily decreasing.	Barry Lawson	NRECA
Other	There should be in the very near term and periodically thereafter, a thorough and meaningful audit of all control area operators, and that includes approximately a dozen NRECA members, G&T cooperatives, but an audit of all control area operators regarding their compliance with existing NERC operating policies and planning standards.	Barry Lawson	NRECA
Editorial Comment	I would recommend that transmission line ratings be required to be stated in amps instead of MVA. And that would eliminate the disconnect we have between the actual voltage component of the MVA measurement and the nominal voltage component of the MVA rating.	Jack Kerr	Dominion

Rec Type	Recommendations/Comments	Name	Organization
Reliability Standards	We're suggesting that let's not go overboard on developing all kinds of prescriptive standards. I know it's awfully tempting: One type that is essential for maintaining the reliability -- real- time reliability of bulk power systems, and these standards, I would volunteer, could be prescribed to the industry and not necessarily negotiated by the industry. So let's not get into standards for developing line ratings, standards for developing vegetation management; instead let's talk about standards in terms of complying with N-1.	Mike Pennstone	Hydro One
Reliability Standards	The second set of standards would be objective based. And for those of you who are unfamiliar with that term, that basically says, "here's what you have to accomplish." It doesn't prescribe how you're going to get there.	Mike Pennstone	Hydro One
Editorial Comment	I think there's a need to establish an environment to ensure that there is a continued diligent adherence to these key standards.	Mike Pennstone	Hydro One
Standards Development	I would suggest that we need incentives to develop and implement reliability, investments and solutions. For some reason they're not there.	Mike Pennstone	Hydro One
Editorial Comment	I have encouraged the industry to try to identify some sets of precursors or measures by which you could identify the potential deterioration in the performance of entities that are responsible for reliability. I think if you read the August 14 report, there was enough suggestions in the practices that were being followed that people should have picked up on it early, come in and asked those responsible to clean up their act. This is not an unusual practice in our industry. Within Hydro One we do this as a regular basis in terms of managing our safety.	Mike Pennstone	Hydro One
Other	I would like to reinforce something that Bob Cummings touched on and that's to increase the comparability and interface between off line planning tools and the state estimator and on line simulation.	Carson Taylor	BPA
Training	I think a dump of the state estimator studies is great but I'd go further than that and suggest that perhaps a dump of disturbances on the system should also be used for training operators, for training personnel.	Frank Macedo	Hydro One
Safety Net	On voltage load shedding, zone 3 relays have already been mentioned a few times and another recommendation is prioritized control and protection improvements both at generators -- probably mainly at generators, and also at transmission.	Carson Taylor	BPA
Prevention	Other things I'll talk about are coordinated voltage control design, some ideas on better voltage control and advanced form of capacitor bank design, special protection systems and wide area measurement systems and wide area control systems, and automated direct load control or demand side management. The main message is what we need is defense in depth or multiple layers of defense.	Carson Taylor	BPA

Rec Type	Recommendations/Comments	Name	Organization
Investment	There's a few items mentioned but going back to the bottom item, it's possible to replace the existing under frequency load shedding relay with a relay, a new digital relay, that does both under frequency load shedding and under voltage load shedding and you need the same trip circuits so it's a lower cost.	Carson Taylor	BPA
Safety Net	If it is needed you should look at either blinders or replacement of a digital relay that you can restrict to operation in the load area. This again would be one area perhaps for prioritized control and protection improvements.	Carson Taylor	BPA
Grid Integration	The basic idea is that transmission level shunt capacitors should work in conjunction with generators and stator compensators to keep reactive power reserve on generators and also our line drop compensation or high side voltage control, can make the generator voltage control much more effective.	Carson Taylor	BPA
Communication	One of the other things that we stress in our criteria is that effective system protection design requires coordination among all of the engineering disciplines.	Phil Tatro	National Grid
Safety Net	Consider the use of under voltage load shedding in recognizing that it is a local solution but when taken in total may serve to mitigate or slow down future cascades and these under voltage load shedding schemes should developed with standard philosophy in mind, much the same as what Carson had presented to us.	Tom Wiedman	ConEd
Systems Operations	Need to develop settings criteria that are known commonly by the planner, by the operators and by the relay setters, and what is the primary reason for an element to reach well beyond its protected line and what can we do to bring that setting a little less far out into the transmission system?	Tom Wiedman	ConEd
Safety Net	So we need to make sure that our under frequency load shedding program does indeed coordinate with the under frequency tripping of generators.	Tom Wiedman	ConEd
Reliability Standards	Develop standards on reporting of disturbances including prescribed common reporting format -- one of the problems we had not only with time synchronization was the very different ways that digital devices captured the data and then tried to bring all that data into one common format.	Tom Wiedman	ConEd
Emergency Response	Coordinate relay tripping with line emergency capability and assure, proper automatic operation of generator excitation systems, again as Carson had alluded to.	Tom Wiedman	ConEd
Other	Regional reliability coordinators need to develop protective performance criteria and compliance audit standards to install under voltage load shedding throughout the Eastern interconnection to evaluate line reading methodologies consistently possibly using the same equations, certainly the same methodology -- identify likely break points in the Eastern interconnection -- as the system cascades.	Tom Wiedman	ConEd
System Operations	Develop disturbance analysis methodology across the Eastern interconnection -- and finally, insist on voltage support requirements for generators.	Tom Wiedman	ConEd

Rec Type	Recommendations/Comments	Name	Organization
Standards Development	I think we really do need to take a hard look at our planning and operating criteria and make sure that we maintain that level of reliability. And maybe the N - 1 criteria isn't adequate and we need to very seriously consider what we really need to do to make sure that we don't have these blackouts in the future.	Dave Hilt	NERC staff
Grid Integration	The bus system disturbance recorders that we installed two years ago are time synchronized, and they proved invaluable in investigating the blackout and I strongly recommend that we deploy such devices much wider across interconnections.	MACEDO	Hydro One
Other	What about power plant equipment and ADRs should also have time synchronization so you know if an over excitation limiter operation occurs and so on. And I think that's largely missing.	Carson Taylor	Bonneville Power Administration
Reliability Standards	The second comment I wanted to make was, maybe we should try to consider the effect on reliability when you have say a 500 kV grid, the impact of operating 115 kV lines radially instead of in parallel with the high voltage. That might be interesting to look at.	Carson Taylor	Bonneville Power Administration