Proposal to Develop Results-Based Reliability Standards

October 16, 2009

Background

In Attachment 2 of the ERO Three-Year Assessment, stakeholders recommend that the industry should "focus existing reliability standards and reliability standards development on areas that will lead to the greatest improvement in bulk power system reliability." Stakeholder suggestions include: (i) focus the development of new reliability standards on those that will lead to the greatest improvement in reliability; i.e., address the greatest risks of wide-area cascading outages; (ii) reduce the number of existing reliability standards to just those that have a critical impact on reliability of the bulk power system and convert the remaining reliability standards to guidelines; and (iii) develop a more systematic process for prioritizing new reliability standards development projects based on risks to the bulk power system.

Beyond the strain of the standards development work itself, the first two years of experience with mandatory reliability standards tell us that the number and quality of standards have a profound downstream impact on the level of effort required to implement effective, comprehensive compliance programs (Figure 1). Many entities believe they are diverting resources to documenting compliance with administrative or prescriptive requirements when these resources would be better invested in verifying compliance with requirements having a more direct impact on the reliability of the bulk power system.

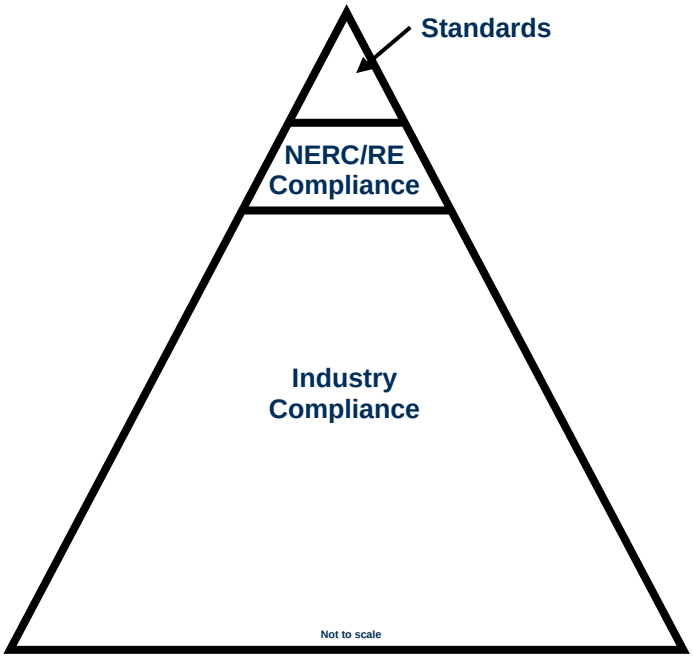

Figure 1 – Impact of Standards on Compliance

In its three-year assessment as the ERO, NERC acknowledged these stakeholder comments and committed to resolving the issues by: i) addressing quality issues to ensure each reliability standard has a clear statement of purpose, and has outcome-focused requirements that are clear and measurable; and ii) eliminating requirements that do not have an impact on bulk power system reliability.

Purpose and Description of Ad Hoc Initiative

This report describes the results of an initiative by an ad hoc group representing industry and NERC and regional staffs (see the roster of the ad hoc group in Exhibit A). The purpose of the

initiative is to develop recommendations to ensure that NERC's reliability standards can have the greatest possible positive effect on the reliability of the bulk power system.

The group's report outlines a guiding set of principles based on performance and risk-based methods and presents specific recommendations for improving the development and format of reliability standards. Most of these recommendations can be adopted without revising NERC's Reliability Standards Development Procedure or other rules of procedure – they deal simply with improving the style and quality of the performance requirements themselves. However, a few proposed changes to the format of a reliability standard would require regulatory approvals.

The ad hoc group has been proactive in seeking industry input on the recommendations and the feedback has been positive. The concepts were presented to the NERC standing committees on September 15, 2009, in a standards development plan webinar on September 17, and in a NERC standards workshop on October 15. The concepts have also been reviewed in several regional forums.

The activities undertaken by the ad hoc group in developing this report are summarized as follows (see Exhibit B for a more detailed outline of the project milestones):

- Document a design philosophy for developing performance requirements that are focused on reliability outcomes.
- Develop criteria to test the effectiveness of reliability requirements using a 'scorecard' approach.
- Using the scorecard, evaluate the existing board-approved performance requirements to prepare a gap analysis.
- Develop guidelines, tools, and examples for drafting teams to use in developing results-based requirements.
- Propose modifications to improve the reliability standards template.
- Communicate with and seek inputs from reliability stakeholders.
- Deliver the project results to the Standards Committee for implementation.

It should be noted that, at the time of the project, substantial improvements to reliability standards were already underway. The guidelines and recommendations from this report should be adopted into ongoing standards development projects, preserving and building upon the many improvements that were already underway with existing drafting teams.

Overview of Performance-Based Methods

Performance-based methods have been applied for several decades in the development of standards and in personnel training. Performance-based methods were recognized and widely used as early as the 1970's in the U.S. military. Today they are widely used as the basis for systematic approaches to training and standards-setting in various industries worldwide. For example, the U.S. nuclear industry has extensive experience in applying performance-based methods in its rulemakings and inspections and has achieved admirable improvements in nuclear performance and safety. Some uses of performance-based methods include:

- U.S. military procedures, training, and standards (over 4 decades)
- Systematic approach to training design (over 4 decades)

- Nuclear regulations, guidelines, procedures, and training (over 3 decades)
- American Society of Mechanical Engineers standards development

In its simplest form, a performance-based standard has four components: *who, under what conditions (if any), shall perform what action, to achieve what particular result or outcome*?

As applied to the bulk power system, a performance-based standard should define a particular reliability objective or outcome to be achieved. Ideally, this outcome should be observable and measurable on the bulk power system. If the standard is met, there should be an observable effect on the reliability of the bulk power system, i.e. an effect that can be measured using power system data or trends. Good examples of such requirements are the Control Performance Standard (CPS) and Disturbance Control Standard that have long been part of the NERC reliability policy. These requirements set specific performance outcomes for the bulk power system, they have a technical basis in reliable interconnected operations, and they are readily measurable and reportable.

Bulk power system performance-based standards can be beneficial because they focus requirements on achieving a specific reliability outcome. The purpose and benefit is clear because the reliable outcome itself is what is being directly measured. Performance-based standards can also establish a bright line of expected reliability performance, thus guiding entities to take actions to avoid approaching or exceeding these bulk power system performance criteria. Additionally, a performance-based standard does not prescribe how a particular outcome is to be achieved and therefore allows for innovation and efficiency.

Effective methods for measuring outcomes of performance-based reliability standards include:

- Evaluate bulk power system performance data, reportable periodically or by sampling.
- Evaluate bulk power system performance data, post event.
- System testing and simulation.

Risk-Based Methods – Necessary When Failure Consequences Are High

One challenge of using a purely performance-based approach, however, is that the reliability of the bulk power system is so critical to the public interest and safety that standards based solely on reliable outcomes are not sufficient. In other words, it is insufficient to have standards that simply say 'avoid cascading failures'. The analogy in airline safety would be a performance-based requirement to avoid plane crashes. The cost of failure is too high to rely solely on enforcing compliance after such a failure. Like airline safety, <u>bulk power system reliability requires additional, preventive requirements to reduce the risks of failure to acceptable tolerance levels.</u>

Using a similar model as the performance-based approach, a risk-based reliability standard should be framed as: *who, under what conditions (if any), shall perform what action, to achieve what particular result or outcome <u>that reduces a stated risk to the reliability of the bulk power system</u>?*

Unlike a performance-based requirement, however, a risk-based requirement is unlikely to be directly measurable on the bulk power system itself, since risks represent possible but not actual outcomes. The measures are more likely to be determined by evaluating a particular

product or outcome resulting from the required actions, or by monitoring performance of the entity. Examples of risk-based requirements in the current standards include requirements to maintain and test relays, perform vegetation management in right of ways, and operate within defined system operating limits. There is an assumption that if the observed results satisfy the stated risk objective, then risk has been mitigated as desired. Sample methods for measuring risk-based reliability standards include:

- Evaluate records/logs of performance.
- Observe defined risk targets/deliverables were achieved
- Interview personnel regarding performance.
- Observe bulk power system performance trends

Independent of monitoring conformance to the risk-based standards themselves, monitoring overall bulk power system performance over time to see if the standards are effective will help to correlate the risk-based standards more directly to system performance. NERC's current initiative to develop bulk power system reliability metrics is a key enabler for measuring the impact of risk-based reliability standards over time.

Capability-Based Requirements

A third type of requirement that is useful in reliability standards is a capability requirement. Such a requirement defines a minimum set of capabilities an entity needs to have to demonstrate it is able to perform its designated reliability functions. This might include tools, communications, control systems, analysis capabilities, back up capabilities, etc. Another way to think about these requirements is that they would serve as the basis for certifying an entity or attesting that the entity has the capability to plan and operate a reliable bulk power system. Once again, it is key that the capability that is expected be one that is defined to be measurable and demonstrable. Examples of possible measures include:

- Observe/test tools, functionality, communications, other capabilities.
- Evaluate documentation of capabilities.
- Interview personnel regarding capabilities.

Blended Approach for Reliability Standards

To achieve an adequate level of reliability, a blended approach using all three types of requirements described above is needed. The premier category of requirements within the standards should be those that directly establish a measurable reliability outcome on the bulk power system. Satisfactory achievement of the requirement results in a reliable bulk power system and the result is measurable. Avoiding cascading failures, loss of firm load, and other attributes, as defined in an adequate level of reliability, should serve as the basis for these requirements. Outcome based standards that are measurable through bulk power system reliability performance should shape the foundation of the reliability standards, should be utilized to the maximum extent possible, and are preferred relative to the other kinds of requirements.

Recognizing the need to not only perform reliably, but also to minimize risks leading to unreliable performance, a second category of risk-based requirements is necessary. These risk-based requirements should establish minimum 'reliable outcomes' necessary to provide a reliable bulk power system. These outcomes result from actions taken by an organization to

minimize the risk of adverse impacts to the bulk power system. Examples include coordinating relay settings or maintaining and testing relays. To be effective, these requirements should be stated such that there is a clear definition of the reliability objective being achieved and the outcomes must be measurable. Preferably, the risk mitigation objective or outcome is explicitly stated within the requirement itself, to make it clearer how success will be measured.

Finally, the third type of requirement used in effective standards should be capability or competency-based requirements. These ensure the entity is equipped, qualified, and prepared to plan or operate a reliable bulk power system and to effectively manage and respond to risks associated with reliable operation.

A good foundation for developing results-based standards is NERC's definition of "Adequate Level of Reliability", which was filed with the Federal Energy Regulatory Commission and applicable Canadian government authorities on May 5, 2008. A results-based reliability requirement should withstand the test of meeting at least one of the six goals of an Adequate Level of Reliability. If it is determined that there are gaps between the definition of an adequate level of reliability and existing performance-based standards, then a concerted effort should be made to define additional performance-based requirements to ensure each attribute of a reliable bulk power system is addressed to the extent such outcomes can be defined and measured.

Other Types of Requirements to Be Minimized

Another type of requirement that is common in the NERC standards is a prescriptive requirement, which defines how a particular action should be performed. To the extent possible, prescriptive requirements should be minimized. Prescriptive requirements within reliability standards inhibit innovation and alternative solutions to solve a problem. Instead, the performance expectation should be set in a requirement that defines a performance outcome. Procedures on how to perform an action, unless it is essential that the actions be performed in a common manner to preserve reliability, should be moved to supporting references or guides.

Another common type of requirement is a requirement to document something. It is much preferred to state a performance outcome or a risk to be mitigated and relegate the need to document something to the measures used to demonstrate compliance. A distinction should be made here that producing a document containing specific content necessary for reliability, such as a system restoration procedure, can be an effective requirement used to minimize risk. However, documentation that does not stand on its own as a result necessary for reliability should not be made into a requirement. Such documentation requirements should either be eliminated or moved to an administrative, informational section of the standards. An example of a weak requirement is "the Responsible Entity shall document the implementation of security patches". The requirement that directly contributes to a risk reduction outcome is to implement applicable cyber security patches. Documentation of the implementation is simply a vehicle for demonstrating compliance.

Finally, reliability standards should not prescribe commercial business practices which do not contribute directly to reliability.

Defense-in-Depth Strategy

Reliability standards should not be viewed as a body of unrelated requirements, but rather should be viewed as part of a portfolio of requirements designed to achieve an overall defense-

in-depth strategy. Modern history tells us that major accidents and catastrophic failures, regardless of the industry, are the result of multiple underlying causes, each of which could have been prevented but was allowed to exist. All that is missing is the triggering event and major failure is set in motion. A defense-in-depth strategy for reliability standards should recognize that each requirement in the NERC standards, like the blocks in the walls in Figure 2, has a role in preventing system failures, and that these roles are complementary and reinforcing. These prevention measures should be arranged in defensive layers or walls, as depicted in the figure. No single defensive layer provides complete protection from failure by itself, as suggested by the irregular shapes of the walls and the holes in each wall. But taken together, with well-designed layers including competency-based, risk-based, and performance-based requirements, a defense-in-depth approach can be very effective in preventing future large scale power system failures.

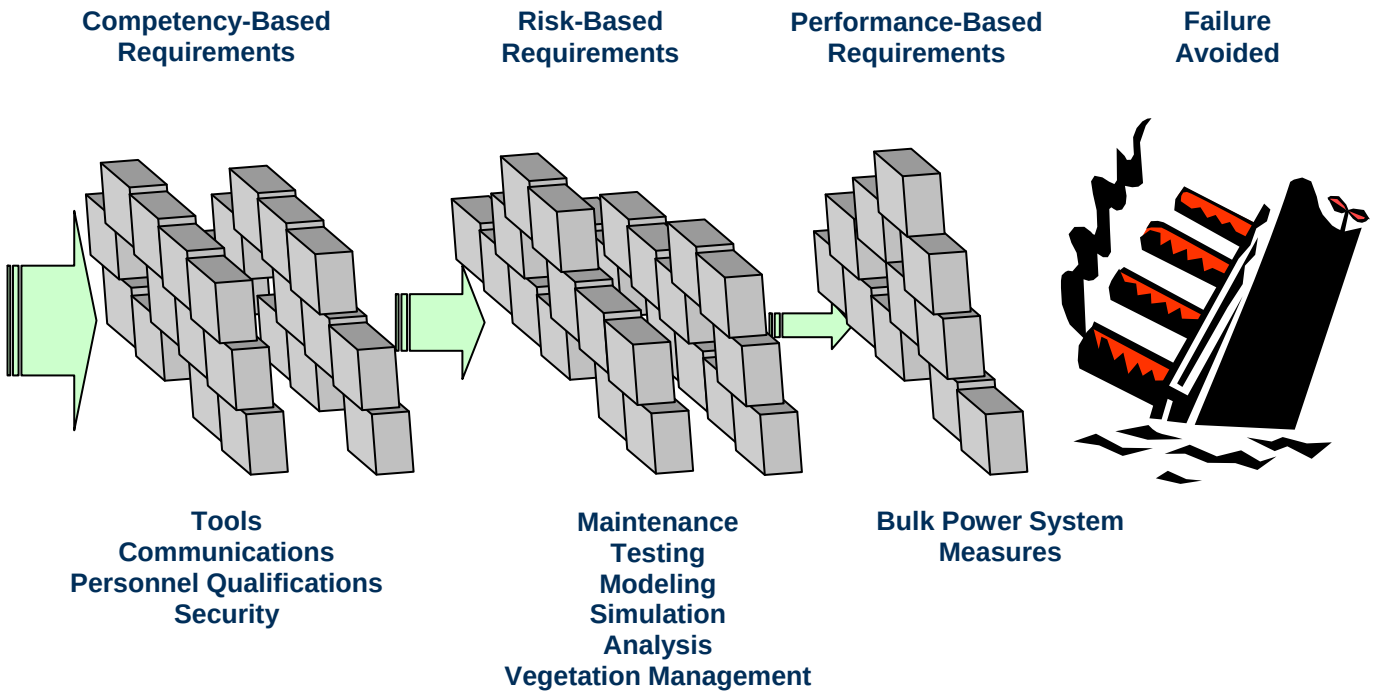

Figure 2 – Defense in Depth Strategy for Reliability Requirements

Risk Management Approach to Standards Development

On a longer-term basis as risk-based approaches mature at NERC, there will be an opportunity to apply NERC's bulk power system reliability metrics and lessons learned from event analyses to determining risk management objectives that feed into reliability standards. This concept is shown in Figure 3.

System events, performance trends, and compliance results are analyzed to determine causal relationships that can then be formulated into risk mitigation strategies to guide development of mandatory requirements as well as lessons learned, voluntary guides, and best practices. Of particular importance in this conceptual framework are the 'small signal' events that occur all the time on the system. Multiple element outages caused by relay misoperation or human error are but two examples of minor events that can be used to develop strategies for avoiding larger

events. Corrective actions determined from analyzing small events can have a profound impact on preventing larger events. This conceptual framework also allows for consideration of new threats that may arise from time to time.

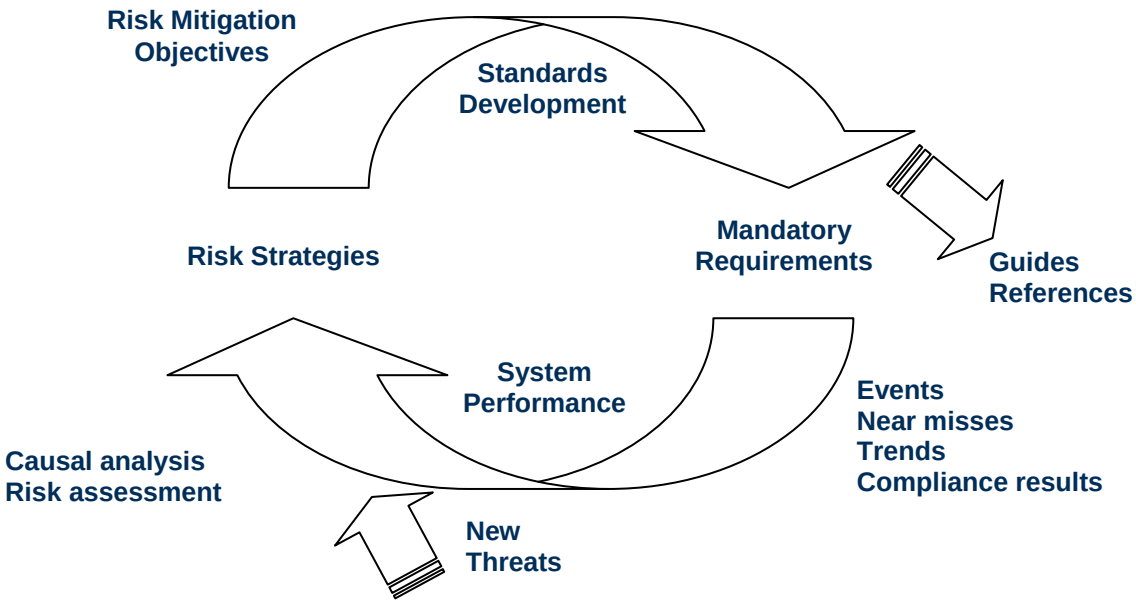

Figure 3 – Risk-Based Approach to Standards Development

Scorecard for Evaluation of Effectiveness of Reliability Requirements

The ad hoc team used the results-based concepts outlined above and developed a scorecard to evaluate the existing NERC reliability requirements based. The scorecard used the following questions:

Table 1 – Evaluation Criteria in Scorecard Tool

Question	Possible Responses
1. This requirement is:	Performance-based (specifies a bulk power system outcome).
	Risk-based (reduces risk).
	Capability-based (provides necessary capability).
	Prescriptive (explains how to).
	Administrative (requires only documenting/reporting something).
2. The reliability objective (or risk mitigation) achieved by this requirement is:	A bulk power system result that is clear in the requirement.
	A risk mitigation objective that is clear in the requirement.
	Is implied but not explicitly stated in the requirement.
	Is unclear.
	No reliability benefit is provided by the requirement.

3. The most effective way to measure this requirement is:	Evaluating bulk power system performance, data, or results.
	Evaluating a product or result (can be written such as a restoration procedure).
	Evaluating performance of an activity or a record/log of that activity.
	Evaluating capabilities, such as tools, systems, training records, etc.
	Can only be measured through documentation.
4. This requirement addresses the following goals associated with an adequate level of reliability (select all that apply):	The bulk power system is controlled to stay within acceptable limits during normal conditions.
	The bulk power system performs acceptably after credible contingencies.
	The bulk power system limits the impact and scope of instability and cascading outages when they occur.
	Bulk power system facilities are protected from unacceptable damage by operating them within facility ratings.
	The bulk power system's integrity can be restored promptly if it is lost.
	The bulk power system has the ability to supply the aggregate electric power and energy requirements of electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components.
5. The time horizon to which this requirement applies is:	Real-time or current hour
	Same-day
	Operations planning: day-ahead up to one year
	Planning: one year and longer

These questions were incorporated into an electronic spreadsheet tool and all existing board-approved North American reliability standards were loaded into the tool. Members of the ad hoc team then conducted assessments of the existing requirements and recorded their responses. Regional standards approved by the board were excluded from the analysis, and when the board had approved multiple versions of a standard, only the most recent version was used.

It should be noted that there was no attempt to assess current drafts of standards still in the hands of drafting teams. It would be expected that the results from those requirements would be substantially improved, as concerted efforts have been underway to improve the quality and effectiveness of the standards.

One useful byproduct of this work is that the scorecard tool itself can be made available in the future for drafting teams to perform their own self-assessments of proposed requirements and the tool could be used to seek industry input on the potential effectiveness of each proposed requirement in the standards by including the questions above in the public comment forms.

Analysis Results

The team analyzed 1360 unique reliability requirements that had been approved by the board. The results are summarized at a high level in the charts that follow.

The first chart in Figure 4 summarizes the categories of existing reliability requirements. The chart indicates that 45% of existing requirements are deemed to be prescriptive and 20% are deemed by the reviewers to by administrative. That leaves a total of 35% that are performance-based (6%), risk-based (23%), or competency-based (6%).

Although it should be expected that there will be a portfolio of requirement types, there certainly appears to be a significant opportunity to shift a substantial number of prescriptive and documentation-only requirements to informational guides or to rework these requirements to state explicit performance or risk-based outcomes.

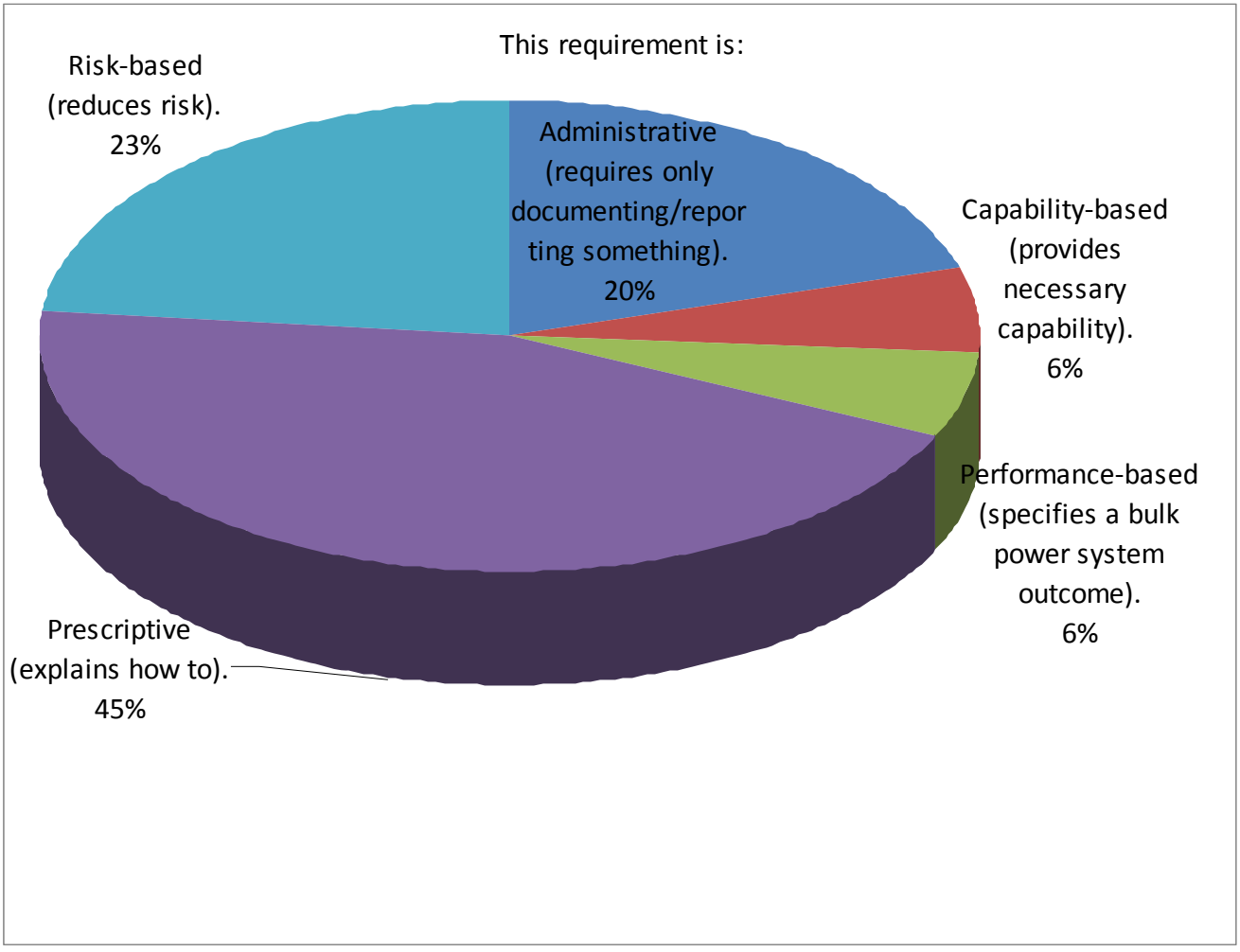

Figure 5 – Summary of Types of Existing Requirements

Figure 6 shows how the existing requirements are rated with respect to the clarity of the reliability objective within the requirement itself. It should be noted that stating a reliability objective within a requirement was not previously expected of drafting teams, as it was thought

that the purpose statement of the standard would be sufficient. However, as indicated in this report, a results-based approach would lend preference toward stating an explicit reliability objective or outcome in the requirement itself. For 32% of the existing requirements there either does not appear to be a reliability objective (6%) or the objective is not clear from reading the requirement (26%). For 48% of the requirements there is an implied reliability objective that is reasonably understood, but not explicitly stated. Finally, 20% of the requirements appear to provide an explicit bulk power system performance objective (6%) or an explicit risk mitigation objective (14%).

This distribution could once again be improved in future revisions of these requirements to ensure each reliability objective is clearly stated within the requirement, or by removing requirements that are verified to not provide a reliability benefit.

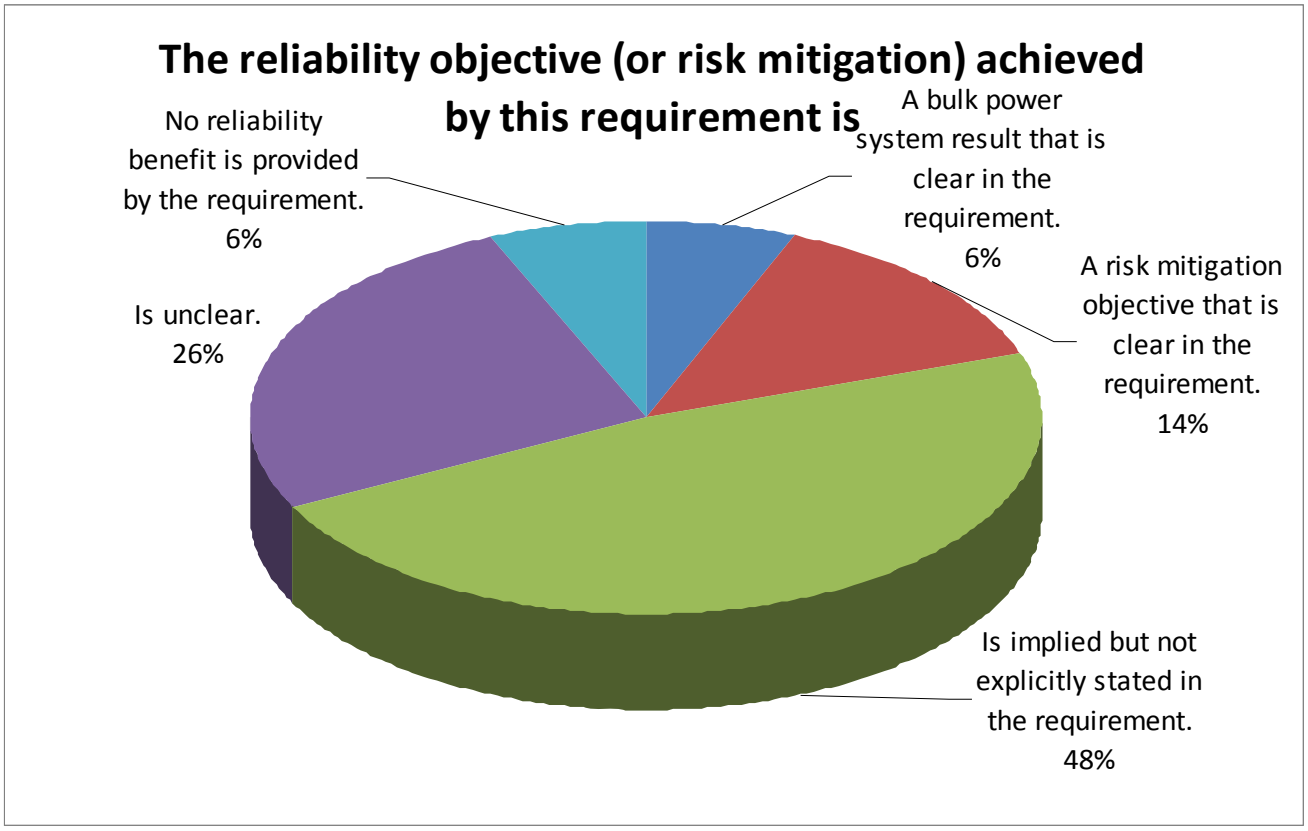

Figure 6 – Summary of Clarity of Reliability Objectives in Existing Requirements

The next chart in Figure 7 reinforces the conclusions from the first two charts. Of the 1360 existing board-approved requirements, 44% are judged to be best measured by documentation only. Evaluating a product or result accounts for 23% of the requirements and evaluating performance of an activity record or log accounts for another 23%. Evaluating capabilities or competencies is the best method for measuring compliance with 7% of the requirements and 3% are best measured by looking at bulk power system data.

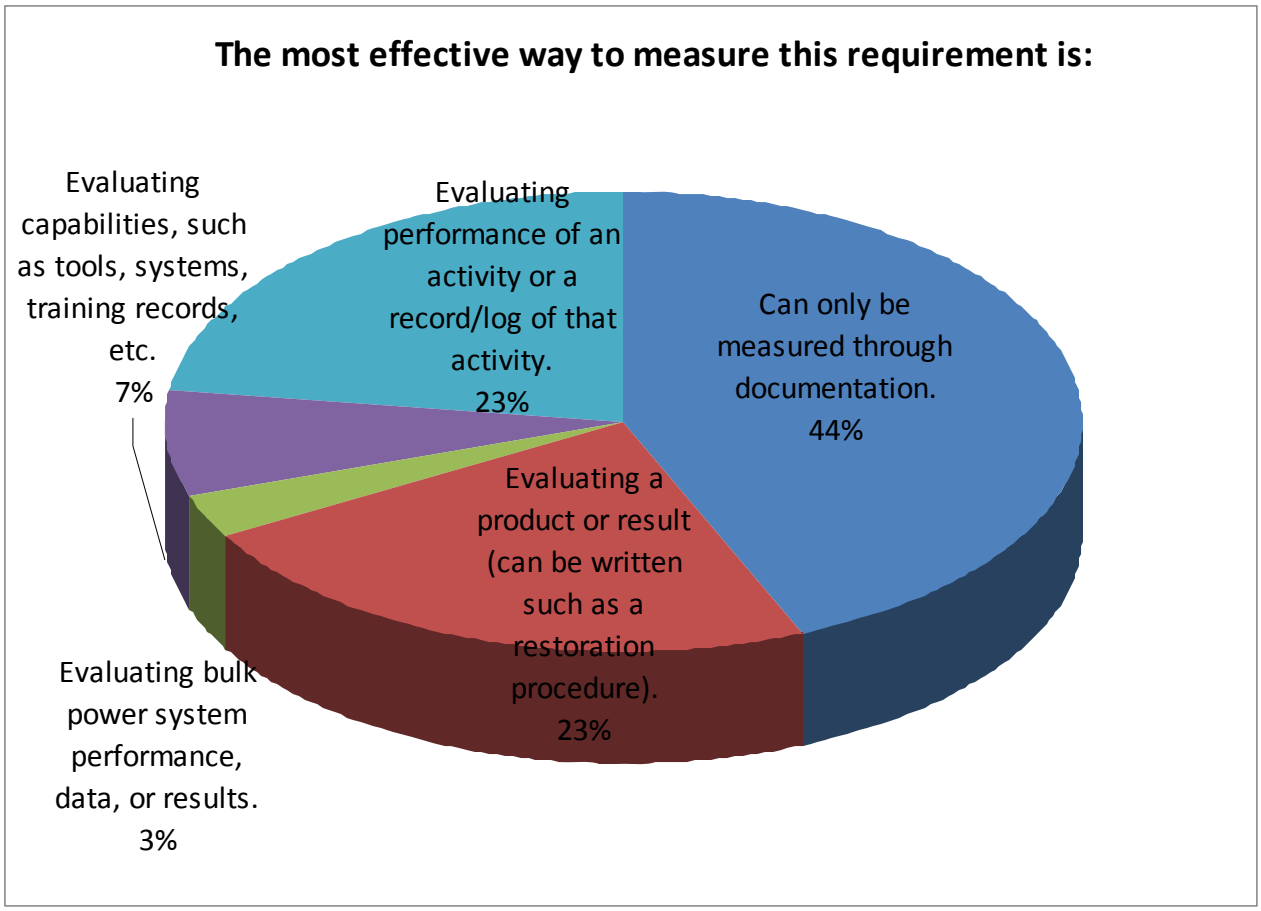

Figure 7 – Effective Measures for Existing Requirements

The team also evaluated correlations between the scorecard questions and verified that the requirements that are deemed to be performance-based or risk-based also score much better with respect to having clear reliability objectives stated within the requirement (74% of the performance and risk-based requirements had clearly articulated reliability objectives compared to 20% of the entire population of requirements). Nearly all (99%) of performance-based and risk-based requirements were also determined to be most effectively measured using methods other than documentation-only.

The team performed similar analyses on each topical cluster of standards, such as BAL, COM, FAC, etc. These results will be made available to the various drafting teams for consideration.

The team performed dozens of other cross-relational tests on the requirements and the results are consistent with the main conclusions described above. The most powerful outcome of this analysis is not the specific ratings from this exercise, but establishment of a tool for drafting teams and industry to better understand and rate the effectiveness of performance requirements using the results-based methods described in this report.

Role of the Standards Committee

On October 7, 2009, the NERC Standards Committee endorsed the concepts presented in this report and indicated its commitment to reinforce these principles and recommendations in the

standards development program and guidance provided to the drafting teams. The Standards Committee has provided guidance in the past that drafting teams should focus on developing performance requirements with clearer reliability objectives. However, historically the Standards Committee has interpreted its role as guardian of the ANSI-accredited process and not the quality of the standards themselves. The NERC Rules of Procedure 302.3, 302.4, and 302.5, however, respectively state that:

> Each reliability standard shall state one or more performance requirements, which if achieved by the applicable entities, will provide for a reliable bulk power system, consistent with good utility practices and the public interest. Each requirement is not a "lowest common denominator" compromise, but instead achieves an objective that is the best approach for bulk power system reliability, taking account of the costs and benefits of implementing the proposal.
>
> Each performance requirement shall be stated so as to be objectively measurable by a third party with knowledge or expertise in the area addressed by that requirement. Each performance requirement shall have one or more associated measures used to objectively evaluate compliance with the requirement. If performance can be practically measured quantitatively, metrics shall be provided to determine satisfactory performance.
>
> Each reliability standard shall be based upon sound engineering and operating judgment, analysis, or experience, as determined by expert practitioners in that particular field.

These statements, along with the other Essential Attributes of Technically Excellent Reliability Standards, suggest that the oversight provided by the Standards Committee does include oversight of the quality aspects of standards. The ad hoc team believes that the quality of NERC reliability standards will improve over time if the scope of the Standards Committee is expanded to include the responsibility for ensuring the standards meet the essential quality attributes established by the Rules of Procedure. This oversight role should be further guided by the results-based principles outlined in this report. In exercising this responsibility, it would be important for the Standards Committee to focus on quality attributes, without prejudice regarding the specific content of each standard.

Recommendations

Based on the research and analysis conducted in the development of this report, the ad hoc team offers the following recommendations for consideration in the development of NERC reliability standards going forward. These recommendations should be implemented through the ANSI-accredited standards development process under the oversight of the Standards Committee:

1. Strive to achieve a portfolio of performance, risk, and competency-based mandatory reliability requirements that provide an effective defense-in-depth strategy for achieving adequate reliability of the bulk power system.
2. Each performance requirement in the standards should identify a clear and measurable expected outcome, such as: i) a stated level of reliability performance, ii) a reduction in a specified reliability risk, or iii) a necessary competency.

3. Each performance requirement in the standards should be structured in the form of *who, under what conditions (if any), shall perform what action, to achieve what particular result or outcome (that reduces a stated risk to the reliability of the bulk power system).*
4. Provide instructions, training, and job aids to drafting teams to reinforce the results-based approach and structuring of requirements in this manner.
5. Provide the evaluation tool and criteria developed in this project to drafting teams and encourage use of the four questions outlined in Exhibit D throughout the drafting and commenting process.
6. Strive to minimize prescriptive, administrative (document something), and commercial requirements within the reliability standards.
7. Reduce the number of sub-requirements by incorporating essential components into the main body of the requirement statement for the purpose of reducing the compliance administration burden of numerous separate sub-requirements.
8. Provide increased focus in describing the applicability of each requirement by identifying not only the specific functional entities, but also any specific assets and conditions to which the requirement should apply to achieve the necessary reliability objective.
9. Provide active participation of compliance personnel in the development of standards to ensure performance requirements can be effectively measured in the field.
10. Evaluate the current three-year standards development plan and adjust priorities going forward to achieve the most reliability benefit using the principles outlined in this report.
11. Modify the standard template to distinguish elements that are mandatory for registered entities from elements that are informational or used to administer compliance (a sample template for a reliability standard is provided in Exhibit C).
    a. Mandatory and enforceable sections of the standard should include: i) applicability, ii) performance requirements, iii) measures, and iv) data/record retention (plus any regional variations if applicable).
    b. Informational sections for the administration and application of the standards should include: i) compliance administration information, ii) procedures, and iii) guidelines or supporting information.
12. Revise the Standards Committee charter to clearly indicate that the committee is responsible not only for the integrity of the standards process, but also the essential quality attributes of the reliability standards in accordance with the ERO Rules of Procedure, as guided by the results-based principles outlined in this report, and without prejudice regarding the specific content of each standard.
13. In the longer-term, NERC should develop a robust standards information management system based on relational database methods.

Exhibit A — Ad Hoc Group on Results-Based Reliability Standards

Gerry Adamski, NERC
Terry Bilke*, Midwest ISO
Gerry Cauley, SERC Reliability Corporation
Carter Edge, SERC Reliability Corporation
C Hajovski, RRI Energy
Pete Heidrich, Florida Reliability Coordinating Council
Pat Huntley, SERC Reliability Corporation
Ben Li*, Consultant – (formerly IESO)
Allen Mosher*, American Public Power Association
Eric Rollison, NERC
Steve Rueckert*, Western Electricity Coordinating Council
Dave Taylor, NERC

* Members of NERC Standards Committee

Exhibit B — Ad Hoc Project Summary

The following is a list of project milestones and target dates:

Milestone/Deliverable	Due Date	Status
Kickoff meeting and discussion of scope and participation.	8/7/09	Completed
Develop startup work plan.	8/14/09	Completed
Distribute prior documents on related efforts to improve standards.	8/14/09	Completed
Evaluate alternatives and draft a written design philosophy for reliability standards.	8/21/09	Completed
Develop criteria/attributes for review of existing standards.	8/21/09	Completed
Develop “scorecard” based on criteria above and evaluate each existing requirement based on these criteria.	9/11/09	Completed
Perform gap analysis of existing standards compared to criteria.	9/30/09	Completed
Communicate to stakeholders Standards Committee conference call Standing committees joint presentation Standards three-year plan webinar Standards Committee presentation Standards workshop WIRAB	 9/3/09 9/15/09 9/17/09 10/7/09 10/15/09 10/20/09	 Completed Completed Completed Completed Completed
Develop improved construct/format of a reliability standard, including supporting documents; reference SCPS’s prior effort.	9/30/09	Completed
Develop several examples of model performance-based standards focused on reliability objectives.	10/16/09	Completed
Develop a roadmap and high-level work plan for implementing modified approach to standards development.	10/16/09	Completed
Present to NERC Standards Committee for endorsement	10/7/09	Completed
Present report to NERC MRC and board.	11/4/09	
Sunset ad hoc group and transition ownership to Standards Committee.	12/3/09	

Exhibit C — Proposed Revised Template for a Reliability Standard

Mandatory and Enforceable Sections of Standard

A. Introduction
    1. Title
    2. Number
    3. Purpose
    4. Effective Date
B. Requirements
    1. R1
    2. R2
C. Measures
    1. M1
    2. M2
D. Records Retention

Informational Sections of the Standard

E. Application Information
    1. Application Guidelines
    2. Procedures
F. Compliance Information
    1. Compliance Monitoring Process
    2. Levels of Non-Compliance
    3. Additional Compliance Information

Exhibit D — Questionnaire for Evaluating Effectiveness of Performance Requirements

Question	Possible Responses
1. This requirement is:	Performance-based (specifies a bulk power system outcome).
	Risk-based (reduces risk).
	Capability-based (provides necessary capability).
	Prescriptive (explains how to).
	Administrative (requires only documenting/reporting something).
2. The reliability objective (or risk mitigation) achieved by this requirement is:	A bulk power system result that is clear in the requirement.
	A risk mitigation objective that is clear in the requirement.
	Is implied but not explicitly stated in the requirement.
	Is unclear.
	No reliability benefit is provided by the requirement.
3. The most effective way to measure this requirement is:	Evaluating bulk power system performance, data, or results.
	Evaluating a product or result (can be written such as a restoration procedure).
	Evaluating performance of an activity or a record/log of that activity.
	Evaluating capabilities, such as tools, systems, training records, etc.
	Can only be measured through documentation.
4. This requirement addresses the following goals associated with an adequate level of reliability (select all that apply):	The bulk power system is controlled to stay within acceptable limits during normal conditions.
	The bulk power system performs acceptably after credible contingencies.
	The bulk power system limits the impact and scope of instability and cascading outages when they occur.
	Bulk power system facilities are protected from unacceptable damage by operating them within facility ratings.
	The bulk power system's integrity can be restored promptly if it is lost.
	The bulk power system has the ability to supply the aggregate electric power and energy requirements of electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components.