Good afternoon Chairman Wellinghoff, Commissioners, staff, and fellow panelists.

Incorporating Lessons Learned into a More Reliable Grid

For today’s second panel, you have asked us to address how lessons learned are incorporated into NERC priorities. Specifically:

a. How do lessons learned from events analysis get disseminated to industry?
b. How do NERC’s non-standards process such as industry alerts, compliance application notices interact with the reliability standards? To what extent do these processes aid in identifying important reliability matters that are not addressed under the existing Reliability Standards?
c. Is the alerts process getting the message out on issues of immediate importance?
d. How do you gauge whether industry is appropriately implementing NERC alerts or lessons learned from an event analysis?
e. Is there a feedback loop into the Reliability Standards development process to determine if there is a gap in the standards? If so, how has that been working? If not, should there be?

While NERC’s Reliability Standards provide the foundation for bulk power system reliability, NERC’s Compliance and Enforcement activities are tools needed to ensure reliability. NERC strives to create an environment in which reliability is not only sustained, but improved. A key component of this environment is an industry that continuously learns from itself and others, and deploys, as practical, those elements that will provide effective reliability risk controls into the future.

As one element of a learning organization, NERC’s event analysis serves an integral function of providing insight and guidance by identifying and disseminating valuable information to users, owners, and operators of the bulk power system that enables improved reliability performance.

Since January 2010, NERC has significantly increased both the volume and quality of information to the industry in response to three major factors: 1) industry’s request for more information to understand compliance; 2) NERC’s commitment to improve openness and transparency; and 3) NERC’s vision of being a learning organization and working collaboratively internally, with the Regional Entities and with industry, to focus on reliability issues.

There are a number of ways to support industry learning and provide guidance. NERC provides a variety of communications and documents meant to support an industry learning environment.
For example, NERC has focused on Compliance Application Notices, Lessons Learned, and Alerts, including what role they play, whether the processes for these communications are working, and whether any gaps exist, to provide multiple channels for transparent information flow to industry and energize organizational learning on bulk power system reliability activities.

To assist in these efforts, NERC has developed several resource materials to aid in transparency, communication and consistency:

i. **Directives** - Directives are guidance provided from NERC to the Regional Entities on conducting delegated activities pursuant to the Regional Entity delegation agreements.

ii. **Compliance Analysis Reports (CAR)** - CARs are analyses of standards that have experienced a high frequency of violations, as well as analyses of registration appeals and organization certification. These reports provide statistical information regarding violations as well as insight on potential causes of the violations.

iii. **Compliance Application Notices (CAN)** – CANs provide instructions for NERC and Regional Entity Compliance Enforcement Authority (CEA) staff, which includes auditors, investigators, and enforcement staff, regarding how to assess compliance. They also provide transparency on that instruction to industry.

iv. **Reliability Standard Audit Worksheets (RSAW)** - The RSAW provides a non-exclusive list, for informational purposes only, of examples of evidence a registered entity may produce or may be asked to produce in their demonstration of compliance with a Reliability Standard.

v. **Key Reliability Spot Check Program Reports (KRSSC)** – The KRSSC Program is a valuable tool in assessing and identifying consistency issues in the application of key Reliability Standards across the eight Regional Entities. Assessment of inconsistencies allows NERC to provide the proper guidance to the Regional Entities and registered entities which, improves the compliance monitoring process.

vi. **Bulletins (Public Notices)** – Bulletins provide information to NERC and Regional Entity staff and/or industry.

vii. **Case Notes** – Case Notes provide information on approved mitigation plans to industry. These mitigation plans are associated with enforcement actions that are still being processed and that may be resolved by dismissal, Notices of Penalty or Find, Fix, Track and Report (FFT) Remediated Issue Informational filings. Therefore, they provide information well before the corresponding violation is fully processed. Information regarding these mitigation plans and activities is provided in a redacted form.

viii. **Dismissal Analysis** – The dismissal analysis provides information to registered entities on common reasons for dismissals.

ix. **Annual Compliance Monitoring and Enforcement Program (CMEP) Report** – This report provides an overview and analysis of the previous year’s CMEP activities.

x. **Annual Actively Monitored List (AML)** – A registered entity is required to be compliant with all applicable reliability standards. The AML is issued every year to provide a base subset of standards that are to be actively monitored. An audit scope may be expanded or reduced from this list.

xi. **Annual Electric Reliability Organization (ERO) CMEP Implementation Plan** - The ERO CMEP Implementation Plan is the annual operating plan for compliance monitoring and enforcement activities.
xii. **Annual Audit Schedule** – Provides notification of upcoming audits.

xiii. **Enforcement - Find, Fix Track (FFT) and Report Spreadsheet** – The FFT spreadsheet, introduced as part of NERC’s Compliance Enforcement Initiative in September 2011, is one of the newest streamlining initiatives to resolve lesser (minimal to moderate) risk issues. It contains Remediated Issues that must be mitigated and a statement of completion of mitigation activities provided by the registered entity. They are tracked as part of a registered entity’s compliance history. Inclusion of issues in the FFT informational filing at FERC represents closure of the enforcement action by NERC and the Regional Entities, subject to later verification of completion of mitigation activities, as warranted.

xiv. **Enforcement - Administration Citation Notice of Penalty Spreadsheet** – This spreadsheet, used between January and August 2011, contained minor, administrative, or documentation violations that posed a minimal risk to the reliability of the bulk power system. This also represents an early 2011 streamlining initiative.

 xv. **Enforcement - Notice of Penalty Spreadsheet** – This spreadsheet provides a list of low to medium risk compliance issues disposed with reduced enforcement processing. This spreadsheet built upon the successful implementation of the Administrative Citation Notice of Penalty. It was another streamlining initiative that was introduced by NERC in September 2011. It contains more serious (minimal to moderate) risk issues.

xvi. **Enforcement - Full Notice of Penalty** – The most serious risk issues are filed in Full Notices of Penalty. They also may be used with respect to minimal to moderate risk issues, as needed to convey more detailed or specific information in support of the disposition of the underlying violation. – Violations with medium to high risk are disposed through a full Notice of Penalty and complete enforcement process.

NERC realizes that while these materials have their benefits, providing volumes of information can lead to entities focusing more on managing compliance risk than focusing on reliability risks. Therefore, NERC continues to work with entities on activities, such as the compliance enforcement initiative, to address low to medium risks to reliability in a more efficient manner, thereby enabling registered entities to spend more time focusing on high risk priorities.

1. **Compliance/Compliance Application Notice**
   One of most well known of all these materials is the Compliance Application Notice (CAN). NERC currently has 16 CANs posted as final on its website and anticipates having approximately 25 posted by the end of 2011. CANs were developed for the purpose of creating consistency of compliance application across all NERC and Regional Entities and to provide transparency to industry. NERC has produced CAN’s on several topics. CAN-0016 provides instruction for assessing whether registered entities have developed sabotage reporting procedures that fulfill the requirements of CIP-001 R1. CAN-0018 provided instruction for assessing what equipment should be considered “terminal equipment” under FAC-008 and has been revised to reflect specific series connected terminal equipment.

CANs do not expand the scope of a Reliability Standard, and the importance of this was discussed during the August 3, 2011 Member Representatives Committee (MRC) in Vancouver. As a result, the NERC Board of Trustees (BOT) provided guidance regarding CANs to NERC staff. In response to that guidance, NERC is in the process of redrafting all
of the CANs that had been previously posted as final to target the instruction to Compliance Enforcement Authorities (CEA’s) instead of industry. NERC staff has expanded the process to include more industry input and transparency and is seeking to define, wherever applicable, a range of acceptable actions that meet the requirements of the standard. As part of the process revisions, NERC staff continues to provide greater information regarding how the compliance application was determined and its rationale for adopting or not adopting industry comments.

There is still work needed to gain industry acceptance for CANs. As acceptance of the CANs grows and industry understands that CANs are an ERO activity relating to the compliance aspect of the cycle, not the standards aspect of the cycle, NERC continues to receive feedback that, there should be a stronger link to the standards development process. To that end, NERC staff encourages “CAN Prevention” to standards drafting teams, with the goal that the teams will consider compliance monitoring and thus draft the standards as clearly as possible including compliance monitoring provisions. While the need for CANs may never be completely eliminated, it can be greatly reduced if the standards are first written in a way that provides for more consistent compliance application.

NERC is supportive of revising a standard but cannot wait until it becomes mandatory and effective to monitor compliance. NERC believes it can provide instruction to CEAs in order to facilitate consistent assessments of compliance and to make those instructions transparent to industry so it is aware of how a CEA will assess compliance during an audit or spot check. Additionally, NERC recognizes the expertise of industry. As NERC becomes more transparent regarding the compliance expectations for standards as currently written, the collective experience and expertise of the industry must be considered and balanced with the understanding that NERC, as the ERO, has an enforcement responsibility that requires independence in enforcing the currently approved standards.

2. Events Analysis
NERC is responsible for conducting an event analysis when serious events occur on the system to understand why they happened and what needs to be done to address the causes. NERC’s goal is to shine a light on what the problems are and to make sure it doesn’t happen again.

NERC’s event analysis process reviews numerous events that occur on the bulk power system. These events can range from loss of a single component to loss of large amounts of load or generation. The events analysis process provides us with a path to learn from what happened with the goal of sharing those lessons with others to prevent it from happening again.

As part of this process, working with teams in each of the eight regional entities, NERC experts have analyzed a variety of events. System owners and operators are required to report the occurrence of defined bulk power system disturbances and unusual occurrences to the applicable Regional Entity and NERC in accordance with reliability standards and other
requirements. Each of these standards specifies timeframes within which initial and final event reports are required. Additional reporting requirements may also be required.

Operators of the system, Regional Entities and NERC need to become aware quickly of events and disturbances that take place throughout the bulk power system. This ‘initial impression’ information and insight are produced and delivered quickly and made available to personnel with planning and operations responsibilities across the system. This initial information sets forth a workable structure for very short-term analyses and reports, which can be followed by more intensive studies.

Once an event analysis is completed, the publishing of industry-developed lessons learned from these analyses serves an integral function of providing insight and guidance by identifying and disseminating valuable information to owners, operators and users of the bulk power system (BPS). I do believe NERC, working with the Regional Entities and industry, needs to develop a mechanism to better track and ensure closure of those issues identified to be addressed. It is essential to ensure we don’t repeat the errors of the past and ensure accountability on a going forward basis.

3. Lessons Learned
NERC’s role as the ERO facilitates a vast and unmatched capability for access to event data and information, which allows for a varied library of lessons learned. The leveraging of industry experiences and preventative measures is a proactive way of preventing events from re-occurring or from happening at all. Lessons learned are publications that originate and are developed by registered entities that are impacted by events and disturbances on the BPS. The key elements include the corrective actions taken, the innovative solutions used, and the primary lessons institutionalized by the submitting entity. The lessons learned are then submitted to NERC for publication and sharing with the industry. There are times in which NERC or the regional entities will develop lessons learned from trends or observations of consolidated event information.

Since April of 2010, NERC has published 45 individual lessons learned that were developed from recorded analysis of events captured in the ERO event analysis program. There have been 79 lessons learned candidates submitted in the first three quarters of 2011, and those submittals are in various levels of the drafting process. These publications are announced formally and posted for industry consumption on the NERC web site.

As an example, 55 lessons learned were submitted by entities impacted during the February 2011 cold weather event in Texas and the Southwest. These lessons were consolidated into 22 separate lessons for publication. Several themes addressed in these lessons are as follows:

- Generating Unit Temperature Design Parameters and Extreme Winter Conditions
- Adequate Maintenance and Inspection of Generator Freeze Protection
- Plant Instrument Transmitters and Sensing Equipment Freezing Due to Heat Trace and Insulation Failures
- Plant Fuel Switching and Cold Weather
- Generation plant winter preparation
For 2011, the NERC lessons learned program also published eight individual relay protection systems lessons that address the following subjects:

- Special Protection Systems (SPS) maintenance precautions
- Relay Protection Systems coordination for close in faults
- Relay Protection Systems misoperations
- Power line carriers and misoperations
- Field revision to Relay Protection Systems
- Transmission Relaying – voltage transfer failure
- Transmission Relaying – removing unused components
- Use of out of date Relay Protection System technical prints

Other examples of lessons learned publications include SCADA modem vulnerabilities, Sub-synchronous interaction, backup control center operation and training.

A new companion program to the lessons learned initiative is the publication of best practices observed by NERC and the Regional Entities during the review and conduction of the event analysis program. Learning from best practices is as valuable as learning from lessons or near misses. Finally, the Reliability Risk Management (RRM) group is currently developing a human performance/human factors publications program that will be published on a quarterly basis. This will be accompanied by webinars to support the publications and create another forum for communication.

4. Alerts

As part of its normal course of business, NERC often discovers, identifies, or is provided with information that is critical to ensuring the reliability of the bulk power system (BPS) in North America. In order to effectively disseminate this information, NERC utilizes “Alerts” designed to provide concise, actionable information to the electricity industry. As defined in its Rules of Procedure, NERC Alerts are divided into three distinct levels, as follows:

- Industry Advisory - Purely informational, intended to alert registered entities to issues or potential problems. A response to NERC is not necessary
- Recommendation to Industry - Recommend specific action is taken by registered entities. Require a response from recipients as defined in the alert
- Essential Action - Identify actions deemed to be “essential” to BPS reliability. Require NERC Board of Trustees approval prior to issuance. Like recommendations, essential actions also require recipients to respond as defined in the alert.

Generally, NERC distributes Alerts broadly to users, owners, and operators of the BPS in North America utilizing its Compliance Registry. Reliability entities such as Balancing Authorities, Transmission Operators, Planning Authorities, Generation Owners, etc., are most often the recipients of NERC Alerts. Each reliability entity’s primary compliance contact is responsible for registering any other individuals in its organization who should also be receiving Alerts from NERC.

Thus far, in 2011, NERC has published nine advisory alerts to industry on bulk power issues such as geomagnetic disturbances, cyber attacks exploiting RSA Secure ID authentication, Stuxnet and Night Dragon as well as transmission line facility ratings. Examples include:
The Industry Advisory Alert on geomagnetic disturbances provided industry with a set of operation and planning actions to prepare for the effects of a severe Geo-Magnetic Disturbances (GMD) on the bulk power system. The Alert included categorized lists providing prospective examples based on industry experience that could be used by entities to reduce or mitigate the impacts of high levels of GIC resulting from severe GMD. This included operational planning actions to be considered after a severe GMD event (K>6) such as increasing import capability, increasing real and active reserves and increase attention to situation awareness and enhance surveillance procedures. Real-Time Operator Actions to be coordinated with the Reliability Coordinator after receiving a severe GMD warning (K>6) were identified, including increasing reactive reserves and decreasing load on susceptible equipment. The Alert also provided long term stakeholder actions to consider including modeling and simulation; relay review and inventory assessment. NERC also produced a draft guideline providing additional information on warning levels and information exchange.

NERC also recently published an Alert “Reducing Human Error by the use of Configuration Control Practices. This emerging reliability issue trend was identified by NERC staff during their quarterly trend analysis of events. This publication includes five examples where a lack of configuration control was causal to events that occurred on the BPS as well as the ten configuration control practices that can be implemented to prevent these kinds of events from occurring.

FAC-008 is another example of where NERC utilized an Alert to identify a problem, issued an Alert Recommendation and continues to work on addressing those concerns. During 2011, NERC provided guidance and information to the Alert Recommendation for performing the FAC assessments, including guidance and information regarding the prioritization of Transmission and Generation Owner's facilities. This Assessment Plan Review Criteria was used to provide guidance to Regional Entity staff in review of assessment plans, provide further assistance to the Owners in meeting the intent of the Recommendation, and to respond to those issues. Two webinars were held, and NERC developed a semi-annual reporting spreadsheet to be used for providing information on their complete assessments. On July 15, 2011, NERC received the first High Priority Assessment report noting the progress each registered entity has made in completing their assessment plans. A significant number of assessments have been completed, and we anticipate the remainder will complete their assessments in the beginning of 2012.

There are four levels of sensitivity utilized in deciding who within industry is able to view and receive a NERC Alert:

i. Public: No restrictions and posted to NERC’s website alert page for all users, owners, and operators to view

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ii. Private: Restrict to Internal Use and Necessary Consultants / Third-Party Providers

iii. Sensitive: Internal Use Only (Do Not Distribute Outside Your Company)

iv. Confidential: Limited Internal Distribution Decided Upon by an Officer of the Company

The NERC Alert system is working well, especially in the area of critical infrastructure where not all vulnerabilities can or should be addressed by a standard. In such cases, NERC Alerts are a key element in critical infrastructure protection. The system is well known by industry, handles confidential information and does so in an expedited manner. It does not require a NERC balloting process. The CIP Alerts use a HYDRA group which is comprised of many industry subject matter experts from across the BPS to help craft Alerts. The Alerts process has a mandatory “up to 5 days” of review time built in for FERC review. This is a required final review by FERC before NERC can release the Alert. After an Alert is sent out, the NERC Rules of Procedure provide for a series of questions with a mandatory response required for Level 2 and 3 alerts. The questions that are asked go to how the entity is responding to the Alert. We also receive feedback from the industry via webinars on the topic of the Alert.

5. Reliability Assessments and Performance Analysis: Metrics and Measures

While the aforementioned efforts in providing greater openness, transparency and focus on reliability are core to NERC’s mission, the follow-on reliability assessment, system measurement and metrics development are critical to making informed decisions as to the efficacy of the work. Coupled with an understanding of reliability priorities, NERC assessments provide the appropriate measures of accomplishment and can lead to important recommendations to industry, policymakers and NERC, as well as provide important input into standards development.

The NERC Reliability Assessment and Performance Analysis (RAPA) program reviews, assesses, and reports on the overall electric reliability of the interconnected BPS in North America. As part of this assessment, the program identifies and analyzes the impact of key issues and trends that may affect reliability in the future, such as market practices, industry developments, potential technical challenges, technology implications, and policy changes. NERC reliability assessments are performed based on data supplied by users, owners, and operators of the BPS, and is gathered by the eight Regional Entities. This “bottom up” approach ensures that local and Regional issues are accounted for and that their relevance is understood.

NERC’s primary objective in providing an assessment is to identify areas of concern regarding the reliability of the North American BPS and to make recommendations for that assessment as needed. The assessment process enables BPS users, owners, and operators to systematically document their operational preparations and to exchange vital system reliability information. These assessments are prepared by NERC in its capacity as the ERO. Section 39.11(b) of the U.S. FERC’s regulations provide: “The Electric Reliability Organization shall conduct assessments of the adequacy of the Bulk-Power System in North America and report its findings to the Commission, the Secretary of Energy, each Regional
Each year, NERC prepares two seasonal (summer and winter) assessment and one Long-Term (10-year horizon) reliability assessment. These assessments provide an independent view of the seasonal and long-term reliability for the North American BPS while identifying trends, emerging issues, and potential concerns. Additional insights are offered regarding seasonal resource adequacy and operating reliability, an overview of projected electricity demand growth, Assessment Area highlights, and Assessment Area self-assessments.

Industry’s plans to address reliability are gathered through data and detailed responses to NERC’s reliability assessment questions. These questions use engineering experience on elements vital to measuring resource adequacy, ongoing concerns, lessons learned from previous seasons, and resource challenges. Each Assessment Area prepares a self-assessment in response to NERC’s request for information on plans to address reliability considerations. The Assessment Area self-assessments are then made subject to scrutiny and review. These documented responses shed light on ongoing industry responses to reliability considerations such as variable generation integration, seasonal equipment preparations, operational procedures, etc.

Annually, the Long-Term Reliability Assessment forms the basis for the NERC reference case. This reference case incorporates known policy and regulation changes expected to take effect throughout the 10-year timeframe assuming a variety of factors such as economic growth, weather patterns, and system equipment behavior. A set of scenarios can then be developed from risk assessment of emerging reliability issues. These scenarios can then be compared to the reference case to measure and identify any significant changes to the BPS that may be required to maintain reliability. For this reason, NERC investigates each of these issues through structured industry technical committees and leveraged the expertise of the electric industry’s broad knowledge base.

For NERC’s annual long-term reliability assessment, the risk from standing and emerging reliability issues is measured based on their perceived likelihood of occurrence and potential consequences to reliability of the BPS. To qualify for consideration, emerging reliability issues must affect BPS reliability based on the following criteria:

- Exists for more than a single year in the 10-year study time horizon;
- Impacts reliability no sooner than three years into the future to allow for sufficient assessment and analysis; and
- Impacts reliability across at least one Regional Entity footprint and is not a local or sub-Regional reliability issue

For example, six issues were identified this year:

- Environmental regulations and impacts to bulk power system reliability
- Integration of Variable Generation (Operational and Planning affects)
- Increased gas generation to support variable generation
- Critical infrastructure protection
- System modeling Improvement and coordination
A risk assessment was completed to prioritize the resulting issues based on risk, defined as their likelihood of occurrence and consequence. Each issue was categorized as high impact, medium impact, or low impact to reliability. This risk assessment evaluated two timeframes: the risk to the BPS in the next one to five years (2011-2015), and the risk to the BPS in the next six to 10 years (2016-2020). Shifts in relative risk can be determined by evaluating the change between the two time periods.

For those issues identified as having a high likelihood of occurrence and high consequence to the reliability of the BPS, a detailed special reliability assessment can be completed to further understand the implications to reliability. Scenario analysis can also be performed to assess the robustness of the reference case against the scenario results, and to determine how the issues affect BPS reliability. The most recent instances include NERC’s special reliability assessments on the integration of variable generation and resource adequacy impacts from potential environmental regulations. For example, in 2009, environmental regulations were determined to be a high-risk reliability issue; therefore, in 2010, NERC completed a detailed analysis to model what the potential effects could be to resource adequacy. These reports contain recommendations for policy makers, the industry and NERC.

Going forward in the long term, some issues become riskier due to technical and policy challenges, as well as uncertainties associated with determining solutions. These uncertainties continue to stress the planning functions, and will affect industry’s ability to operate the system in a reliable manner. For example, in the face of accommodating large amounts of variable generation, the changing landscape of planning and operating the BPS must be finely tuned. Through the course of operator experience and implementing enhanced planning techniques, reliability must ultimately be maintained. For this reason, NERC pays considerable attention to these emerging and standing issues to provide input into NERC’s reliability standards as well as supporting changes as needed in bulk power system planning and operations ensuring reliability is preserved, while meeting the potential challenges facing industry in the future.

To measure system performance and risk trends of the current bulk power system, NERC is also collecting reliability risk information, developing risk metrics and assessing the current state of reliability. The goal is to provide a view of risks to reliability based on historic performance. The objective is to integrate many ongoing efforts underway by providing technical analysis and feedback on risk attributes and reliability trends to stakeholders, regulators, policymakers and industry. The joint report development was led by NERC staff in collaboration with industry.

Since its inaugural report, NERC has advanced the development and understanding of risk attributes that impact reliability performance and the corresponding metrics that provide insight to the performance of the BPS. As this work proceeds, industry continues to investigate those risk attribute areas that enhance understanding and insights made evident for system reliability.
The 2011 Risk Assessment of Reliability Performance begins a transition from a metric performance assessment to a more complete risk impact evaluation of reliability. This transition is expected to crystallize as more data becomes available and understanding of the data and trends matures. The annual report will provide a technically sound platform to ultimately communicate the effectiveness of ERO reliability programs, set the foundation of a learning organization and accountable Electric Reliability Organization, and present an overall view of risk impacts that affect reliability performance.

By addressing the key, measurable components of BPS reliability, metric development and assessment will provide insights, guidance, and direction to those areas in which reliability goals can be more effectively and sustainably achieved. Also, this analysis serves as a foundation to streamline and align the data and information arising from multiple technical groups, thereby providing efficient data and information transparency. The key findings and recommendations are envisioned as input to NERC’s Reliability Standards and project prioritization, compliance process improvement, event analysis, reliability assessment, and critical infrastructure protection.

The ultimate goal is twofold. First, the report will illuminate the historical, overall BPS reliability picture. By using robust data, the reliability of the system can be explained and documented. Currently, there are no measures, datasets, or reports that explicitly and completely state the historical performance of the system. Second, the report will help identify risk clusters and create actionable results for reliability improvement. These significant risk clusters can be selected as priority projects to develop coordinated and multifunctional solutions to relevant problems. NERC’s assessment of the state of reliability will provide an industry reference for historical BPS reliability and analytical insights with a view to action. It will also enable the discovery and prioritization of specific, actionable risk control steps.

Conclusion
NERC continues to improve openness and transparency in a unique regulatory environment: striving to assist industry in understanding compliance, being a learning organization and working collaboratively with a clear focus on reliability as the main objective. The ERO continues to evolve, and these efforts, coupled with a commitment to accomplish the responsibilities as described in section 215 of the Federal Power Act, will enable the continued improvement in bulk power system reliability.