



# **Results of the 2007 Survey of Reliability Issues**

## Revision History

Release No.	Date	Reviewer	Revision Description
Rev. 1	October 24, 2007	Jessica Bian	Changed title language of the illustrations in Figure 6 and 9 to better reflect content following comments received from the Member Representatives Committee (MRC)

## **Acknowledgement**

The NERC Reliability Assessments & Performance Analysis Program would like to thank all the stakeholders and individuals who took the time to participate in this very important survey. We know the results will support the goal of improving electric reliability.

We would like to thank everyone in advance for their continued support and contributions in the next step. Now the program will develop a white paper aimed at identifying the proper reliability metrics. Through collaboration and industry consensus, we expect to provide a solid framework of reliability benchmarking that will help measure the reliability performance of the bulk power system.

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## **Introduction**

### ***Mission of the Electric Reliability Organization***

NERC's mission is to improve the reliability and adequacy of the bulk power system in North America. To achieve that, NERC develops and enforces reliability standards; monitors the bulk power system; assesses future adequacy; audits owners, operators, and users for preparedness; and educates and trains industry personnel. NERC is a self-regulatory organization that relies on the diverse and collective expertise of industry participants. As the Electric Reliability Organization (ERO), NERC is subject to audit by the U.S. Federal Energy Regulatory Commission and governmental authorities in Canada.

On July 20, 2006, the Federal Energy Regulatory Commission (FERC) approved NERC's application to become the ERO for the United States. As the ERO, NERC will have legal authority to enforce reliability standards on all owners, operators, and users of the bulk power system, rather than relying on voluntary compliance. NERC is working to gain similar recognition by governmental authorities in Canada, including eight provinces and the National Energy Board, before the end of this year, and will seek recognition in Mexico once the necessary legislation is adopted there.

### ***Purpose of the Survey***

The NERC Reliability Issue Survey identifies and ranks factors that electrical power industry executives and professionals perceive may negatively impact reliability. NERC will use the results to:

- Develop the appropriate reliability metrics for display on our Reliability Dashboard
- Improve our Reliability Metrics and Benchmarking Program

### ***How this Survey was Conducted***

NERC conducted an online survey from July 17, 2007 to August 7, 2007, and surveyed a broad range of utility users, owners, and operators at various levels of leadership and management to find out what they consider the most important issues affecting the reliability of the bulk power system. The survey posed 17 reliability topics for ranking within two areas, business and technical, and one preparedness topic for ranking.

NERC allowed all industry personnel to participate in the survey, but only once.

The survey was divided into three sections:

1. Organization and position
2. Identification of reliability issues
3. Ranking: Is this factor an Issue to Reliability? If so, what is the:
  - a. Likelihood?
  - b. Severity?

NERC did collect some personal information to eliminate duplicate responses. NERC also separated respondents' concerns based on their responsibilities, geography, and their type of organization. NERC will not release any personal information collected from its survey.

## Summary of Survey Results

NERC received 236 responses during the three weeks allotted for the survey. The majority of responses, 35%, by Organization Type came from participants categorized as “Other,” while 22% of such responses came from participants identified as “Transmission Operators.” The largest amount of survey participants by position, 43%, came from middle managers, such as directors, program managers and operations managers, followed by 18% of survey participation by general management, such as supervisors, project managers, and senior technical advisors. The Northeast Power Coordinating Council (NPCC) led survey participation at 18%, followed by ReliabilityFirst Corporation (RFC) and Western Electricity Coordinating Council (WECC) at 17% of survey participation each.

Within the category of Business Issues, survey participants ranked first, at 67%, a high likelihood that there would be a reliability risk due to the occurrence of an aging workforce and lack of skilled workers, with 51% assigning it at a high severity level. Participants also noted that there was a high likelihood that environmental regulation could impact electric reliability at 55%, with a 26% high severity ranking, and 48% medium severity ranking.

Within the category of Technical Issues, survey participants ranked first, at 65%, a high likelihood that there would be a reliability risk due to the aging infrastructure and limited new construction, with 53% assigning it at a high severity level. Participants also noted that there was a high likelihood of transmission system congestion impacting electric reliability at 62%, with a 39% high severity ranking, and 48% medium severity ranking.

Within the category of Preparedness, survey responses reveal that by less than 2%, there is almost an equal split (49% and 51%) regarding if the electric power industry is prepared to respond to catastrophic threats that could simultaneously impact multiple utilities.

## Survey Results by Participation Rankings

### ***Organization Type***

Individuals working at a wide range of organizations participated in the Survey of Reliability Issues. The majority of participants, 35%, identified their organization type under the “Other” category, such as regulatory agencies, industry associations, research institutes and equipment manufacturers. Participation of individuals at Transmission Operator organizations contributed to 22% of overall survey participation.

**Figure 1: Breakdown of Participation by Organization Type**

#	Organization Type	Response Count	Response %
1	Balancing Authority	25	11%
2	Consulting Firm	7	3%
3	Energy Marketer	6	3%
4	Load Serving Entity	29	12%
5	Reliability Coordinator/ISO	34	14%
6	Transmission Operator	53	22%
7	Other	82	35%
<b>Total</b>		<b>236</b>	<b>100%</b>

## **Position**

NERC identified eight major categories of leadership and management that survey participants could select before they identified what they believed are the most important issues affecting the reliability of the bulk power system.

The middle management category reflects the largest number of survey participants at 43%, while individuals involved in marketing account for the least of amount of survey participants.

**Figure 2: Breakdown of Participation by Position**

#	Position	Response Count	Response %
1	Consultant	8	3.4%
2	Engineer	29	12%
3	General Management (Supervisor, Project Manager, Senior Technical Advisor, etc.)	43	18%
4	Marketing (Non-Manager)	1	0.4%
5	Middle Manager (Director, Program Manager, Operations Manager, etc.)	102	43%
6	Operations (Non-Manager)	10	4%
7	Planning (Non-Manager)	3	1.2%
8	Upper Management (CEO, COO, VP, etc.)	29	13%
9	Other	11	5%
	<b>Total</b>	<b>236</b>	<b>100%</b>

## **NERC Region**

NERC works with eight Regional Reliability Councils to improve the reliability of the bulk power system. The members of the regional councils come from all segments of the electric industry: investor-owned utilities; federal power agencies; rural electric cooperatives; state, municipal and provincial utilities; independent power producers; power marketers; and end-use customers. Regions in the Eastern Interconnection represent the highest amount of participation in the survey, and 5% of responses came from outside the NERC footprint.

**Figure 3: Breakdown of Participation by NERC Region**

#	Region	Response Count	Response %
1	Electric Reliability Council of Texas, Inc. (ERCOT)	17	7%
2	Florida Reliability Coordinating Council (FRCC)	10	4%
3	Midwest Reliability Organization (MRO)	27	11%
4	Northeast Power Coordinating Council (NPCC)	42	18%
5	ReliabilityFirst Corporation (RFC)	40	17%
6	SERC Reliability Corporation (SERC)	38	16%
7	Southwest Power Pool, Inc. (SPP)	11	5%
8	Western Electricity Coordinating Council (WECC)	40	17%
9	Outside of the NERC footprint	11	5%
<b>Total</b>		<b>236</b>	<b>100%</b>

## Survey Results by Business Issue Rankings

Survey participants were asked to rank seven potential business circumstances, based on their belief if the circumstance had a high, medium, or low likelihood of occurrence, and then the severity of impact for each. The “Aging Workforce and a Lack of Skilled Workers” is ranked first among all business issues, with the highest likelihood and highest impact.

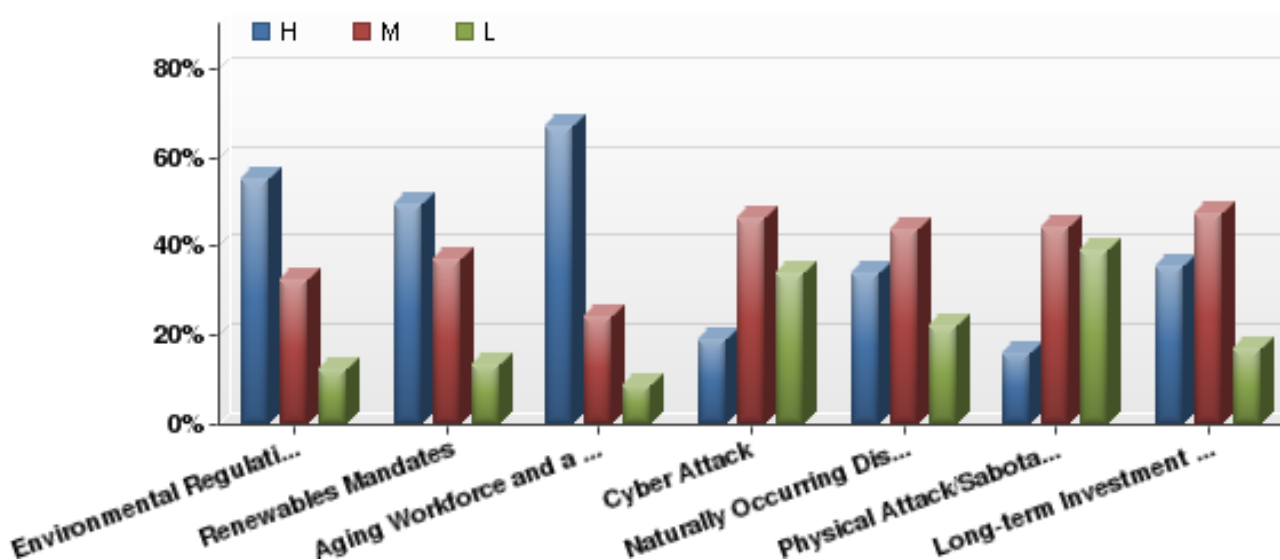
### Likelihood of Occurrence

Participants were asked: “What do you believe is the likelihood of occurrence?” Sixty-seven percent said they believed there was a high likelihood that there will be an aging workforce and a lack of skilled workers.

Figure 4a: Breakdown Based on Participants’ Belief in the Likelihood of Occurrence

#	Question <sup>1</sup>	H	M	L
1	Environmental Regulation	55%	33%	12%
2	Renewable Mandates	50%	37%	13%
3	Aging Workforce and a Lack of Skilled Workers	67%	24%	9%
4	Cyber Attack	19%	46%	34%
5	Naturally Occurring Disasters (weather, earthquake, pandemic flu, etc.)	34%	44%	22%
6	Physical Attack/Sabotage	16%	44%	39%
7	Long-term Investment Risk/Uncertainty	36%	47%	17%

Figure 4b: Bar Graph Displaying Participants’ Belief in the Likelihood of Occurrence



<sup>1</sup> Note: “H” indicates High; “M” indicates Medium; “L” indicates Low.  
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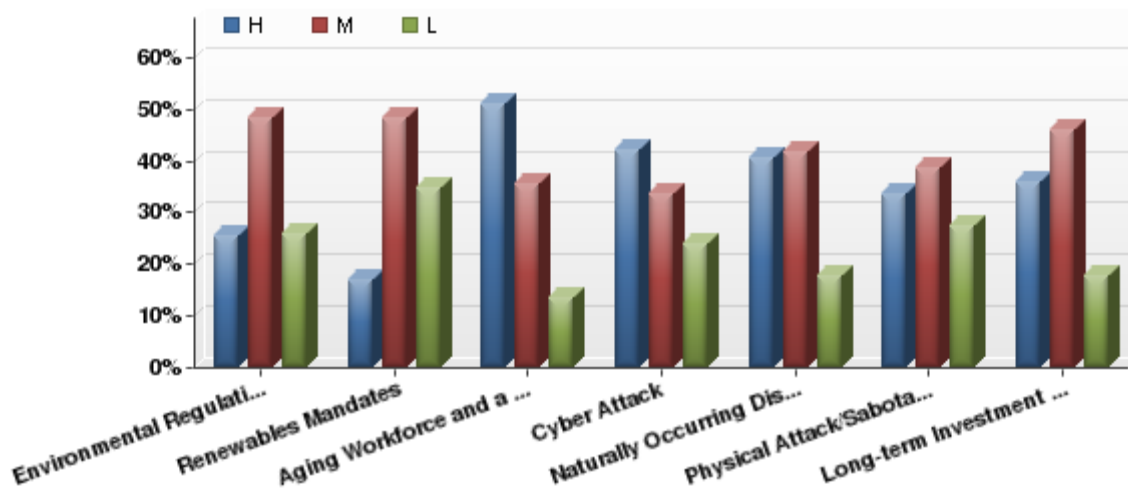
### Severity of Impact

Participants were asked to rank the severity impact of seven potential business circumstances. Fifty-one percent ranked at a high severity impact the aging workforce and a lack of skilled workers.

**Figure 5a: Breakdown Based on Participants' Belief in Severity of Impact**

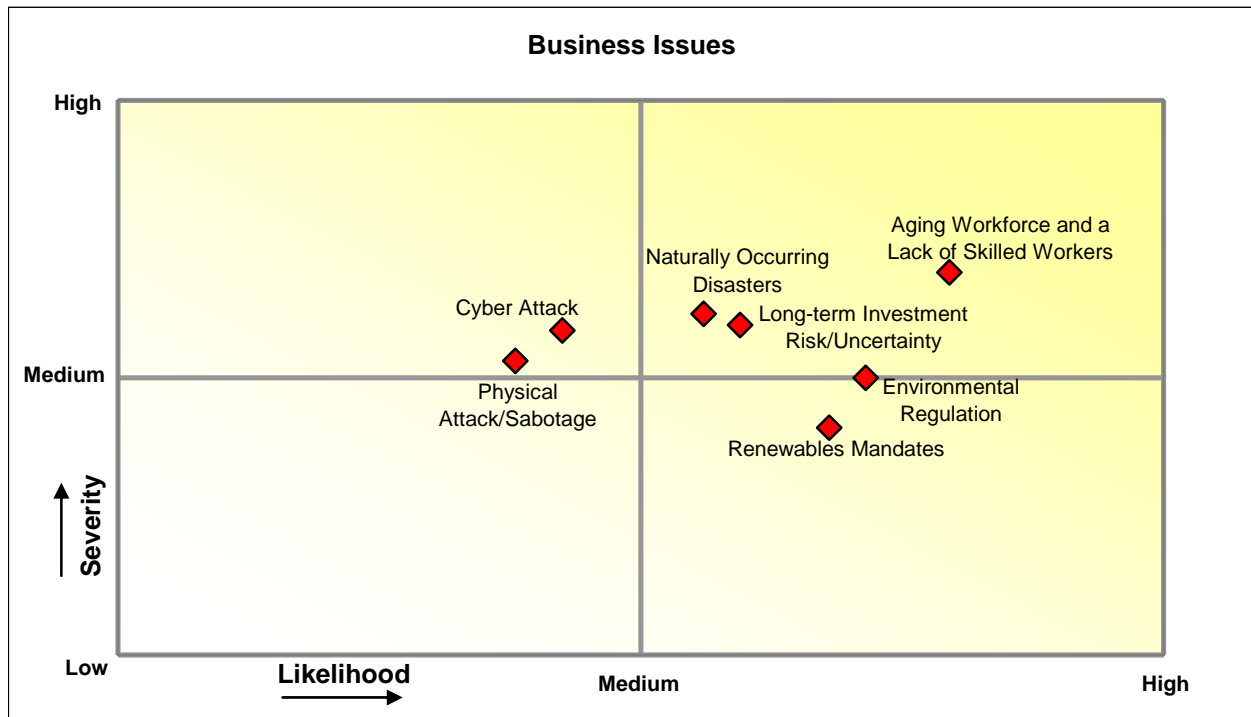
#	Question	H	M	L
1	Environmental Regulation	26%	48%	26%
2	Renewable Mandates	17%	48%	35%
3	Aging Workforce and a Lack of Skilled Workers	51%	35%	13%
4	Cyber Attack	42%	34%	24%
5	Naturally Occurring Disasters (weather, earthquake, pandemic flu, etc.)	41%	42%	18%
6	Physical Attack/Sabotage	34%	39%	28%
7	Long-term Investment Risk/Uncertainty	36%	46%	18%

**Figure 5b: Bar Graph Displaying Participants' Belief in Severity of Impact**



The “Aging Workforce and a Lack of Skilled Workers” is ranked first among all business issues, with the highest likelihood and highest impact

Figure 6: Combined View of Business Issue Rankings



## Survey Results by Technical Issue Rankings

Survey participants were asked to rank 10 potential technical circumstances, based on their belief if the circumstance had a high, medium, or low likelihood of occurrence, and then the severity of impact to electric reliability for each circumstance. The “Aging Infrastructure and Limited New Construction” is ranked first among all technical issues, with the highest likelihood and highest impact.

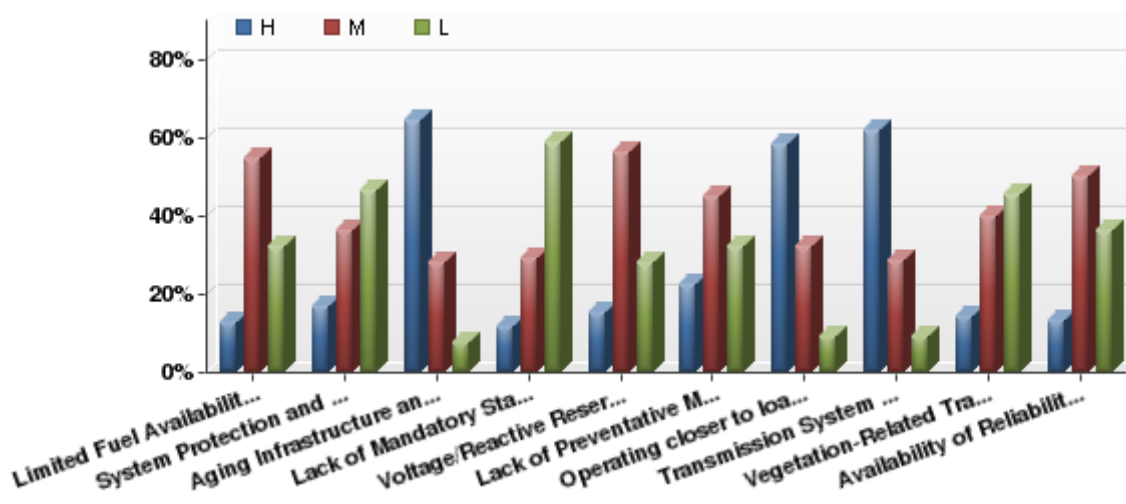
### Likelihood of Occurrence

Participants were asked: “What do you believe is the likelihood of occurrence?”

**Figure 7a: Breakdown Based on Participants’ Belief in the Likelihood of Occurrence**

#	Question	H	M	L
1	Limited Fuel Availability, Transportation, or Reduced Onsite Supplies	13%	55%	32%
2	System Protection and Controls - Imbalances and Malfunctions	17%	36%	47%
3	Aging Infrastructure and Limited New Construction	65%	28%	7%
4	Lack of Mandatory Standards for Reliable Operation	12%	29%	59%
5	Voltage/Reactive Reserve Availability	15%	57%	28%
6	Lack of Preventative Maintenance	22%	45%	32%
7	Operating closer to load limits	58%	32%	9%
8	Transmission System Congestion	62%	29%	9%
9	Vegetation-Related Transmission Outages	15%	40%	46%
10	Availability of Reliability Analysis Tools for Situational Awareness	13%	50%	36%

**Figure 7b: Bar Graph Displaying Participants’ Belief in the Likelihood of Occurrence**



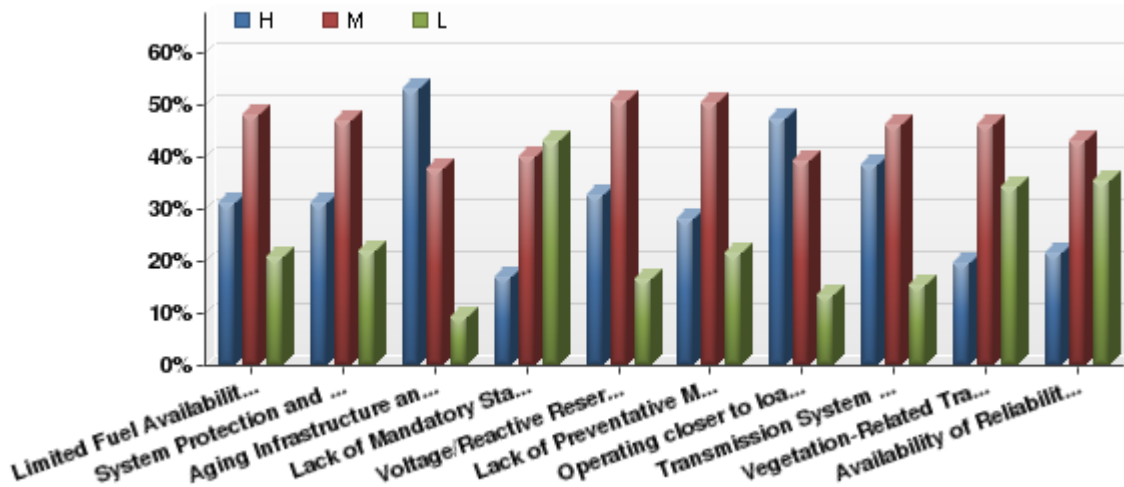
### Severity of Impact

Survey participants were asked: “What do you believe is the severity of the impact for each of the following? Please indicate H (High), M (Medium), or L (Low).” Fifty-three percent ranked at a high severity impact the “Aging Infrastructure and Limited New Construction.”

**Figure 8a: Breakdown Based on Participants’ Belief in Severity of Impact**

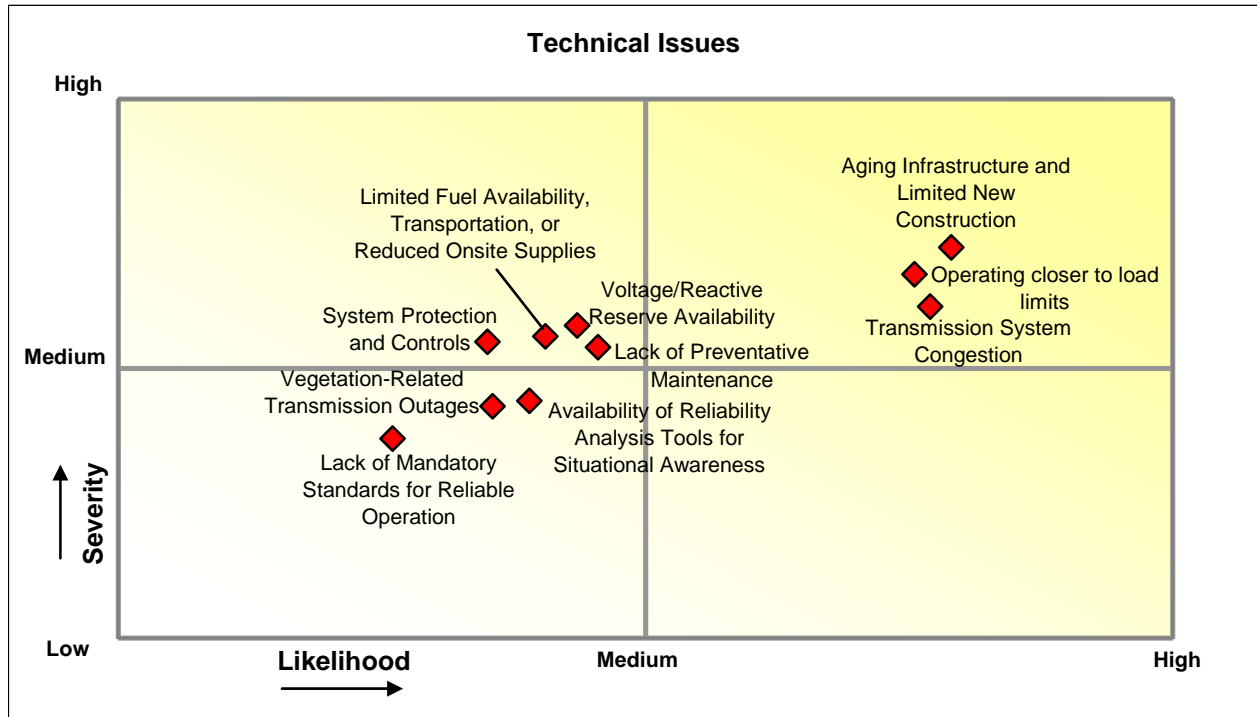
#	Question	H	M	L
1	Limited Fuel Availability, Transportation, or Reduced Onsite Supplies	31%	48%	21%
2	System Protection and Controls - Imbalances and Malfunctions	31%	47%	22%
3	Aging Infrastructure and Limited New Construction	53%	38%	9%
4	Lack of Mandatory Standards for Reliable Operation	17%	40%	43%
5	Voltage/Reactive Reserve Availability	33%	51%	17%
6	Lack of Preventative Maintenance	28%	50%	22%
7	Operating closer to load limits	47%	39%	13%
8	Transmission System Congestion	39%	46%	15%
9	Vegetation-Related Transmission Outages	20%	46%	34%
10	Availability of Reliability Analysis Tools for Situational Awareness	22%	43%	35%

**Figure 8b: Bar Graph Displaying Participants’ Belief in Severity of Impact**



The “Aging Infrastructure and Limited New Construction” is ranked first among all technical issues, with the highest likelihood and highest impact

Figure 9: Combined View of Technical Issue Rankings



## Top Five Non-Survey Issues Identified by Participants

Survey participants were asked to identify top reliability concerns, which could be different from the ones listed in the survey. Below are the top five additional issues that participants identified.

**Figure 10: Five Additional Reliability Issues Identified by Survey Participants**

#	Additional Issue
1	State policies and public opposition to new transmission line construction
2	Market design that fails to provide incentives to preserve and improve grid reliability
3	Lack of enforcement measures to ensure generation adequacy to meet load growth
4	Inadequate information sharing and system coordination due to complex relationships within the industry
5	Lack of sufficient situational awareness and appropriate response to system disturbance events

## Survey Results by Preparedness Rankings

Survey Participants were asked: “*Is the electric power industry prepared to respond to catastrophic threats that could simultaneously impact multiple utilities?*” Fifty-one percent believe the industry is prepared for such a potential occurrence, while 49% believe the industry is not prepared.

#	Answer	Response	%
1	Yes	120	51%
2	No	116	49%
<b>Total</b>		<b>236</b>	<b>100%</b>

## Feedback

If you have questions or comments about this report, the survey, or the upcoming white paper and its role in the process of reliability benchmarking, please contact Jessica Bian at [jessica.bian@nerc.net](mailto:jessica.bian@nerc.net), or 609-452-8060, ext. 162.