

Consideration of Comments

Project Name: Electromagnetic Pulse (EMP) Task Force –Draft Strategic Recommendations

Comment Period Start Date: August 30, 2019

Comment Period End Date: September 30, 2019

There were 20 sets of responses, from different companies

All comments submitted can be reviewed in their original format on the [project page](#).

If you feel that your comment has been overlooked, please let us know immediately. Our goal is to give every comment serious consideration in this process. If you feel there has been an error or omission, you can contact Senior Manager of Standards [Soo Jin Kim](#) (via email) or at (404) 446-9742.

Questions

1. Do you agree with the scope and direction of the recommendations in the Policy chapter of the report?
2. Do you agree with the scope and direction of the recommendations in the Research chapter of the report?
3. Do you agree with the scope and direction of the recommendations in the Vulnerability Assessment chapter of the report?
4. Do you agree with the scope and direction of the recommendations in the Mitigations chapter of the report?
5. Do you agree with the scope and direction of the recommendations in the Response and Recovery chapter of the report?
6. Provide any additional comments for the EMP Task Force to consider, if desired.

1. Do you agree with the scope and direction of the recommendations in the Policy chapter of the report?

Kim Thomas – Duke Energy

Answer: No

Comment

Consider adding North American Transmission Forum (NATF) to the list of support organizations for Policy Recommendation #2. NATF already has a proven track record in educating its members on key issues like EMP. We applaud the identification of all three Policy Matters. All three are needed to advance meaningful research, identification and development of cost-effective mitigations.

Response

Troy Brumfield - American Transmission Company

Answer: Yes

Comment

Response

Kelsi Rigby - Arizona Public Service Company

Answer: Yes

Comment

Response

Alberto Ramirez Orquin

Answer: Yes

Comment

Totally agree, particularly on “Policy Matter #1: The high costs of EMP mitigations and the lack of cost recovery mechanisms.”

Response

Robin Yee - Canadian Electricity Association

Answer: No

Comment

CEA appreciates the recognition of cost recovery mechanisms as a policy matter identified by the Task Force for consideration. Canadians and Americans are joint custodians of an integrated electric grid connected by over 35 transmission lines. Integration has resulted in a flexible, reliable and secure grid on both sides of the border, which contributes to North American energy security and resilience. However, as the sector faces a time of rapid change, any EMP policymaking will need to consider, in its decision-making process, what is feasible for industry, weighed against other risks and changes to the grid. / EMP planning, mitigation and recovery will require high costs in proportion to other challenges facing the grid, including energy storage, distributed energy resources, extreme weather, and climate change resiliency. This does not mean that planning for it should not be pursued; but CEA would emphasize the importance of recognizing that resources must inherently be considered as part of any discussion or policymaking on EMP planning, mitigation, and recovery. / For other comments on scope and direction, please see Additional Comments.

Response

John Shaver - Arizona Electric Power Cooperative, Inc.

Answer: No

Comment

AEPC supports the development of best practices and guidelines for EMP issues, but we believe more research and identification of federal government/military responsibilities must be determined outside of NERC’s purview before standards can be considered.

Response

Ruida Shu - NPCC

Answer: No

Comment

Response

Aubrey Short - FirstEnergy

Answer: Yes

Comment

Response

Preston Walker - PJM Interconnection, LLC

Answer: Yes

Comment

Response

Barry Lawson - National Rural Electric Cooperative Association (NRECA)

Answer: No

Comment

NRECA supports the development of best practices and guidelines for EMP issues, but we believe more research and identification of federal government/military responsibilities must be determined outside of NERC’s purview before standards can be considered.

Policy Recommendation #1 – What does the phrase “performance expectations” mean as used in the report? Additionally, the words “expectations” and “as required” are confusing when speaking about best practices and guidelines. Please remove or clarify these terms as used in the report. Also recommend removing the ESCC from the support organization list. While an important group for our industry, it is not a government agency nor is it undertaking EMP research. EPRI would be more appropriate here than the ESCC.

Policy Recommendation #2 – What does “endorsed” mean with respect to educational materials? Who would be doing the endorsing? Also recommend adding DHS and FERC to the support organizations list.

Policy Recommendation #3 – Recommend adding DOE to the support organizations list.

Policy Matters #1 – NERC and the EMP Task Force should not be addressing cost recovery in any manner. This should be left to utilities and their state PUCs, Boards and FERC to handle. NRECA recommends either removing

Policy Matters #1 from the report, or clearly state that these issues are important, but should be left for utilities and others mentioned in the previous sentence to handle. NERC and the EMP Task Force has no role here and the EMP Executive Order applies to other government agencies, not NERC. Also, there is mention of “required effective EMP mitigation” which sounds mandatory in nature, and not related to best practices and guidelines. Recommend removing or clarifying this language.

Policy Matters #2 – Recommend removing “cost recovery actions” from this item as it is outside the scope of NERC’s role as the ERO. Also recommend adding the FBI to the support organizations list.

Policy Matters #3 – Recommend adding the FBI to the support organization list.

Response

Kevin Lyons - Central Iowa Power Cooperative

Answer: No

Comment

CIPCO agrees with the comments submitted by the NRECA on this question.

Response

Aaron Cavanaugh - Bonneville Power Administration

Answer: Yes

Comment

BPA has the following concerns:

Regarding Policy Recommendation 1, will a decision be made about ride-through versus recovery, since ride-through would require significantly more investment?

Regarding Policy Recommendation 3, who is going to ensure coordination between utility sectors? NERC does not have that authority. This was an issue for Y2k preparation.

Regarding Policy Matter 2, is there a way to determine if there is useful classified information—can those who have seen the information brief the rest of us on its usefulness? Can they characterize what cannot be de-classified?

Response

Devin Shines - PPL/LG&E-KU

Answer: Yes

Comment

Response

Mark Gray - Edison Electric Institute

Answer: Yes

Comment

EEI supports the scope and direction of the Policy section of the EMP Task Force Draft Strategic Recommendations. While we support the recommendations, we also offer the following suggestions for Task Force consideration:

Recommendations

Policy Recommendation #1 (Performance Expectations for an EMP Event)

- Potential Support Organization - EEI suggests adding Industry stakeholders.

Policy Recommendation #2 (Industry and Public Education)

- EEI suggests removing “Public” from the title of this Policy Recommendation. While we support NERC as the Lead Organization for this activity, we are of the opinion that this role should be limited to acting as a clearinghouse of relevant EMP educational materials for the Industry but not for the general public.

Policy Recommendation #3 (Coordination with other Sectors)

- Lead Organization –EEI is of the opinion that the DHS is a more appropriate organization to lead this activity.
- Potential Support Organizations – EEI suggests that DHS be moved from a support organization to the lead Organization. NERC should be moved from the Lead Organization to a support organization.
- EEI is of the opinion that this recommendation should shift to a policy matter recommendation. Moreover, DHS via the Executive Order is best positioned to look at the broad interdependencies across the critical infrastructure sectors and to address and drive coordination across sectors to enhance EMP resilience nationwide.
- EEI further emphasizes the important role natural gas pipeline systems play toward reliable electric infrastructure. The recommendation and additional attention to provide guidance on cross sector coordination with fuel supply sectors will be

especially helpful from a fuel resilience perspective. Additional research and coordination are necessary to ensure any vulnerabilities between natural gas and electric power systems are addressed.

Policy Matters Policy Matter #1 (Cost Recovery Mechanisms)

- Lead Organization – EEI suggests that FERC should have a leadership role in developing cost recovery mechanisms for the electric utility Industry and added as a lead organization along with DHS. While EEI recognizes that DHS was specifically identified to lead this effort, EEI is of the opinion that their role will be to coordinate with FERC to develop cost recovery mechanisms. Moreover, DHS’s primary role will be to work within the Federal Government to ensure the Industry is provided necessary funding for federal recovery mechanisms that will be developed by FERC.

Policy Matter #2 (Access to Classified Information)

- Lead Organization – EEI suggests adding FERC. (EEI recognizes that FERC does not have classified information, but we are of the opinion they would be the appropriate organization to funnel information from the DOE and DOD to the Industry.)
- Bullet 1 – EEI suggests changing as follows: gain access to data/information related to research on the threats and impacts

Policy Matter #3 (Declassification of Information)

- Bullet 3 – Correct the following: efforts to facilitate information sharing

Response

Kent Feliks - AEP

Answer: Yes

Comment

Response

Carla Flinn - Ameren

Answer: Yes	
Comment	
Ameren agrees with and supports EEI's comments.	
Response	
Daniel Graham - Tri-State Generation and Transmission Association, Inc.	
Answer: No	
Comment	
<p>Policy recommendation should be based on additional research and identified leading and supporting agencies roles should be evaluated for realignment.</p> <p>Policy Recommendation #1: Establish BPS Performance Expectation for an EMP Event: Research, vulnerability assessment, and proper alignment of organizational responsibilities should be completed prior to consideration of performance expectations. EPRI, Executive Order, and DHS's "Strategy for Protecting and Preparing the Homeland against Threats of Electromagnetic Pulse and Geomagnetic Disturbances" identify more information is needed. Performance expectation would need to base on results from the additional information. The additional information may identify individual utilities are not correctly aligned for performance expectations.</p> <p>Policy Recommendation #2: Providing industry and public education on EMPs: Based on text from the EPRI, Executive Order, and DHS additional research is required. This research would need to be conducted prior to educating electric subsector owners and operators and the public about</p> <ol style="list-style-type: none"> 1) EMP threat generally; 2) Its possible impacts; 3) Possible mitigations; 4) Response and Recovery options. 	

Additionally NERC may not be the best appropriate lead organization for public education.

Policy Recommendation #3: Coordination with other Critical Infrastructure sectors on EMP matters: While coordination with other sectors is often useful, it may be premature. Based on text from the EPRI, Executive Order, and DHS additional research is required. This research should be completed prior to determining how coordinate with other sectors.

Response

Douglas Webb - Westar / Kansas City Power & Light

Answer: Yes

Comment

Westar / Kansas City Power & Light support EEI's Comments

Response

Paul Taylor - Florida Power & Light

Answer: Yes

Comment

Restoration time frames would be immediate and then after intervention in the field?

Response

Becky Webb - Exelon

Answer: Yes

Comment

Exelon supports the scope and direction of the EMP Task Force. Exelon also supports EEI’s comments and would like to reiterate the recommendation that the DHS be identified as the lead organization for Policy Recommendation #3, ultimately changing this to a Policy Matter. Exelon further emphasizes the important role natural gas pipelines have in the reliability of the electric system and the needed research and coordination between these two sectors supported by this recommendation.

Response

2. Do you agree with the scope and direction of the recommendations in the Research chapter of the report?

Kim Thomas – Duke Energy

Answer: No

Comment

Consider adding North American Transmission Forum (NATF) to the list of support organizations for Policy Recommendation #2. NATF already has a proven track record in educating its members on key issues like EMP. We applaud the identification of all three Policy Matters. All three are needed to advance meaningful research, identification and development of cost-effective mitigations.

Response

Troy Brumfield - American Transmission Company

Answer: Yes

Comment

Response

Kelsi Rigby - Arizona Public Service Company

Answer: Yes

Comment

Response

Alberto Ramirez Orquin - Resilient Grids, LLC

Answer: Yes

Comment

Totally agree, particularly on “Policy Matter #1: The high costs of EMP mitigations and the lack of cost recovery mechanisms.”

Response

Robin Yee - Canadian Electricity Association

Answer

Comment

CEA appreciates the recognition of cost recovery mechanisms as a policy matter identified by the Task Force for consideration. Canadians and Americans are joint custodians of an integrated electric grid connected by over 35 transmission lines. Integration has resulted in a flexible, reliable and secure grid on both sides of the border, which contributes to North American energy security and resilience. However, as the sector faces a time of rapid change, any EMP policymaking will need to consider, in its decision-making process, what is feasible for industry, weighed against other risks and changes to the grid. / EMP planning, mitigation and recovery will require high costs in proportion to other challenges facing the grid, including energy storage, distributed energy resources, extreme weather, and climate change resiliency. This does not mean that planning for it should not be pursued; but CEA would emphasize the importance of recognizing that resources must inherently be considered as part of any discussion or policymaking on EMP planning, mitigation, and recovery. / For other comments on scope and direction, please see Additional Comments.

Response

John Shaver - Arizona Electric Power Cooperative, Inc.	
Answer: No	
Comment	
<p>Research Recommendation #2 – NERC and the EMP Task Force must be cautious when undertaking research on distribution facilities. Such research must be explicitly focused on reliability impacts to the BES. This same comment applies to the end-use facilities section. Section 215 of the Federal Power Act (FPA) is very clear on how the ERO can address distribution facilities and the EMP Task Force must adhere to the FPA language.</p>	
Response	
Ruida Shu - NPCC	
Answer: No	
Comment	
Response	
Aubrey Short - FirstEnergy	
Answer: Yes	
Comment	
Response	

Preston Walker - PJM Interconnection, LLC

Answer: Yes

Comment

Response

Barry Lawson - National Rural Electric Cooperative Association (NRECA)

Answer: No

Comment

Research Recommendation #2 – NERC and the EMP Task Force must be cautious when undertaking research on distribution facilities. Such research must be explicitly focused on reliability impacts to the BES. This same comment applies to the end-use facilities section. Section 215 of the Federal Power Act (FPA) is very clear on how the ERO can address distribution facilities and the EMP Task Force must adhere to the FPA language.

Response

Kevin Lyons - Central Iowa Power Cooperative

Answer: No

Comment

CIPCO agrees with the comments submitted by the NRECA on this question.

Response

Aaron Cavanaugh - Bonneville Power Administration

Answer: Yes	
Comment	
Response	
Devin Shines - PPL/LG&E-KU	
Answer: Yes	
Comment	
<p>While we agree with the scope and direction of the recommendations in the Research chapter of the report, we do have the following comments: (1) What entity provides the funding for the research? It would be useful to know whether the entity providing funding will have an effect on which areas receive more focus. (2) Additional focus may be required for assessing the impact to “Load”: Industrial I&C, Motors, Computer Systems.</p>	
Response	
Mark Gray - Edison Electric Institute	
Answer: Yes	
Comment	
<p>EEI supports the scope and direction of the recommendations in the Research chapter of the report but also offers the following suggested changes for Task Force consideration:</p> <p>Research Recommendation 1 (Monitor Current Research and Report on National Initiatives)</p> <ul style="list-style-type: none"> Task Description: EEI suggests removing “and other affiliated National Security”. It should read “Monitor and communicate to the industry research pertaining to EMP (DELETE: and other National Security) activities that impact BPS.” (The report should remain focused on EMP, no other National Security activities.) 	

- Suggested Lead Organization – EEI suggests moving NERC to a Support Organization. The DOE and DHS have the expertise in this area and could better lead this recommendation. EEI would support NERC in this role acting as a clearing house for research information.
- Potential Support Organization – DHS should be deleted as a support organization given, they are already listed as a Lead Organization.

EEI suggests expanding this recommendation to include both new and existing research that might help entities better protect their assets against the effects of EMP. The National Labs have been studying this issue for many years and much of that research remains useful but often difficult to locate or otherwise unavailable.

EEI suggests adding EPRI and Industry Partners. (Many companies who sell products to the electric utility industry have conducted their own research on this topic. Future research should consider leveraging those findings.)

Recommendation 2 (Identify Gaps in Research) Generating Facilities

- EEI suggests the following edits: (DELETE as they assume a larger) CHANGE TO given their growing role in electric generation.
- EEI suggest the following edits: impact of E2 to distribution level auxiliary systems critical to the reliable operation of around a generating plant. Transmission & Distribution Bulk Electric System (BES) Facilities
- This report should remain focused on BES facilities. While EEI recognizes that the grid is an interconnected system where impacts at one level can have impacts on another level, NERC jurisdiction is limited to the BES and the focus of this report should remain at that level. (EEI members are concerned that this report unintentionally blurs the lines between federal and state regulations and responsibilities. While we recognize the concerns associated with distribution systems, we believe it would be more appropriate if the report focuses on NERC's core area of responsibility which is the reliable operation of the BES.)
- As stated in our comment above, distribution systems, including Distribution Automation Circuit Reconfiguration (DACR) and Advanced Metering Infrastructure (AMI), should be addressed by others. For these reasons, we believe this bullet should be removed.
- EEI understands that vulnerability assessments on electromechanical relays (i.e., non-microprocessor-based relays) were conducted by Oak Ridge National Laboratory (and possibly others) in the early 90s. (See ORNL-6708). Given this equipment has not changed much since these earlier assessments, the results may still be valid.

- Substation control houses (i.e., Relay Control Houses) are critical control elements that should be more clearly addressed within this Section. End-use Facilities
- While EEI recognizes that NERC’s role is to assess the reliability impacts broadly on the Bulk Power System (BPS), their role should not be expanded into non-BPS systems. For this reason, this category should clarify NERC role in understanding the BPS impacts and additional research would be the role of others.

Recommendation 3 (Industry Specifications)

- Lead Organizations – EEI suggests removing “NERC Technical Committees” and replacing them with the phrase “and other Industry standard making organizations”. (NERC or their supporting technical committees do not develop Industry Specifications for Equipment.)
- Potential Support Organizations – EEI is of the opinion that NERC (i.e., supporting NERC technical committees) would be better suited as a support organization.
- EEI suggests changing bullet 2 to “Assess the value of existing IEC EMP specifications for use by the electric utility industry.”

Response

Kent Feliks - AEP

Answer: Yes

Comment

Response

Carla Flinn - Ameren

Answer: Yes

Comment

Ameren agrees with and supports EEI's comments.

Response

Daniel Graham - Tri-State Generation and Transmission Association, Inc.

Answer: Yes

Comment

Research Recommendation #2 – Based on section 215 of the Federal Power Act (FPA) language, NERC may not be the correct lead organization

Response

Douglas Webb - Westar / Kansas City Power & Light

Answer: Yes

Comment

Westar / Kansas City Power & Light support EEI's Comments

Response

Paul Taylor - Florida Power & Light

Answer: Yes

Comment

Could EPRI be added to the access for declassified information (Policy 2 and 3)? They have already go through some of this process to provide information to industry. Under End-Use Facilities, it would be great to know what how load in general is going to respond-will it all disappear, what will be left, etc.

Response

Becky Webb - Exelon

Answer: Yes

Comment

Exelon supports the EMP Task Force’s scope and direction and the corresponding comments offered by EEI. While it is important to understand the performance characteristics of those non-BES facilities during an EMP event as stated in Recommendation #2 (Identify Gaps in Research), Exelon offers a suggestion that other organizations such as the DOE and/or EPRI may lead the research of facilities outside of NERC’s jurisdiction.

3. Do you agree with the scope and direction of the recommendations in the Vulnerability Assessment chapter of the report?

Kim Thomas – Duke Energy

Answer: No

Comment

Consider adding North American Generation Forum (NAGF) and NATF to the list of support organizations for VA Recommendation #3. Both organizations have provided similar advice to their members on mitigations for this and/or other issues.

Response

Troy Brumfield - American Transmission Company

Answer: No

Comment

Please add Asset Owners to the Support Organization(s) of “VA Recommendations #2: EMP Vulnerability Assessment Methodology”. Asset Owners are likely to provide valuable insights and input to the guidelines for assessing EMP impacts on the BPS.

Response

Kelsi Rigby - Arizona Public Service Company

Answer: Yes

Comment

Response

Alberto Ramirez Orquin - Resilient Grids, LLC

Answer: Yes

Comment

Research Recommendation #2 In this sense, a lot of attention must be paid to the issue of EMP-E3 GIC flow; the fact that it can even be higher than transformer rated current or prevailing lower instant load currents, thus posing the real problem of a non-zero crossing; such a prolonged condition, say 10 minutes or more, could seriously compromise both breakers and transformers, regardless of relaying performance. Moreover, this vulnerability is not yet fully understood, hence not a safe basis to make optimistic assumptions, such as hypothetical transformers GIC resilience, chiefly developed from thermal models. These stem from tests carried out up to 200 A. For E3 we are talking a completely different scenery; for substantially higher than 200 Amps may happened; while these will cause a diminishing return for stray flux impacts, still could cause unanticipated vulnerabilities, as equipment overload for starters.

Response

Robin Yee - Canadian Electricity Association

Answer

Comment

For comments on scope and direction, please see Additional Comments.

Response

John Shaver - Arizona Electric Power Cooperative, Inc.

Answer: Yes

Comment

Response

Ruida Shu - NPCC

Answer: Yes

Comment

Response

Aubrey Short - FirstEnergy

Answer: Yes

Comment

Response	
Preston Walker - PJM Interconnection, LLC	
Answer: Yes	
Comment	
<p>In VA Recommendation #2: EMP Vulnerability Assessment Methodology “The ERO Enterprise should develop guidelines for industry planners and equipment owners to use in assessing EMP impacts on the Bulk Power System”. The recommendation title has “Methodology” but in the statement it says the ERO should develop “guidelines”. More clear scope of guideline and methodology needs to be defined. Simple guidelines may not be that helpful for the industry to initiate VA.</p>	
Response	
Barry Lawson - National Rural Electric Cooperative Association (NRECA)	
Answer	
Comment	
Response	
Kevin Lyons - Central Iowa Power Cooperative	
Answer	
Comment	

Response	
Aaron Cavanaugh - Bonneville Power Administration	
Answer: Yes	
Comment	
Regarding VA Recommendation 2, BPA has a concern about FERC/NERC and industry disagreements about what level of EMP to prepare for. This issue has come up with the Supplemental Event analysis of TPL-007-4 for Geomagnetic Disturbances.	
Response	
Devin Shines - PPL/LG&E-KU	
Answer: Yes	
Comment	
While we agree with the scope and direction of the recommendations in the Vulnerability Assessment chapter of the report, we have the following comment: We should emphasize the importance of maintaining security parameters around the sharing or availability of data in this area. Results of this effort could be used by maliciously by others.	
Response	
Mark Gray - Edison Electric Institute	
Answer: Yes	
Comment	

EEl agrees with the scope and direction of the recommendations in the Vulnerability Assessment chapter of the report. However, it is also important to clarify the interdependencies of the Recommendations as some of these Recommendations (ex. Recommendation #2 and Recommendation #3) may not be able to be performed without input from the results of other noted Recommendations in the report.

Vulnerability Assessments Recommendation 1 (Collaborate and Coordinate with Federal Government)

- Lead Organizations – EEl suggests adding FERC.
 - EEl believes that FERC should play an active role in the release and coordination of classified EMP environments. EEl also suggests the following edits: (DELETE - Collaborate with) Change to: The Department of Homeland Security and FERC should work collaboratively to ensure electric reliability concerns associated with an EMP can be effectively addressed through the release of (Delete: to obtain) the unclassified.....
 - EEl suggests moving this Bullet (i.e., Inter-agency exercises) to the Response and recovery section (Chapter 5) of the Report. (While a database or repository of lessons learned through exercises is appropriate for vulnerability assessment inclusion, sponsorship/participation in exercises is more appropriately housed within emergency response.)

Recommendation 2 (EMP Vulnerability Assessment Methodology)

- Scope Statement - EEl is of the opinion that it may be too early to begin developing Industry guidelines. (While the report states that EMP benchmark scenarios are now unclassified, it also states that the industry still does not have this information. For this reason, it may be more prudent to say that efforts should be made to begin evaluating the feasibility of developing Industry Guidelines.)
- Potential Support Organizations: EEl suggests adding Asset Owners (Asset Owners will need to play a key role in this activity.)

Recommendation 3 (Critical Asset Identification)

- Scope Statement – EEl is supportive of this effort, however additional information may still be necessary to effectively develop these guidelines.

Response

Kent Feliks - AEP	
Answer: Yes	
Comment	
Response	
Carla Flinn - Ameren	
Answer: Yes	
Comment	
Ameren agrees with and supports EEl's comments.	
Response	
Daniel Graham - Tri-State Generation and Transmission Association, Inc.	
Answer: No	
Comment	
These vulnerability assessment recommendations should be based on additional research results.	
Response	
Douglas Webb - Westar / Kansas City Power & Light	
Answer: Yes	
Comment	

Westar / Kansas City Power & Light support EEI's Comments	
Response	
Paul Taylor - Florida Power & Light	
Answer: Yes	
Comment	
Response	
Becky Webb - Exelon	
Answer: Yes	
Comment	

Response

4. Do you agree with the scope and direction of the recommendations in the Mitigations chapter of the report?	
Kim Thomas –Duke Energy	
Answer: No	
Comment	
NATF has already provided guidance in this area. Consider adding NATF to the support organizations for this recommendation.	

Response

Troy Brumfield - American Transmission Company

Answer: Yes

Comment

Response

Kelsi Rigby - Arizona Public Service Company

Answer: Yes

Comment

Response

Alberto Ramirez Orquin - Resilient Grids, LLC

Answer: Yes

Comment

Totally agree, “the electric utility industry has taken a different approach: historically, the industry has hardened its individual components, allowing flexibility to install them in virtually any environment. This approach has significantly reduced the overall cost to implement and minimize the cost to rate payers.” Furthermore, omitting of GIC-blocking technology, even from any consideration, may be just premature; this particularly minding the substantial knowledge gaps on vulnerability. That technology we, and many others, have comprehensively researched and developed for many years. In our case it has been shown, to present a minimal set of unintended consequences, if any; with cost-effectiveness which we are willing to prove and discuss before this Task Force, as we have done in many forums, and discussed with

experts of major utilities--you would be surprised how much they praised the concept--(fully documented). We argue why leaving industry without elaboration of one additional mitigation asset which they might consider, as described in the previous paragraph; resource which could prove useful to cope with potential large/unanticipated GIC impacts.

Regarding unintended consequences of mitigation concepts. This important issue was also used as a GIC-blockers off-putting. The argument seems to be that when this device is applied to protect one transformer, while diminishing/cancelling this flow into that equipment, it may increase that circulation into others. This has repeatedly been used by advocates of not tackling GIC-magnitude control but instead successfully trying to deal with all its impacts; in other words: transformers are assumed to be GIC resilient. While this approach has fostered consensus there is an inherent contradiction to it; for if the actual magnitude of GIC were not an issue how come its marginal incremental change, after a device deployment, becomes a major offender and thus a neutral-blocker disqualifier. Moreover, we understand that for EMP, the only alternate mitigation philosophy left will rest on restoration via modular equipment with heavy stockpile, in contrast to solar GMD waging standards and operational procedures-inviable for EMP E3- but in any event, all alternatives to blockers have never undergone any cost/benefit/effectiveness/unintended consequences evaluation, as requested by FERC for rate impact; while, at least in our case we are ready and willing to have a full discussion about all of them.

Response

Robin Yee -Canadian Electricity Association

Answer

Comment

For comments on scope and direction, please see Additional Comments.

Response

John Shaver - Arizona Electric Power Cooperative, Inc.

Answer - Yes

Comment

Response	
Ruida Shu - NPCC	
Answer: Yes	
Comment	
Response	
Aubrey Short - FirstEnergy	
Answer: Yes	
Comment	
Response	
Preston Walker - PJM Interconnection, LLC	
Answer: Yes	
Comment	
Response	

Barry Lawson - National Rural Electric Cooperative Association (NRECA)	
Answer	
Comment	
Response	
Kevin Lyons - Central Iowa Power Cooperative	
Answer	
Comment	
Response	
Aaron Cavanaugh - Bonneville Power Administration	
Answer: Yes	
Comment	
Response	
Devin Shines - PPL/LG&E-KU	

Answer: Yes

Comment

While we agree with the scope and direction of the recommendations in the Mitigations chapter, we believe that the statements differentiating between DOD and utility methods may be distracting. This could lead to unnecessary discussion and debate about strategy/methods, when, in the end, both perspectives are required for a holistic approach.

Response

Mark Gray - Edison Electric Institute	
Answer	
Comment	

Response

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Kent Feliks - AEP

Answer: Yes

Comment

--

Response

--

Carla Flinn - Ameren

Answer: Yes

Comment

--

Ameren agrees with and supports EEI's comments.

Response

Daniel Graham - Tri-State Generation and Transmission Association, Inc.

Answer: No

Comment

These mitigation recommendations 2 and 3 should be based on additional research results.

Response

Douglas Webb -Westar / Kansas City Power & Light

Answer: Yes

Comment

Westar / Kansas City Power & Light support EEI's Comments

Response

Paul Taylor - Florida Power & Light

Answer: Yes

Comment

Consideration of cost-effective retrofitting options and for new installations.

Response

Becky Webb - Exelon	
Answer: Yes	
Comment	
Response	
5. Do you agree with the scope and direction of the recommendations in the Response and Recovery chapter of the report?	
Kim Thomas - Duke Energy	
Answer: No	
Comment	
<p>NATF and EEI have already been developing a communication template/process in support of Department of Energy's (DOE) Grid Security Event (GSE) capabilities. Consider adding NATF and EEI to the list of support organizations for recommendations #1 & #4. NATF's Supplemental Operating Strategies (SOS) efforts address much of the work described in recommendations 2 & 3. Consider adding NATF as a support organization for both #2 & #3. The initial effort on NATF's SOS (i.e., Spare Tire) identified many of the items noted in recommendation #5 and provided recommendations to NATF members. Consider adding NATF as a support organization for recommendation #5.</p>	
Response	
Troy Brumfield - American Transmission Company	
Answer: Yes	
Comment	

Response	
Kelsi Rigby - Arizona Public Service Company	
Answer: Yes	
Comment	
Response	
Alberto Ramirez Orquin - Resilient Grids, LLC	
Answer: Yes	
Comment	
Response	
Robin Yee - Resilient Grids, LLC	
Answer	
Comment	
For comments on scope and direction, please see Additional Comments.	
Response	
John Shaver - Arizona Electric Power Cooperative, Inc.	

Answer	
Comment	
<p>In Chapter 6, AEPC recommends removing the reference to “cost recovery mechanisms as this is outside the scope of NERC’s responsibilities under Section 215 of the Federal Power Act.</p> <p>AEPC feels that when considering this potential threat that the likelihood of smaller entities being targeted are minimal when they are under certain thresholds and of minimal impact to the BPS if lost.</p> <p>AEPC appreciates the work and effort undertaken by the NERC EMP Task Force on this challenging area of focus.</p>	
Response	
<p>Ruida Shu - NPCC</p>	
Answer	
Comment	
<p>1. In general the policy recommendations are within an acceptable scope however there is concern with the use of the term BPS. BPS, as defined in the legislation, is very broad and encompasses many elements of the electric system that may not be under NERC’s jurisdiction. NERC Standards are written to encompass BES and those elements that affect the reliable operation of the BES. Although NERC has guideline and various guidance documents to help promote better practices, there is a reduced role and authority regarding the portions of the BPS that are non-BES and reach down to distribution level systems. An EMP event has the potential to be very impactful to distribution systems. Reestablishing these distribution systems and restoration to customers is left to local utilities. A possible policy recommendation would be to ensure that some basic minimum operational level of BES is reestablished for the local utilities to work from to perform distribution restoration. Coordination of restoration from BES to critical load serving infrastructure such as gas, water, and wastewater as well as addressing public safety should be emphasized.</p> <p>Regarding Policy Recommendation #2, and in consideration that cost and funding will have to be provided through governmental channels rather than existing industry cost recovery mechanisms and markets, DOE should be the suggested lead organization. This is a much larger issue and educating the public, drawing in national lab and information from EPRI and other large research and consulting firms is better handled by DOE. NERC is not equipped to engage in mass public educational endeavors.</p>	

Regarding Policy Recommendation #3 and the potential support organizations listed (“DHS, Asset Owners, Trade and Forum Organizations, ESCC, ISO/RTO Council”), this list needs to be reviewed. The purpose of the Recommendation #3 is to coordinate with other sectors such as gas, water, and wastewater treatment. Organizations similar to NERC EISAC need to be listed here. These existing references will not be directly related to these other sectors.

Policy Recommendation #3 is not needed. There is no clear role for NERC. The activities will all be undertaken by government to address the Executive Order. If something arises in the area where NERC can assist, it will be done and need not appear as a placeholder in this report.

2. In general there is concern with compromise of National Security, depending on the level of ability to monitor research and gain accessibility to its assumptions, testing, data and methods. NERC and the industry role in research should be to provide the areas needing further research, develop parameters around what needs to be studied and what the expectation is for deliverables, e.g. cost effective hardening. Providing a level of monitoring of research may reveal thresholds of vulnerability that may render cost hardening and mitigation efforts less effective.

Although Recommendation #2 is laudable it should be identified that any gaps identified by NERC or others need to remain confidential for National Security issues. If the industry identifies weakness in specific equipment and under what conditions, it could provide an attack vector for a malicious actor. Confidentiality protocols and methods of securely communicating gaps needing further study to research labs and organizations needs to be developed.

3. Recommendation #2 should have consideration of restriction of distribution of any tools that may be developed to help an adversary determine the effectiveness of EMP on disrupting the electric system.

6. Suggest that the EMP TF focus efforts on coordination and what NERC has jurisdiction over and where value can be provided. There are a number of areas appearing in the report that NERC has no role in such as items in Utility storm plans (e.g. “Plans are in place for housing and feeding employees involved in the recovery effort”). NERC’s principle values that should be emphasized in the report are in coordinating with the DOE and stakeholders and ensuring reliability of the BES by identifying gaps, critical electric infrastructure, and the development of standards and guidance based on findings of future research.

Response

Aubrey Short - FirstEnergy

Answer: Yes

Comment

Response

Preston Walker - PJM Interconnection, LLC

Answer: Yes

Comment

Response

Barry Lawson - National Rural Electric Cooperative Association (NRECA)

Answer

Comment

In Chapter 6, NRECA recommends removing the reference to “cost recovery mechanisms as this is outside the scope of NERC’s responsibilities under Section 215 of the Federal Power Act.

NRECA appreciates the work and effort undertaken by the NERC EMP Task Force on this challenging area of focus.

Response

Kevin Lyons - Central Iowa Power Cooperative

Answer

Comment

CIPCO agrees with the additional comments submitted by the NRECA. Thank you for undertaking this important effort and for requesting input from the industry.

Response

Aaron Cavanaugh - Bonneville Power Administration

Answer: Yes

Comment

As a result of having an advanced warning system, operator training will require a lot of time to develop and regularly test the procedure, especially if operators will be contacted and dispatched to multiple substation locations. Refer to EOP-005 Restoration plans requirement R9 for “unique tasks.”

Response

Devin Shines - PPL/LG&E-KU

Answer: No

Comment

We have the following feedback that we believe the Task Force should consider:

- 1) It may be premature to imply that there are “actions” a TO could take to be effective for E1 and E2 mitigation. We suggest that actions should be framed around investigating “if” there are effective options.
- 2) The Task Force should consider changing references to “Black Start” procedures to be framed as “Black Sky.” Black Start, as it is currently written, is predicted to be less than effective.
- 3) The Task Force should consider changing the verb in Recommendation #3 to state: “Work with industry to develop” as opposed to “Provide industry guidance.” The industry is the expert at operating the system, and should be working in conjunction with other entities to develop guidance.

4) (4) Recommendation #5 may be too detailed and potentially divulge critical infrastructure detail that should be safely maintained by asset owners. The phrase “...should have policy and practices ensuring the following...” would be better stated as: “...make recommendations for best practices.”

Response

Mark Gray - Edison Electric Institute

Answer: Yes

Comment

EEL supports the EMP Task Force scope and direction for the recommendations in the Response and Recovery chapter of the report; however we offer the following suggestions for Task Force consideration:

Recommendation 1 (Establish National EMP Notification System)

- Potential Support Organizations – EEL suggests there may be merit in adding Telecommunication companies (While EEL understands that DHS and FEMA already have such systems in place, it is unclear whether those systems could be utilized for this purpose and whether the arrangements already in place would cover electric utilities.)
- EEL suggests changing to the following: Consider establishing (DELETE: a standard) (ADD: an) early warning threat system
- EEL suggests changing to the following: Consider developing a notification system protocol to inform system and plant operators immediately after an EMP (ADD: event) has occurred, (ADD: recognizing that many directly impacted may not have operating communication systems for some time after the event). (Per the report, those directly impacted by an EMP event are unlikely to have communications for several hours after the event.)
- EEL suggests changing to the following: Consider (DELETE: using) (ADD: requesting) the DOE (ADD: to approve the use of the) notification system established by the 2015 Fast Act

Recommendation 2 (Coordinated Response Planning)

- Potential Support Organizations – EEI suggests adding Asset Owners (NERC will need the support of asset owners to complete this task.) Recommendation 3 (Enhanced Operating Procedures)
- Potential Support Organizations – EEI suggest adding Asset Owners.

Recommendation 4 (Incorporate EMP Events into Industry Exercises and Training)

- Suggest changing to the following: Consider having the E-ISAC (ADD: periodically) lead a Grid-Ex simulation around the EMP threat... Recommendation 5 (Guidance on Supporting Systems)
- EEI suggests removing the ERO Enterprise from the recommendation and replacing it with (DELETE: The ERO Enterprise should p) Provide guidance to industry for supporting systems and equipment (including spare equipment strategy) needed for BES recovery post-EMP event.” (This suggested change is to provide consistency within the report.)
- Potential Support Organization – EEI suggests adding the NATF.

Response

Kent Feliks - AEP

Answer: Yes

Comment

Response

Carla Flinn - Ameren

Answer: Yes

Comment

Ameren agrees with and supports EEI's comments.

Response	
Daniel Graham - Tri-State Generation and Transmission Association, Inc.	
Answer: No	
Comment	
<p>#1. Would NAWAS already provide the EMP notification functionality? If so, an additional system may not be necessary. Two through five should be based on additional research and vulnerability assessments. Two through five should be based on additional research and vulnerability assessments.</p>	
Response	
Douglas Webb - Westar / Kansas City Power & Light	
Answer: Yes	
Comment	
<p>Westar / Kansas City Power & Light support EEI's Comments</p>	
Response	
Paul Taylor - Florida Power & Light	
Answer: Yes	
Comment	
<p>Yes, We would like to see a joint coordination of material in a national emergency with respect to spare equipment organizations that already exist (Restore, Grid Assurance, etc.). Also, national coordination of personnel that may be essential after an EMP attack (SEE mutual assistance for example)</p>	

Response

Becky Webb - Exelon

Answer: Yes

Comment

Response

6. Provide any additional comments for the EMP Task Force to consider, if desired.

Kim Thomas – Duke Energy

Answer

Comment

Some of the wording in the Background section could lead to confusion. Specifically the following wording is problematic:

“EMPs are divided into the following three categories of hazard fields:

1. E1 EMP: intense, short-duration EMP characterized by a rise of 2.5 nanoseconds and amplitude on the order of tens of kV/m (up to 50 kV/m at the most severe location on the ground);
2. E2 EMP: intermediate duration with an electric field pulse amplitude of 0.1 kV/m and duration of one microsecond to approximately ten milliseconds; and
3. E3 EMP: low frequency (below 1 Hz) pulse with amplitude on the order of tens of V/km with duration of one second to hundreds of seconds. E3 EMP is compared to severe geomagnetic disturbances, but an E3 EMP can be much more severe. Also, the E3 event is much shorter in duration than GMD events.”

An EMP wave is comprised of three waveform components. By using the term “three categories”, it could lead one to think for any given event that only one of the three components would apply, which is incorrect. The use of “categories” implies that only one or more components can occur, when in actuality all three components are in every EMP event. Duke Energy suggests replacing “EMPs are divided into the following three categories of hazard fields:” with “An EMP wave is comprised of three waveform components:”

There appears to be minimal research into the full body of work already performed in the industry for this topic. For example, NATF, EEI, and other industry organizations are already working on a number of these recommendations. Additionally, a review of existing literature was the first steps undertaken by EPRI when it began its EMP Project work. Recommend NERC acknowledge and utilize work-in-progress or completed for this topic by reviewing and incorporating other entity efforts and reports to avoid duplication of work and to provide additional depth and understanding of this topic.

Response

Troy Brumfield - American Transmission Company

Answer

Comment

Response

Kelsi Rigby - Arizona Public Service Company

Answer

Comment

Response

Alberto Ramirez Orquin - Resilient Grids, LLC

Answer

Comment

Response

Robin Yee - Canadian Electricity Association

Answer

Comment

Canadian and American Bulk Power System owners and operators understand that, due to the interconnected nature of the North American electricity grid, its reliable and safe operation is a shared responsibility. Compliance to a shared set of operational and commercial rules enables effective interconnectedness.

Because of the nature of this highly integrated electrical grid, CEA notes that it will be fundamental to consider both Canadian and U.S. perspectives on EMP planning, mitigation and recovery. Many of the draft strategic recommendations are framed within a U.S.-specific context, proposing U.S. departments as lead organizations, referencing NERC’s authority under the Federal Power Act, or proposing coordinated response planning aligned with FEMA. CEA requests that as EMP issues continue to be considered, NERC develop a framework for ongoing consultation and dialogue between governments, supported by business-sector participation, to ensure that any policymaking or standards developed for a North American scope consider all North American perspectives.

CEA also suggests that EMP recommendations – and standards, should they be proposed – be based on a risk assessment of the reporting entity, similar to what has been implemented with the CIP-014 standard.

Furthermore, in consideration of the interdependencies of an EMP event, CEA suggests that the issue should be considered as part of a broader national defense plan.

Response

John Shaver - Arizona Electric Power Cooperative, Inc.

Answer

Comment

In Chapter 6, AEPC recommends removing the reference to “cost recovery mechanisms as this is outside the scope of NERC’s responsibilities under Section 215 of the Federal Power Act.

AEPC feels that when considering this potential threat that the likelihood of smaller entities being targeted are minimal when they are under certain thresholds and of minimal impact to the BPS if lost.

AEPC appreciates the work and effort undertaken by the NERC EMP Task Force on this challenging area of focus.

Response

Ruida Shu - NPCC

Answer

Comment

1. In general the policy recommendations are within an acceptable scope however there is concern with the use of the term BPS. BPS, as defined in the legislation, is very broad and encompasses many elements of the electric system that may not be under NERC’s jurisdiction. NERC Standards are written to encompass BES and those elements that affect the reliable operation of the BES. Although NERC has guideline and various guidance documents to help promote better practices, there is a reduced role and authority regarding the portions of the BPS that are non-BES and reach down to distribution level systems. An EMP event has the potential to be very impactful to distribution systems. Reestablishing these distribution systems and restoration to customers is left to local utilities. A possible policy recommendation would be to ensure that some basic minimum operational level of BES is reestablished for the local utilities to work from to perform distribution restoration. Coordination of restoration from BES to critical load serving infrastructure such as gas, water, and wastewater as well as addressing public safety should be emphasized.

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much larger issue and educating the public, drawing in national lab and information from EPRI and other large research and consulting firms is better handled by DOE. NERC is not equipped to engage in mass public educational endeavors.

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Response	
Aubrey Short - FirstEnergy	
Answer	
Comment	
Response	
Preston Walker - National Rural Electric Cooperative Association (NRECA)	
Answer	
Comment	
Response	
Barry Lawson - National Rural Electric Cooperative Association (NRECA)	
Answer	
Comment	
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Response	

Kevin Lyons - Central Iowa Power Cooperative	
Answer	
Comment	
CIPCO agrees with the additional comments submitted by the NRECA. Thank you for undertaking this important effort and for requesting input from the industry.	
Response	
Aaron Cavanaugh - Bonneville Power Administration	
Answer	
Comment	
BPA believes the report effectively balances policy with science, and provides a prudent and methodical approach to addressing this issue.	
Response	
Devin Shines - PPL/LG&E-KU	
Answer	
Comment	
PPL NERC Registered Affiliates also agree with EEI's comments.	
Response	
Mark Gray - Edison Electric Institute	

Answer	
Comment	
<p>Comments: EEI would like to offer some suggested next steps for the EMP Task Force consideration:</p> <ul style="list-style-type: none"> • EEI believes that the EMP Task Force Strategic Recommendations Report is a good first step in defining the necessary actions needed by the Industry to address the threats associated with an EMP. Nevertheless, we are of the opinion that activities associated with local distribution and those systems that do not impact the reliable operation of the BES should be removed from this report. This is not to imply that we do not believe recommendations associated with local distribution are not important or should not be addressed, simply that we feel the scope of this effort should be aligned with NERC’s statutorily delegated responsibilities. • EEI is of the opinion that EMP-related Reliability Standards cannot be effectively developed at this time. Additionally, the research that is needed to appropriately guide the industry toward effective planning assessments and mitigations is incomplete. Furthermore, there remains critical information, held by the Federal Government, that is necessary in order to effectively and efficiently develop Industry Guidelines and Reliability Standards. • EEI agrees that the EMP Task Force should be maintained but their role should not change beyond what is currently defined for this task force. • While a minor issues, the report inconsistently uses the term "Potential" Support Organization throughout the report. • EEI suggests that the report be reviewed and corrected to ensure consistent use of terms throughout the report. 	
Response	
<p>Kent Feliks - AEP</p>	
Answer	
Comment	
<p>AEP appreciates the work that EMPTF has put into these strategic recommendations, and feels that the general direction and scope of the recommendation are appropriate at this time. AEP also approves of the suggested coordination organizations identified by the report. Because the risk of EMPs is a matter of national security, AEP believes the issue must be addressed at the federal level. Additionally, the impact of EMPs will likely be felt by large sections of the country, and given the interconnected nature of America’s electric grid, AEP</p>	

supports the development of national planning and mitigation measures. This will ensure that there are consistent mitigation measures applied across the country, and avoid the undesired results of potential weakness resulting from localized requirements not meeting national standards.

Response

Carla Flinn - Ameren

Answer

Comment

Ameren agrees with and supports EEI's comments.

Response

Daniel Graham - Tri-State Generation and Transmission Association, Inc.

Answer

Comment

Response

Douglas Webb -Westar / Kansas City Power & Light

Answer

Comment

Westar / Kansas City Power & Light support EEI's Comments

Response

Paul Taylor - Florida Power & Light	
Answer	
Comment	
Response	
Becky Webb - Exelon	
Answer	
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