National Infrastructure Advisory Council

Executive Collaboration for the Nation's Strategic Infrastructure

Final Report and Recommendations

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About the National Infrastructure Advisory Council

The National Infrastructure Advisory Council (NIAC) advises the President of the United States through the Secretary of Homeland Security on issues related to the security and resilience of the Nation's critical infrastructure sectors and their functional systems, physical assets, and cyber networks for the 16 critical infrastructure sectors. These critical infrastructure sectors span the U.S. economy and include the chemical; commercial facilities; communications; critical manufacturing; dams; defense industrial base; emergency services; energy; financial services; food and agriculture; government facilities; healthcare and public health; information technology; nuclear reactors, materials, and waste; transportation systems; and water and wastewater systems sectors. The National Infrastructure Advisory Council also advises the lead Federal agencies that have critical infrastructure responsibilities. Specifically, the Council has been charged with making recommendations to:

- Enhance the partnership between the public and private sectors in securing and enhancing the security and resilience of critical infrastructure and their functional systems, physical assets and cyber networks, and providing reports on this issue to the President through the Secretary of Homeland Security, as appropriate;
- Propose and develop ways to encourage private industry to perform periodic risk assessments and implement risk reduction programs;
- Monitor the development and operations of critical infrastructure sector coordinating councils and their information sharing mechanisms and provide recommendations to the President through the Secretary of Homeland Security on how these organizations can best foster improved cooperation among the sectors, the Department of Homeland Security (DHS), and other Federal Government entities;
- Report to the President through the Secretary of Homeland Security who shall ensure appropriate coordination with the Assistant to the President for Homeland Security and Counterterrorism, the Assistant to the President for Economic Policy, and the Assistant to the President for National Security Affairs; and,
- Advise sector specific agencies with critical infrastructure responsibilities, to include issues pertaining to sector and government coordinating councils and their information sharing mechanisms.

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Executive Summary

Background

The Nation's critical infrastructure is at a defining point in securing itself and assuring its operational resilience. The pace of growth of threats, whether man-made or natural, and their potential catastrophic consequences creates a sense of increased urgency. The nature and sheer volume of these threats require accelerating progress for improvements and realizing commitments to substantive action in a more systematic, coordinated way across sectors.

From the physical attacks of 9/11 and natural disasters such as Hurricane Katrina, to the more recent Ebola outbreak and Sony Cyber-attacks, the critical infrastructure threat landscape has continuously expanded and grown. These disasters, along with other cyber incidents, industrial accidents, pandemics, acts of terrorism, sabotage, criminal acts, and aging of physical assets have resulted in an enormously complex environment for the Nation's critical infrastructure. Resources will always be limited and insufficient to address everything that might happen.

In order to ensure our ability to respond to this continuously evolving and growing scenarios of threats and consequences, Presidential Policy Directive 21 (PPD-21) explicitly incorporated resilience into the mission to complement security as a means to manage the Nation's critical infrastructure risks. Resilience, however, requires greater integration of activities, and consideration of long-term as well as short term investments, within and across sectors. This requirement, in turn, will need greater coordination and unity of understanding, and unified action. As a result, there is a need to move the supporting public-private partnership to a more mature and advanced stage to make significant progress in addressing this complex environment.

Engagement of Senior Executive Leadership-The Need

The members of the NIAC have historically seen the need for engagement of senior executive leadership in the public-private partnership in order to advance the mission for critical infrastructure resilience at the pace and attention required. Chief Executive Officer (CEO) decisions and direction have the ability to move entire industries and reshape markets. As early as 2006, and most recently in 2013, the Council has repeatedly recommended CEO or senior executive decision-maker engagement in critical infrastructure security and resilience initiatives at both the regional and national levels. This report builds upon and advances implementation of those past recommendations.

Report Development Approach

In April 2014, the Council received tasking to provide a report to the President which would provide the Council's perspective on a CEO or equivalent senior executive's decision-making

role and contribution to a public-private partnership or coordination activity, the benefits and challenges of such engagement, and criteria for effective sustainability, and to recommend a model for communicating with CEOs or their equivalents through development of a CEO-level summary for the National Infrastructure Protection Plan (NIPP) 2013. In response, the Council established the CEO Engagement Working Group to collect perspectives for several case studies, develop recommendations and draft a report. The working group conducted interviews of subject matter representatives from six different sectors, collected written data from others, and performed research from public open sources. The data was then organized into case studies, developed into consolidated findings, which became the basis for development of the draft recommendations for the full Council to consider, deliberate, and adopt. This report represents the results of the full Council's deliberations.

Findings

Commonalities and Sector-Unique Considerations

The Council recognizes that the data it collected was limited by available resources and time. However, even within the limited collection of data that its working group achieved, common themes and findings emerged from the perspectives that representatives from each sector or sub-sector provided.

Although scope of activities varied with the size and role of an organization, CEOs and senior executive decision-makers primarily identify desired outcomes and deliverables and delegate execution, while retaining the overall accountability for results and for assuring accountability of others to obtain those results. CEOs also tend to share the perspective that the Federal government is an important catalyst to effectively convene entities at the national level and to facilitate a mutual agenda of priorities based on national interests. Additionally, they value the Federal government's ability to provide information or facilitate information exchange that assists in developing a value proposition and in establishing an agenda that is mutually desirable.

Despite finding that the sectors are generally well organized to reach CEOs, the process to initiate engagement will vary substantially across sectors. The Council notes differences in flexibility and process for investment decision-making between public and private sectors. The sector case studies identified issues and topics of common interest such as cyber security and catastrophic disaster response and recovery, but also saw differences in perspectives on the need and protocol for coordination and collaboration with other sectors at the national level.

Some of the sectors are compartmentalized into sub-sectors or modes with very different concerns, operating norms, and cultures. To assist in bridging some of these divides, the Department of Homeland Security, acknowledging that the critical infrastructure and resilience (CISR) mission is a shared mission, developed and matured, with its owner and operator

partners, the Critical Infrastructure Partnership Advisory Council (CIPAC). Several of the sector representatives interviewed in the case studies saw this mechanism as fulfilling the bridging role across their own sectors as well as with other sectors.

For the purpose of this report, the Council defines "engagement" as an outcomes oriented activity which convenes parties to address and solve a mutually identified issue. The CIPAC framework was originally conceived as a outcomes oriented, issue resolution mechanism, which at times would require advice to be given to the Federal government when its inherently governmental authorities were needed to address an issue.

The Council developed the following findings from the data it collected:

Finding 01: CEOs and Senior Executive Decision-Makers play very specific fiduciary roles to advance outcomes and unify action across their institutions and across their sectors.

CEOs and their equivalents provide thought leadership, approve strategy, set priorities, make decisions on and apply investments, mobilize action, and hold accountability for results and deliverables. They bring focus to the various risks and opportunities as they seek to maximize value of the enterprise and meet their fiduciary duties and obligations and direct and delegate, set direction, empower, and provide the authority and sense of urgency to execute. Larger sized institutions often broaden responsibility of the CEO, delegating decision-making authority.

Finding 02: CEOs and Senior Executive Decision-Makers organize themselves within their sectors around specific types of issues relevant to their role and responsibilities.

Potential common economic, operational, or regulatory issues affecting the entire industry or sub-industry can create a case for mutual engagement. Mutual engagement also occurs when it is required to manage common risks, both those inherent to the business and those driven by external events.

Finding 03: CEOs and Senior Executive Decision-Makers engage with the Federal government and across sectors when an issue has a potential direct impact on their financials, their operations, and when the requirements to address it lie beyond their direct control.

Such an issue is characterized by potential consequences beyond what the industry can manage by itself due to lack of information or resources or control over resources. The issue might involve consequences or costs which are too large to absorb without collaboration or involve needed actions and relevant information such as with cyber-attacks. There must be a strong clear sense of urgency and a mutual value proposition. If specific and well defined,

concrete results can be produced through participation at the CEO level, engagement will become attractive.

Finding 04: Engagement with CEOs and Senior Executive Decision-Makers can only be sustained when there are concrete results produced and progress is measurable.

Meaningful outcomes reinforce the value of engagement. Producing outcomes and results from actions as part of collaborative problem solving demonstrates value and measurable progress toward agreed objectives, and would be seen as optimizing the time of the CEO or senior executive decision-maker. Mutual identification of issues and the ability to establish clear mutual priorities for action are core elements of successful engagement.

Finding 05: Most sectors have established organizational structures for engaging CEOs and Senior Executive Decision-Makers which can be leveraged for efficiency and often as "trusted" channels of communication and collaboration.

Most of the sectors are already well organized at the CEO level through their trade or professional associations, or other historical entities, but "stove-piping" can occur across those associations or sectors. Trade associations serve as primary channels for coordination and communication with CEOs in most sectors. Some of the Sector Coordinating Councils (SCCs) under the CIPAC framework bridge organized groups and business segments within their sectors and have become the focal point for engagement with the Federal government. By design, CIPAC provides the capability to provide advice to the Federal government on policy and strategic issues that may emerge from joint problem solving.

Finding 06: Overcoming challenges and obstacles resulting from the inherent diversity and complexity of sector structures and governance regimes will need to be incorporated into the process for initiating and sustaining CEO engagement.

No one governance model can be seen common to every sector; each sector has different leadership structures. The structure, composition, and governance of a sector, compared to how the government perceives a sector, may be substantially different for considerations of engagement. Obstacles to engagement can include anti-trust issues, conflicts of economic interest, and lack of common mutual interests and senior executive decision-makers only engage when they find it relevant. Public vs. private ownership have very different governance models, issues and challenges which may make it more difficult for sector wide consensus building and commitments. Additionally, government is inherently wary of trade associations because of their role in lobbying. However, many trade associations are also organized to address standards, operational protocols and industry response to emergencies, requiring both the sectors and the Federal government to understand and accept compartmentalization of engagement activities in order to fulfill the need for sustainable and representational relationships.

Recommendations

The Council provides two sets of recommendations:

- An engagement structure and process for CEO and senior executive level engagement; and
- A communication framework targeted specifically at CEOs and senior executive decision-makers, to not just encourage engagement but to also inform their investment, policy and strategic decisions within the own businesses and industries.

CEO Engagement Framework

As established in several previous NIAC reports and in practice in the Electricity Sub-Sector, the key elements of a successful pubic private partnership include: 1) CEO or senior executive decision-maker engagement; 2) trusted relationships at the CEO level; 3) a significant mutual value proposition; 4) a simple effective and efficient process for executive engagement; 5) an executive facilitator. CEOs and equivalent senior executive decision-makers have the authority and the influence to move entire sectors or sub-sectors in a desired direction when it is in the best interest of their businesses and industries to do so.

Due to broad diversity in composition, leadership structures, markets, and operations, the Council found that no one governance model is common to every sector. The Council therefore, proposes a National Strategic Priorities CEO-Level Engagement Framework which would accommodate this diversity. The purpose of this framework is to engender engagement of CEOs or equivalent decision-makers and their counterparts in the Federal government to:

- Identify and prioritize national critical infrastructure security and resilience issues affecting national and economic security requiring coordinated action between sectors, and between the government and the critical infrastructure sectors
- Identify obstacles and challenges to address those priorities
- Develop mutual strategies and policies, including roles and responsibilities, to jointly take action to empower achievement of measurable results within their sectors

The proposed engagement framework is composed of the following five specific recommendations:

Recommendation 01: The President should direct the Secretary of Homeland Security to work with the Sector Specific Agency heads for the Electricity Sub-Sector, Water, Transportation, Communications and Financial Services to establish a Strategic Infrastructure Executive Council under CIPAC, composed of CEO or Senior Executive Decision-Makers from these sectors and their counterpart agencies, to identify national priorities and develop joint or coordinated action plans and agreements to implement them.

CEO or senior executive level engagement represents another level of required problem solving for the critical infrastructure security and resilience mission. This level of engagement is required to address joint strategic and policy issues which translates into programmatic implementation requiring the broader empowerment that only senior executives in both the public and private sectors can bring.

Recommendation 02: The Secretary of Homeland Security should work with the Secretary of Energy to facilitate the Electricity Sub-Sector sponsorship of the Strategic Infrastructure Executive Council and its CEO or Senior Executive Decision-Makers as a cross sector group under CIPAC.

The Electricity Sub-Sector is a common thread of dependency among the other infrastructure sectors as well as the best example currently in CEO engagement with the Federal government. CEOs in other sectors have begun participating in the Electricity Sub-Sector CEO-level SCC meetings. CIPAC was originally designed so that critical infrastructure sectors could engage with the Federal government to jointly identify and solve problems at any managerial level as required by a given issue, which includes giving advice to the Federal government when an action is needed that is inherently a government function. CIPAC membership is institutional and exempt from Federal Advisory Committee Act (FACA) to facilitate the exchange of sensitive information with government. Strategies, policies, and execution on a sector-wide basis require senior executive decision-making for implementation.

Recommendation 03: For any proposed engagement within this framework, the Secretary of Homeland Security should work with the relevant Sector Specific Agency heads and the Special Assistant to the President for Homeland Security in the National Security Council to identify, clarify, and articulate the relevant national priorities, and the compelling and mutual value proposition in consultation with their sector counterparts, in preparation for engagement.

Identifying and clarifying the national level strategic priorities that require strategic problem solving and action would provide the foundation for developing the value proposition. For the government, the value proposition would address public safety and national economic and security issues. For critical infrastructure owners and operators, it would be to assure business and sector assets functional sustainability. Coordination of effort and gained efficiencies from planning and pre-established processes prior to incidents has been a proven value proposition within sectors, and would also be a value proposition between sectors. Strategic public-private and cross sector information sharing in a protected environment for the purpose of strategic planning and investment decisions to reduce clear and immediate risk to a sector or its businesses would be another element of a value proposition.

Recommendation 04: The Secretaries of Homeland Security and Energy should work with other relevant Sector Specific Agency heads and their critical infrastructure counterparts to identify the appropriate CEO or Senior Executive Decision-Maker to participate in this engagement framework.

Each relevant Sector Specific Agency would work through their SCCs to identify the relevant and appropriate senior executive decision-makers to participate in a national cross sector prioritization process with Federal agency heads; and appropriate senior executive decision-maker representation when specific issues are identified for senior executive level cross sector engagement relevant to their sector.

Recommendation 05: The President should establish a permanent budget line item through the Office of Management and Budget and the Department of Homeland Security, as the recognized national coordinator for the critical infrastructure security and resilience mission, to provide permanent staff, analytic resources and administrative support, to assure the effectiveness and efficiency of participation by Senior Executive Decision-Makers participating in the framework to advance the national actions needed.

The staffing requirement to move action forward is essential. Such resources will provide the support and coordination of cross-sector senior executive engagement for both the sectors, and their Sector Specific Agencies, which could involve agency leadership beyond the Sector Specific Agencies, particularly on matters relating to national security. The staffing function should include assuring continuing communication processes for participants, follow-up on action items, common logistics, research on issues to support mutual value proposition development, facilitation of deliberations and developing reports, including measuring progress and effectiveness of the engagement process and mechanism.

CEO Communication Framework

A core framework for communication consists of three basic elements: relevant messaging, format of the messaging, and appropriate venue or method of delivery. For CEOs and senior executive decision-makers, the Council makes the following recommendations on these three elements.

Recommendation 06: Principles of Messaging to the CEO: Tailor the messaging or content of any communication to be relevant to the CEO's responsibilities outlined in the model of CEO level of communication for NIPP 2013 (Appendix B).

The communication needs to tie to what is important to the CEO to carry out the responsibilities or to maintain situational awareness in order to carry out these responsibilities. The message needs to be articulated succinctly and quickly and project concepts through use of bullets, tables, charts and graphics, showing data, trends, and relationships. "Take-away" key points need to be clearly labeled and directly address conclusions and actions required.

Recommendation 07: Format for Communications: Tailor and target format of the communication to the CEO to be as efficient as possible, acknowledging limited attention span and availability of time.

The communication should be written in three pages or less utilizing a "more as needed" format with URLs and appendices to provide more information. Establish a special "CEO Attention" type of regular communication by DHS and Sector Specific Agencies, specifically targeting CEOs and other senior executives, specifically written and tailored to the sector and utilizing the risk element language relevant to them.

Recommendation 08: Venues or Methods for Communicating: Utilize established, CEO-credible or "trusted" channels or venues for transmittal of communication.

Sector-specific trade associations in which CEOs participate, or their SCCs, several of which now have participation by CEOs or their equivalents, bring the most relevant information forward in the right format. Other established channels or venues include: think tanks and thought leader business management organizations; economic regulators, best practice leaders and general business communication vehicles, such as the Wall Street Journal; and the incorporation of CEO-relevant round tables to sector-specific or national exercises.

Conclusion

National and economic security converges in the critical infrastructure security and resilience mission. The economic interests of the owners and operators of the Nation's critical infrastructure and the national security interests of the Federal government intersect. Advancing the mission has reached a stage where senior executive decision-makers in both public and private sector need to be drawn into systematic discussions on priorities, focused problem-solving through strategies and policies, and empowerment for action to achieve measurable results within and across their sector communities. The critical infrastructure sectors, combined, are the foundations of the robustness, resilience, public confidence, and wealth of the country. Together, we can take on all threats, whether man-made or natural, and not only survive, but thrive.

1. Introduction

Background

The mission of critical infrastructure security and resilience has matured over the last decade. Progress has been made. The critical infrastructure community has gained a wider understanding of threats and challenges, and operational lessons learned in response to disruptive events, and the communication and coordination requirements to prepare, respond and recover. At the same time, the scope and complexity of the operating environment for the Nation's critical infrastructure are rapidly evolving. This evolving environment requires moving the supporting public-private partnership, as a whole, to a more mature and advanced stage.

The events of 9/11 focused the Nation's attention on security, or protection of the critical infrastructure, particularly on physical assets. Disruptions of our critical infrastructures have profound effects that can cascade across all facets of our Nation's communities' security and resilience. The attacks of 9/11 illustrated how our own critical infrastructures can be used against us as weapons, and in so doing cause wide-spread disruptions to our economy, and way of life as a consequence. Consequences of physical disruptions are immediate, graphic and easily understood. Subsequent catastrophic disasters such as Hurricane Katrina brought home the critical role of resilience in our communities and their supporting critical infrastructure. As seen in the after action reports from these natural disasters, how well our critical infrastructures, particularly our life line sectors, coordinate among themselves and with the communities which they serve will determine how quickly communities can mitigate consequences and "bounce back". Over the last decade the cyber threat has grown in capability and sophistication along with critical infrastructure reliance on cyber systems for operations. We are now in a clear environment where adversaries continents away, and their multiple tiered support agents, have developed and exercised capabilities to disrupt our critical infrastructure as means of attacking our U.S. national security interests. This threat comes on top of the accelerating threat through cyber space of those with criminal intent to obtain financial gain and advantage.

The critical infrastructure threat landscape over the last decade has continuously expanded and grown: catastrophic disasters, cyber incidents, industrial accidents, pandemics, acts of terrorism, sabotage, criminal acts, aging of physical assets. As a result, the operating environment has grown enormously complex for the Nation's critical infrastructure.

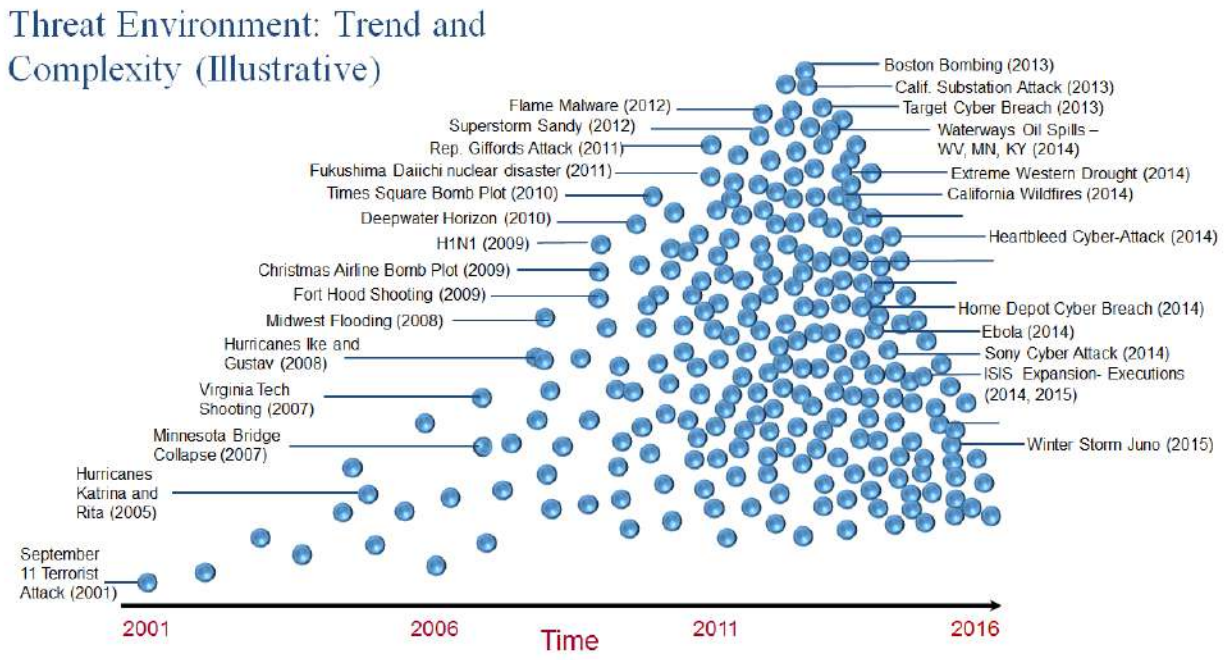

Figure 1: Source: DHS/NPPD/IP/SOPD: Environmental scan for division strategic planning (2012, updated to 2015)

This complexity is expected to grow as new threats emerge and historical threats evolve as a result of accelerating innovations in technology and an extremely dynamic geopolitical situation. We may not always be able to protect ourselves against every threat that could happen, but we should and must be able to "bounce back". The explicit incorporation of resilience into the mission by PPD-21 acknowledged this reality and need. A previous NIAC report has defined infrastructure resilience as the ability to reduce the magnitude and/or duration of consequences from disruptive events. The effectiveness of a resilient infrastructure or an individual enterprise depends upon its ability to anticipate, absorb, adapt to, and/or rapidly recover from a potentially disruptive event.[1]

Engagement of Senior Executive Leaders-The Need

Resilience incorporates security against physical and cyber threats, but its implementation is requiring much more consequential participation and coordination across an enterprise, from business unit operations, to support services, and at all levels of operations and decision-making. It requires a consideration of trade-offs between efficiencies of operations that rely on use of technology and design of business processes, on long term capital expenditures and asset and functional design, and potential changes in business strategies in order to assure infrastructure operations continuity against threats with potential catastrophic consequences. Resilience also

[1] National Infrastructure Advisory Council, *Critical Infrastructure Resilience Final Reports and Recommendations*, 2009, http://www.dhs.gov/xlibrary/assets/niac/niac_critical_infrastructure_resilience.pdf

requires managing dependencies across the sectors, as well as with government, at times, potentially coordinating investments on joint programs or actions for mutual interests. Coordination between sectors does occur at the local or regional level, often brought together by far-sighted local or state governments. A catastrophic natural event drives clarity for the need to do preparedness planning and coordination at all levels. National security and related priorities are the drivers at the national level.

The members of the NIAC have historically seen the need for engagement of senior executive leadership in the public-private partnership in order to advance the mission for critical infrastructure resilience at the pace and attention required. NIAC members have deep personal understanding of the role of the CEO and senior executive decision-makers since many come from such positions. Further, they have been privy to gaining a focused and deep understanding of national economic and security threats, as they carry out their advisory role. CEOs and other senior executive leadership perspectives provide the foundations for decisions on prioritization, long-term capital investment commitments, and unity of operational strategies and direction within an enterprise and their sector. The role and ability of CEOs and senior executive decision-maker engagement on critical issues to move critical infrastructure resilience forward, in their sectors and in the context of public-private collaboration, cannot be underestimated.

The Recommendations made in this report build upon and advance implementation of past recommendations on CEO or senior executive decision-maker engagement made by the Council. In order to provide a framework for investment decisions and priorities to create a value proposition for action and investment, as early as 2006, the Council recommended that a voluntary executive-level information sharing mechanism between critical infrastructure CEOs and senior intelligence officers be developed.[2] This recommendation was reaffirmed in its report on intelligence information sharing in 2012. The Council's 2007 report on the convergence of physical and cyber technologies proposed educating executive leaders in the cyber risk to critical infrastructure control systems and its significance to business' operational safety and sustainability.[3] In 2008, in two reports, the Council recommended strengthening senior leadership engagement in and commitment to partnerships in both government and industry[4] by leveraging the office of the President and the Critical Infrastructure Partnership process to encourage development of necessary high level dialogues[5] to advance the national mission in unity. In 2008, the Council also recommended executives should be educated on ways to identify

[2] National Infrastructure Advisory Council (NIAC), "Public-Private Sector Intelligence Coordination," 2006, accessed February 20, 2015, http://www.dhs.gov/xlibrary/assets/niac/niac_icwgreport_july06.pdf

[3] NIAC, "Convergence of Physical and Cyber Technologies and Related Security Management Challenges," 2007, accessed February 20, 2015, www.dhs.gov/xlibrary/assets/niac/niac_physicalcyberreport-011607.pdf

[4] NIAC, "Critical Infrastructure Partnership Strategic Assessment," 2008, accessed February 20, 2015, www.dhs.gov/xlibrary/assets/niac/niac_critical_infrastructure_protection_assessment_final_report.pdf

[5] NIAC, "The Insider Threat to Critical Infrastructure," 2008, accessed February 20, 2015, www.dhs.gov/xlibrary/assets/niac/niac_insider_threat_to_critical_infrastructures_study.pdf

critical insider threat-vulnerable positions (enterprise-level risk) within their company, as well as potential policy and technology solutions to address the insider threat. In 2009, the Council added to the theme on executive level engagement by recommending that the Federal Government should collaborate with the owners and operators throughout the resilience policy development process to assure clarity of outcomes, and actionable approaches, including pre-establishing processes and relationships to assure rapid response and recovery in crisis situations.[6] In 2010, the Council made a specific recommendation on implementing its previous recommendations on executive level engagement beginning with the electricity and nuclear sectors to define the roles and responsibilities of the private and public sectors regarding high-impact infrastructure risks and potential threats. [7] This recommendation has since been implemented. In 2012, the Council recommended partnerships and information sharing at the senior executive level be established to develop a truly national approach that leverages combined public-private resources for large-scale, persistent threats. [8] As recently as 2013, a report on regional resilience proposed that in order to strengthen regional resilience, the President should direct, and DHS should facilitate, the development of senior executive partnerships within the lifeline sectors and encourage public-private cross-sector partnerships at the state and local level.[9] The Council's completion and delivery of the Final Report and Recommendations for the Implementation of Executive Order 13636 (EO 13636) and PPD-21 in December, 2013 included a recommendation that the government develop a summary targeted at CEOs in order to elevate the understanding of the CISR mission's relevance to their businesses and to encourage greater appropriate participation in public-private coordination and partnership activities.

Report Development Approach

In April 2014, the Council received a tasking from the Administration to study CEO and senior executive decision-maker Engagement. The tasking directed the Council to provide a report to the President that provides the Council's perspective on a CEO or equivalent senior executive's decision making role and contribution to a public-private partnership or coordination activity, the benefits and challenges of such engagement, and criteria for effective sustainability, when required. The report was to also recommend a model for a NIPP 2013 Summary for Senior

[6] NIAC, "Critical Infrastructure Resilience," 2009, accessed February 20, 2015, www.dhs.gov/xlibrary/assets/niac/niac_critical_infrastructure_resilience.pdf

[7] NIAC, "A Framework for Establishing Critical Infrastructure Resilience," 2010, accessed February 20, 2015, www.dhs.gov/xlibrary/assets/niac/niac-a-framework-for-establishing-critical-infrastructure-resilience-goals-2010-10-19.pdf

[8] NIAC, "Intelligence Information Sharing," 2012, accessed February 20, 2015, www.dhs.gov/xlibrary/assets/niac/niac-intelligence-information-sharing-final-report-01102012.pdf

[9] NIAC, "Strengthening Regional Resilience," 2013, accessed February 20, 2015, http://www.dhs.gov/sites/default/files/publications/Strength-reg-resi-final-report-recomendations.pdf

Executive Decision-Makers. In the proposed report, the Council was provided with the following questions in considering the framework for its recommendations:

1. What is the role and obligations of the CEO to their institutions and under what circumstances would these obligations motivate them to engage actively with the shared CISR mission?
2. What is the framework for mutually productive engagement for the government and senior executive decision-makers, such as CEOs, to engage to support the shared mission?
3. What might be effective and persuasive ways to communicate the objectives of the NIPP to Senior Executive Decision-Makers, such as CEOs, that would motivate them to actively participate in accomplishing the NIPP objectives?

To address this tasking, the Council established the CEO Engagement Working Group to collect perspectives, develop recommendations, and draft a report. "CEO" was used as a short-hand for senior executive decision-makers recognizing that the CEO may not always the appropriate executive decision-maker for an issue depending on the size and scope of the owner and operator institution's business. The Working Group conducted interviews with Subject Matter Experts (SMEs), including CEOs or their equivalents, from six different sectors. The data collected focused particularly on the lifeline sectors (Electricity, Transportation, Water, Communications), as a priority, but also on two others (Financial Services and Chemical) to enrich the members' understanding of the differences between sectors. Altogether, 19 interviews were conducted. In addition to the interviews, data was offered in written form from subject matter experts and collected from public open sources on the composition, structures, sector communication, coordination and collaboration processes, role of CEOs and other senior executive decision-makers, and priorities of each sector. The Working Group met 25 times as it gathered information, processed the inputs, identified data needs for additional data gathering and interviews, and deliberated on findings and recommendations. The data was organized into case studies, attached in Appendix C. Data from the case studies were developed into consolidated findings by the Working Group which became the basis for development of its draft recommendations for the full Council to consider, deliberate, and adopt. This report represents the results of the full Council's deliberations.

2. *Findings*

Commonalities and Sector-Unique Considerations

The Council recognizes that the data it collected was limited by available resources and time. Since the scope of this report is limited to CEO and senior executive level engagement, the focus of our data collection was on perspectives of individuals with subject matter expertise on how senior executive leadership in their sectors are organized and motivated. The rest of the data was collected from various public sources in order to assist our members to understand the landscapes of the sectors studied that influence the motivations of CEOs within their sector. However, even within this acknowledged limited collection of data that the Council's working group achieved, common themes and findings emerged.

A review across the case studies showed that roles and responsibilities of CEOs or their equivalent senior executive decision-makers are similar across the sectors. There are variations in the degree of independence of decision-making between public and privately owned institutions. Specific scopes of activities may depend on the size of the organization, but the core responsibilities remain similar. The primary focus of CEOs and senior executive decision-makers is on the "what", i.e. the outcomes and deliverables, and then delegates the "how". In the end, however, they retain the overall accountability for results they assure the accountability of others to obtain those results. Another common theme was the perspective that the Federal government is seen as an important catalyst to effectively convene entities at the national level and to facilitate a mutual agenda of priorities based on national interests. A key part of the Federal government's value is its ability to provide information or facilitate information exchange that assists in developing a value proposition or inform a mutual agenda.

The cases studies also showed that sectors, especially the life line sectors or sub-sectors, are generally well organized to reach CEOs. However, the sectors or industries organize around specific issues that are important to their businesses or operations. Each of the sectors studied have some unique characteristics that affect CEO engagement. The process to initiate engagement will vary substantially across sectors, even within the lifeline sectors, based on diversity of composition, market structure and competitive characteristics, regulatory frameworks, and operational requirements such as dependencies. Flexibility and process for investment decision-making are very different between public and private sectors.

The sector case studies identified issues or topics of common interest such as cyber security and catastrophic disaster response and recovery, but also saw differences in perspectives on the need for coordination and collaboration with other sectors at the national level. Some of the sectors are

compartmentalized into sub-sectors or modes with very different concerns, operating norms, and cultures. For example, the Transportation Sector is segmented into various modes. Even within the public transit mode, forms of transit can be organized very differently. The Chemical Sector, like several other pre-dominantly private sector operated sectors, must carefully manage market competitiveness and anti-trust regulatory issues to collaborate when needed. This consideration is in contrast to the Electricity Sub-Sector owners and operators which hold monopolies in many areas of their business. The data collected indicated that the greater value proposition for engagement, as defined for the purpose of this report, comes from cross-sector identification of priorities, coordination of strategies and joint strategic and policy problem solving, particularly with, and among, the nation's lifeline sectors. Nevertheless, even with cross-sector initiatives, CEO or senior executive decision-maker engagement requires careful and clear definition of the issues to be addressed that are appropriate for their level of problem-solving and decision-making.

To assist in bridging some of the divides within the complex landscape of the critical infrastructure community, the Department of Homeland Security, acknowledging that the CISR mission is a shared mission, and with its owner and operator partners, developed and matured the CIPAC. The Sector and Government Coordinating Councils interact across the industries and across public and private sectors within the CIPAC legal and policy framework established by the DHS Secretary authority to use the Section 871 exemption from FACA) within the Homeland Security Act of 2002. Several of the sector representatives interviewed in the case studies saw this mechanism as fulfilling the bridging role across their own sectors as well as with other sectors. Since membership is institutional rather than by individual, it adapts to the need of the mission.[10] The CIPAC was originally designed to empower engagement with the right level of individual decision-makers or subject matter expertise when it was needed by the Federal government and the sectors, depending on the issue or activity to be addressed. Consequently, "multiple individuals may participate in CIPAC activities on behalf of a member organization."[11] As an example, in the Electricity Sub-Sector, when strategic and policy issues need to be addressed for the entire sector, the Sub-Sector brings CEO-level representatives to the activity, and will have operational subject matter experts participate when the issue is implementation-oriented, operational, or tactical.

During the course of its data collection for this report, the Council's Working Group found that the word "engagement" was subject to multiple interpretations. For the purpose of this report, the Council defines "engagement" as an outcomes oriented activity which convenes parties to address and solve a mutually identified issue.

[10] "The Critical Infrastructure Partnership Advisory Council." Federal Register. accessed January 1, 2015, https://www.federalregister.gov/articles/2015/01/14/2015-00405/the-critical-infrastructure-partnership-advisory-council.
[11] ibid

Specific findings are described in the following section.

Report Findings

Specific Role of CEO and Senior Executive Decision-Makers

Finding 01: CEO and Senior Executive Decision-Makers play very specific fiduciary roles to advance outcomes and unify action across their institutions and across their sectors.

1.1. CEOs and their equivalents provide thought leadership, approve strategy, set priorities, make decisions on and apply investments (including people and executive time), direct action, and hold accountability for results and deliverables

1.2. CEOs bring focus to the various risks and opportunities that their businesses face, as they seek to maximize value of the enterprise and meet their fiduciary duties and obligations to their owners and stakeholders

1.3. CEOs mobilize action (e.g. through their staff, including their trade associations, to address sector wide issues of common interest)

1.4. CEOs direct and delegate; they set direction, empower, and provide the authority and sense of urgency to execute

1.5. Larger sized institutions, particularly those in global markets, broaden responsibility of the CEO; decision-making authority is often delegated to lines of business or regional CEOs, which implies that an engagement process may require a structural analysis and iterative process to identify the appropriate senior executive level decision-makers for a particular issue in sectors with more complex market segments and operations

1.6. Different levels of senior executive decision-makers need to be identified and engaged, depending on sector structure and purpose or type of activity or issue to be addressed; an engagement can only be productive if the agenda has relevance to participating decision-makers

1.7. CEOs are accountable to different oversight bodies based on whether they lead a privately held, a publicly held company, or a public institution, which affects their ability to commit resources and action; they are subject to constraints according to their businesses' regulatory and governance frameworks

Motivation for Self Organization

Finding 02: CEOs and Senior Executive Decision-Makers organize themselves within their sectors around specific types of issues relevant to their roles and responsibilities.

The primary common motivators for intra-sector or sub-sector organizing are:

2.1. Potential common economic, operational, or regulatory issues affecting the entire industry or sub-industry arise

2.2. Mutual engagement is required to manage common risks, both those inherent to the business and those driven by external events

2.3. Interconnectedness and interdependencies of operations among members of the sector which create mutual interest in supporting sector-wide reliability or integrity of operations

2.4. Substantive progress and benefits can be seen in deliverables from mutual engagement

2.5. Common trust and mutual interests are fully established from experience

Motivation for Public-Private and Cross-Sector Engagement

Finding 03: CEOs and Senior Executive Decision-Makers engage with the Federal government and across sectors when an issue has a potential direct impact on their financials, their operations, and when the requirements to address it lie beyond their direct control.

3.1. Such an issue is characterized by potential consequences beyond what the industry can manage by itself due to lack of information or resources or control over resources: e.g. Catastrophic events such as Hurricanes Katrina or Sandy; the issue might involve consequences or costs which are too large to absorb without collaboration with other sectors or with the government

3.2. The issue might involve needed actions and relevant information driven by adversaries who seek to disrupt critical infrastructure operations as a means of degrading the national security interests of the country, such as with cyber attacks

3.3. The issue might be a large enough imminent threat that coordination is required across sector due to dependencies and interconnections

3.4. There must be a strong clear sense of urgency and a mutual value proposition

3.5. Another consideration is to stave off or influence regulation that is considered unnecessary, and which could increase costs or degrade operations due to excessive government involvement, or not representative of diverse interests which must be involved to effectively address an issue, and decreases possible competitiveness (when relevant) in a sector

3.6. The issue is specific and well defined, and concrete results can be produced through participation at the CEO level

3.7. The engagement represents a strategic problem solving opportunity with the government or other sectors which requires guidance from senior decision-makers to support sector-wide investment, policy, and directional decision-making and implementation

Sustaining Engagement

Finding 04: Engagement with CEOs and Senior Executive Decision-Makers can only be sustained when there are concrete results produced and progress is measurable.

4.1. Meaningful outcomes reinforce the value of engagement (i.e. It seems to be productive; it produces real results; "it isn't just talk"; the right level of people at the table consistently)

4.2. Actions and results, from collaborative problem solving, involving senior executives decision-makers from the critical infrastructure sectors and the federal government, provide products and outcomes which demonstrate value and measurable progress toward agreed objectives

4.3. Threats and consequences to business or to the industry that could impair shareholder value continue to emerge or evolve; the CEO has fiduciary responsibilities to stakeholders which can motivate action and drive sustained engagement for the appropriate purpose

4.4. Dialogue must be seen as two-way, not one way (CEOs or their equivalents in the public sector do not like to be "talked at")---decision oriented dialogue which is focused on important mutual objectives

4.5. Engagement optimizes the time of CEO or senior executive decision-maker for both public and private sector participants….executive time is a precious resource and cannot be squandered

4.6. Meetings need to be short and succinct with a clear purpose, agenda, expected outcomes, and decisions to be made

4.7. Mutual identification of issues (on all sides) and ability to establish clear mutual priorities for action is a core element of successful engagement

Leveraging Existing Sector Organizational Structures

Finding 05: Most sectors have established organizational structures for engaging CEOs and Senior Executive Decision-Makers which can be leveraged for efficiency and often as "trusted" channels of communication and collaboration.

5.1 Most of the sectors are already well organized at the CEO level through their trade or professional associations, or other historical entities, but "stove-piping" can occur across those associations or sectors for reasons of competitiveness, focus, type of business, size and differing geographic needs

5.2 Trade associations serve as primary channels for coordination and communication with CEOs in most sectors; they often provide continuity for action following decision-making and often provide the development and communication channels for promulgation of those decisions

5.3 Trade and professional organizations often provide forums, subject matter expertise, and staffing for CEO engagement and actions---they also incubate partnerships

5.4 SCCs within some of the sectors have bridged organized groups and business segments within their sectors; several sector SCCs have become the sector focal point for engagement with the Federal government

5.5 The SCC structure under CIPAC has worked for several sectors as a means for cross sector engagement as well as for public private sector engagement; the SCCs incorporate trade associations as appropriate to achieve representation of smaller owners and operators which might not have the resources to engage regularly with the Federal government

5.6 While committees such as National Security Telecommunications Advisory Committee (NSTAC) and NIAC, which fall under FACA can only provide advice, the CIPAC was designed for government and owners and operators to plan, identify and solve problems, coordinate, and jointly promulgate implementation of agreed upon actions. CIPAC

incorporates the capability to provide advice to the Federal government on policy and strategic issues that may emerge from the joint problem solving.[12]

Challenges and Obstacles

Finding 06: Overcoming challenges and obstacles resulting from the inherent diversity and complexity of sector structures and governance regimes will need to be incorporated into the process for initiating and sustaining CEO engagement.

6.1. No one governance model can be applied to every sector; each sector has different leadership structures---experience of engagement with one sector will often not be applicable to another

6.2. The structure, composition, and governance of a sector, compared to how the government perceives a sector, may be substantially different for considerations of engagement

6.3. Anti-trust issues vary substantially from industry to industry and have consequential effect on ability to engage

6.4. Diversity of some sectors creates disincentives: Members or sub-sectors either compete with each other (conflict of economic interest) or have no common mutual interest compelling enough to cause them to engage among themselves, which affects the structure of a public/private partnership engagement model and process. These situations require a more issue specific process and senior executive decision-makers only engage when they find it relevant

6.5. Public vs private ownership entities have very different governance models, issues and challenges---public sector decision-making authority is often more diffused to a regional or local level which may make it more difficult for sector wide consensus building and commitments

6.6. Finding the real decision-makers for engagement on a given issue becomes essential for diverse and complex sectors

6.7. Government is inherently wary of trade associations because of their role in lobbying. However, many trade associations are also organized to address standards, operational protocols and industry response to emergencies, requiring both the sectors and the Federal government to understand and accept compartmentalization of engagement activities in order to fulfill the need for sustainable and representational relationships.[13]

[12] "The Critical Infrastructure Partnership Advisory Council." Department of Homeland Security. accessed January 1, 2015. http://www.dhs.gov/critical-infrastructure-partnership-advisory-council.

[13] National Infrastructure Advisory Council, *Sector Partnership Model Implementation*, 2005, accessed February 20, 2015, http://www.dhs.gov/xlibrary/assets/niac/NIAC_SPMWGReport_Feb06.pdf

3. Recommendations

The Council makes two sets of recommendations in this report:

- An engagement structure and process for CEO and senior executive level engagement; and
- A communication framework targeted specifically at CEOs and senior executive decision-makers, to not just to encourage engagement but to inform their investment, policy and strategic decisions within the own businesses and industries.

CEO Level Engagement Framework

From several previous NIAC reports, and affirmed with the direct experience of the Electricity Sub-Sector CEO-level engagement with the Federal government over the last two years, the key elements of a successful pubic private partnership include: 1) CEO or senior executive decision-maker engagement; 2) trusted relationships at the CEO level; 3) a significant value proposition; 4) a simple effective and efficient process for executive engagement; 5) an executive facilitator. CEOs and equivalent senior executive decision-makers have the authority and the influence to move entire sectors or sub-sectors in a desired direction when it is in the best interest of their businesses and industries to do so.

One insight gained from the data collected for this report is how extraordinarily diverse the sectors are in their composition, their leadership structures and governance, the nature of their markets, and their operations. As a result, the Council found that while common themes existed, no one governance model can be found for every sector. Consequently, to address the challenges for engaging CEOs and senior executive decision-makers, the Council proposes a National Strategic Priorities Senior Executive Engagement Framework to accommodate this diversity. This framework builds on previous Council recommendations, lessons learned from previous CEO level sector engagement and the Council's findings on challenges and obstacles in this report. The purpose of this framework is to engender engagement of CEOs or equivalent senior executive decision-makers and their agency leader counterparts in the Federal government to:

- Identify and prioritize national critical infrastructure security and resilience issues affecting national and economic security, requiring coordinated action between sectors, and between the government and the critical infrastructure sectors
- Identify obstacles and challenges to address those priorities
- Develop mutual strategies and policies, including roles and responsibilities, to jointly take action to empower achievement of measurable results

The need for this framework for CEO or senior executive level engagement has become a critical requirement now because of the scope and pace of emerging threats which requires a greater understanding at the senior executive levels for action, and to accelerate the execution of appropriate actions.

The proposed engagement framework is composed of five specific recommendations which follow.

Implementing a simplified and focused engagement mechanism

Recommendation 01: The President should direct the Secretary of Homeland Security to work with the Sector Specific Agency heads for the Electricity Sub-Sector, Water, Transportation, Communications and Financial Services to establish a Strategic Infrastructure Executive Council under CIPAC, composed of CEO or Senior Executive Decision-Makers from these sectors and their counterpart agencies, to identify national priorities and develop joint or coordinated action plans and agreements to implement them.

1.1 Although some sectors are fully engaged individually with the Federal government to prepare and respond to a threat, whether man-made or natural, established coordination to facilitate commitments to implementation and execution across the sectors and with the government at the senior executive levels is limited

1.2 The Administration should work with Congress to address obstacles and gaps, as required that may be identified to take effective action and implementation of mutually agreed upon plans.

1.3 Recent experience from major regional catastrophic disasters have demonstrated the need for pre-established coordination between key sectors, in particular, developing coordination protocols between dependent sectors during the event is usually too late.

1.3.1 CEO-level engagement with the Federal government during Hurricane Sandy by the Electricity Sub-Sector was seen as particularly effective in more rapidly deploying resources to the right places to effect swifter response and restoration; the ability to coordinate among senior executive decision-makers across sectors in the same way, when needed, would further these outcomes

1.3.2 Conversely, in Hurricane Sandy, one CEO interviewed described a situation where a shortage of trucks needed for transportation of materials was stranded in the

wrong place due to lack of pre-established communication and coordination with other sectors.

1.4 The Council identified these five sectors or sub-sectors to be core members of the Executive Council because of their centrality to the resilience of most of the other sectors and their national security implications when disrupted

1.5 Based on the findings of this report for successful engagement of CEOs or senior executive decision-makers, the degree of engagement will depend on the issue, its relevance and value proposition to a sector, and its national priority

Implementing the process for engagement

Recommendation 02: The Secretary of Homeland Security should work with the Secretary of Energy to facilitate the Electricity Sub-Sector sponsorship of the Strategic Infrastructure Executive Council and its CEO or senior executive decision-makers as a cross sector group under CIPAC.

2.1 The Electricity Sub-Sector is a common thread of dependency among the other infrastructure sectors. It is also best example of this type of engagement, as defined for the purpose of this report, with the Federal government

2.2 Evidence has been provided that CEOs in other sectors have begun participating in the Electricity Sub-Sector CEO-level SCC meetings

2.3 CIPAC was originally designed so that critical infrastructure sectors could engage with the Federal government to jointly identify and solve problems at any managerial level as required by a given issue, which includes giving advice to the Federal government when an action is needed that is inherently a government function

2.4 CIPAC membership is institutional. CIPAC was exempted from FACA to facilitate the exchange of sensitive information with government in order to develop joint strategies and plans, programs, and coordinate preparedness, response and recovery activities for incidents. Strategies, policies, and execution on a sector-wide basis require senior executive decision-making for implementation, particularly at the pace that may be required as the threat environment for the critical infrastructures continue to evolve and expand

Identifying clear value proposition for engagement

Recommendation 03: For any proposed engagement within this framework, the Secretary of Homeland Security should work with the relevant Sector Specific Agency heads and the Special Assistant to the President for Homeland Security in the National Security Council to identify, clarify, and articulate the relevant national priorities, and the compelling and mutual value proposition in consultation with their sector counterparts, in preparation for engagement.

3.1 Identifying and clarifying the national level strategic priorities that require strategic problem solving and action would provide the foundation for developing the value proposition

3.2 For the government, the value proposition would address public safety and national economic and security issues

3.3 For critical infrastructure owners and operators, the value proposition, based on this report's findings, would be to assure business and sector assets function sustainability

3.4 The value proposition might include resource sharing and complementary actions inherent to the partner's capabilities and authorities to remove obstacles when required, or complementary capabilities to execute, in a resource constrained environment

3.5 Coordination of effort to reduce duplication of effort and to gain efficiencies from planning and pre-established processes prior to incidents has been a proven value proposition within sectors, and data collected by the Council for this report indicate that it would also be a value proposition between sectors

3.6 Another element of the value proposition would be strategic public-private and cross sector information sharing in a protected environment for the purpose of strategic planning and investment decisions to reduce clear and immediate risk to a sector or its businesses.

Executing the process for engagement

Recommendation 04: The Secretaries of Homeland Security and Energy should work with other relevant Sector Specific Agency heads and their critical infrastructure counterparts to identify the appropriate CEO or Senior Executive Decision-Maker to participate in this engagement framework.

4.1 Each relevant Sector Specific Agency would work through their SCCs to identify the relevant and appropriate senior executive decision-makers to participate in a national strategic priorities cross sector prioritization process with the Federal agencies

4.2 Each senior executive identified should hold a clearance at the appropriate level

4.3 Consideration should be given to identifying several CEOs or senior executives, from each of the relevant sectors in this framework, in order to support participation should there be a need for increased meeting frequency, and to support continuity and succession planning. Such individuals could be actively employed or recently retired; all would be members of a relevant SCC.

4.4 For the national strategic prioritization activity, there should be sufficient representation by owners and operators to represent the diversity of the sector

4.5 Meetings are planned to be succinct with clear agenda and specific outcomes

4.6 Meetings should be held at least once a year, but could be held more often as dictated by the agreed strategic agenda. Moreover, meeting frequency would also be determined by the practical value of tracking mutual progress within the sectors and within the government, as Council members make decisions and direct action.

Required resource support

Recommendation 05: The President should establish a permanent budget line item through the Office of Management and Budget and the Department of Homeland Security, as the recognized national coordinator for the critical infrastructure security and resilience mission, to provide permanent staff, analytic resources and administrative support, to assure the effectiveness and efficiency of participation by Senior Executive Decision-Makers participating in the framework to advance the national actions needed.

5.1 Such resources will provide the support and coordination of cross-sector senior executive engagement for both the sectors, and their Sector Specific Agencies, which could involve agency leadership beyond the Sector Specific Agencies, particularly on matters relating to national security

5.2 There should be a joint commitment with the sectors and agencies who participate to staff their own commitments to action

5.3 The staffing function should include assuring continuing communication processes for participants, logistics, research on issues to support mutual value proposition development, deliberations and developing reports measuring progress and effectiveness of the engagement process and mechanism

CEO Level Communication Framework

Communication with any party always begins with the question of "What is the desired end result?" To obtain the most effective results, the communication must be tailored for the result desired and the audience. A core framework for communication consists of three basic elements: relevant messaging, format of the messaging, and appropriate venue or method of delivery. For CEOs and senior executive decision-makers, the Council makes the following recommendations on these three elements.

Recommendation 06: Principles of Messaging to the CEO: Tailor the messaging or content of any communication to be relevant to the CEO's responsibilities outlined in the model of CEO level of communication for NIPP 2013 (Appendix B).

6.1 The communication needs to tie to what is important to the CEO to carry out his responsibilities or to maintain situational awareness in order to carry out his responsibilities.

6.2 To amplify this principle, the CEO has lead responsibility for managing corporate risk. Consequently, messages need to be framed within a risk framework appropriate for a CEO. The framework of risks that a CEO commonly pays attention to primarily consists of:

Risk Category	Definition
Reputational	The risk related to customers, shareholders, or the government developing a negative impression of a business from a perceived trust, financial, legal, or, for homeland security, significant security related issue.
Financial	The risk of an event or circumstance that will either impose significant financial cost on a company or significantly reduce a company's revenues.
Operational	A broad range of risks related to the people, systems, and processes through which a company operates. Can also include other classes of risk: fraud, legal (which is discussed separately below), physical, or environmental.
Regulatory or Legal	The increased likelihood that a company will be exposed to more regulatory oversight and cost, increased legal liability, and/or a higher number of legal actions against a company.

6.3 The message needs to be articulated succinctly with a minimum of prose, and greater use of bullets

6.4 The communication needs to project concepts quickly, with use of tables, charts and graphics, showing data, trends, and relationships

6.5 "Take-away" key points need to be clearly labeled that include answering the questions:

- "What should I conclude from this?"
- "What should I do with this information?"

Appendix B contains a model CEO level of communication for the National Infrastructure Protection Plan 2013 which illustrates these principles.

Information sharing is a form of communication that can be valuable at the CEO or senior decision-maker level. It can assist in identifying and clarifying the "value proposition" that CEOs look for in any engagement and identify the collaboration deliverables that would achieve that value. However, information sharing would most effectively be communicated in a form that is relevant to CEOs and senior executive decision-makers within the preceding risk elements and terms. Problem-solving that would mitigate these risks are normal responsibilities for the CEO, although implementation of mitigation decisions and strategy would be delegated to his staff. Accountability to the Board of Directors for implementation remains with the CEO.

Recommendation 07: Format for Communications: Tailor and target format of the communication to the CEO to be as efficient as possible, acknowledging limited attention span and availability of time.

7.1 The communication should be written, 3 pages or less
- Information within communication organized in a "more as needed" format
- Use URLs and appendices to provide more information as needed and allows CEO to manage his time consistent with relevance of topic

7.2 Establish a special "CEO Attention" type of regular communication by DHS and Sector Specific Agencies, specifically targeting CEOs and other senior executives, specifically written and tailored to the sector and utilizing the risk element language relevant to them

Recommendation 08: Venues or Methods for Communicating: Utilize established, CEO-credible or "trusted" channels or venues for transmittal of communication.

Most effective communication delivery methods are those activities, organizations and mechanisms that CEOs see as standard "trusted" sources for information. Examples include:

8.1 Sector-specific trade associations in which CEOs participate, or their Sector Coordinating Councils, several of which now have participation by CEOs or their equivalents---trade associations in particular have the experience at bringing the most relevant information forward in the right format

8.2 Respected think tanks and thought leader business management organizations (e.g. Conference Board, Council on Competitiveness)

8.3 Economic regulators, best practice leaders and general business communication vehicles, such as the Wall Street Journal (for broadest dissemination of information across the sectors)

8.4 Incorporation of CEO-relevant round tables to sector-specific or national exercises which will assist them to identify decisions or issues that their companies, and a sector as a whole, will need to manage from a financial, regulatory, operational and reputational corporate risk level

Conclusion

The Nation and the critical infrastructure community are really at a defining point in securing itself and assuring their operational resilience. The pace of growth of threats, whether man-made or natural, and their potential catastrophic consequences create a sense of increased urgency. The nature and sheer volume of these threats require accelerating progress for improvements and realizing commitments to substantive action in a more systematic, coordinated way across sectors. The national public-private partnership supporting the mission has proven itself over time. It needs to advance to the next stage to address the emerging environment of threats and consequences of the future.

Consequently, senior executive decision-makers in both public and private sector need to be drawn into systematic discussions on priorities, focused problem-solving through strategies and policies, and empowerment for action to achieve measurable results within and across their sector communities. The critical infrastructure sectors, combined, are the foundations of the robustness, resilience, public confidence, and wealth of the country. Together, we can take on all threats, whether man-made or natural, and not only survive, but thrive.

4. Appendices

Appendix A – Acknowledgements

Chief Executive Officer Engagement Working Group Members

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Other Council Member Interviews

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Constance Lau, President and Chief Executive Officer, Hawaiian Electric Industries, Inc. (HEI), Chairman of American Savings Bank, Honolulu, HI
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The Council would like to acknowledge the individuals and organizations, listed below, who took the time out of their very busy schedules to contribute their knowledge and perspectives to inform the Council's members work on this report. The Council extends to them its deepest appreciation.

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Appendix B – NIPP 2013 CEO-Level Summary

National Infrastructure Protection Plan (NIPP) 2013 - *"Partnering for Critical Infrastructure Security and Resilience"*

Executive Overview

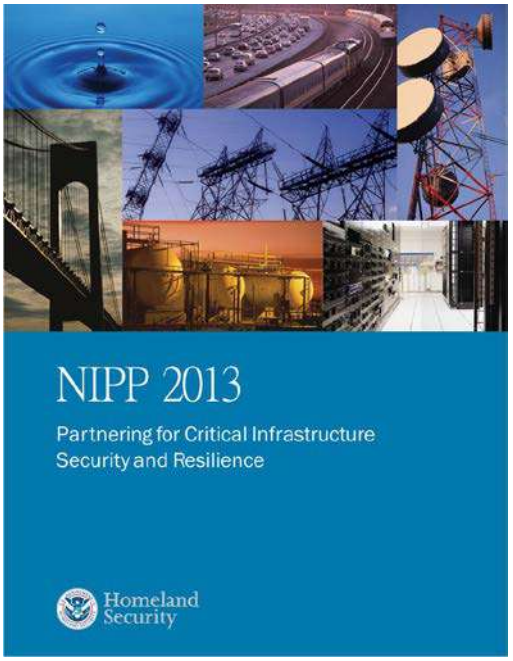
Our Nation's well-being relies upon secure and resilient critical infrastructure—the assets, systems, and networks that underpin American society. The National Infrastructure Protection Plan (NIPP) – outlines how government and private sector participants in the critical infrastructure community work together to manage risks and achieve security and resilience outcomes.

Background

- **PPD's** -- Presidential Policy Directives 8 (2011), *National Preparedness*, and 21 (2013), *Critical Infrastructure Security and Resilience*, established an approach to national preparedness for dealing with risks to critical infrastructure, including the development of an integrated and comprehensive framework, with a focus on "partnership" among government and private sector entities. PPD-21 explicitly called for an update to the NIPP, from the earlier version of 2006.[14] [15]

  PPD-21 identifies 16 critical infrastructure sectors.

  - Chemical
  - Commercial Facilities
  - Communications
  - Critical Manufacturing
  - Dams
  - Defense Industrial Base
  - Emergency Services
  - Energy
  - Financial Services
  - Food and Agriculture
  - Government Facilities
  - Healthcare and Public Health
  - Information Technology
  - Nuclear Reactors, Materials, and Waste
  - Transportation Systems
  - Water and Wastewater Systems



[14] "NIPP 2013: Partnering for Critical Infrastructure Security and Resilience," Washington, DC: Department of Homeland Security, 2013, Accessed February 05, 2015. www.dhs.gov/sites/default/files/publications/National-Infrastructure-Protection-Plan-2013-508.pdf

[15] "National Infrastructure Advisory Council, "Implementation of EO 13636 and PPD-21: DRAFT Report and Recommendations," Washington, DC: Department of Homeland Security, Accessed Feb 05, 2015. www.dhs.gov/sites/default/files/publications/niac-eo-ppd-implementation-report-draft-v10.pdf

Executive Order -- Executive Order 13636, *Improving Critical Infrastructure Cybersecurity*, directs the government to coordinate with critical infrastructure owners/operators on information sharing and to collaborate with the private sector to implement risk-based approaches to address cybersecurity.

Purpose

- Establishes the "Vision" for critical infrastructure security and resilience.
- Guides the national effort to manage risk in achieving security and resilience for the Nation's critical infrastructure.
- Provides the detailed framework and partnership structure for all government and private sector entities to engage in a "trusted" manner to work toward common objectives to:
    - Address threats and hazards
    - Reduce vulnerabilities
    - Mitigate consequences
- Provides approaches to address policy, operating, priority, and resource allocation issues

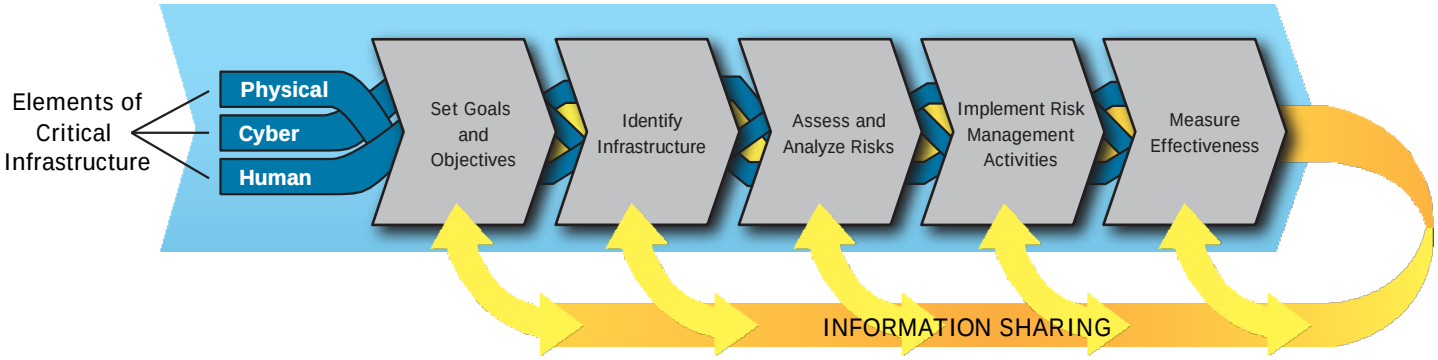
> "A Nation in which physical and cyber critical infrastructure remain secure and resilient, with vulnerabilities reduced, consequences minimized, threats identified and disrupted, and response and recovery hastened."

Key Information

- The *National Plan* provides the "Goals" that lay out a strategic direction for the next several years

> - Assess and analyze threats to, vulnerabilities of, and consequences to critical infrastructure to inform risk management activities;
> - Secure critical infrastructure against human, physical, and cyber threats through sustainable efforts to reduce risk, while accounting for the costs and benefits of security investments;
> - Enhance critical infrastructure resilience by minimizing the adverse consequences of incidents through advance planning and mitigation efforts, and employing effective responses to save lives and ensure the rapid recovery of essential services;
> - Share actionable and relevant information across the critical infrastructure community to build awareness and enable risk-informed decision making; and
> - Promote learning and adaptation during and after exercises and incidents.

- It provides a "Critical Infrastructure Risk Management Framework"… "risk management" is the cornerstone.



- It recognizes that:
  - The government must provide for national security and public safety
  - The private sector partners manage risks based on commitments to community, customers, and governance objectives"
  - Finding the appropriate value proposition among the partners requires understanding differing priorities and setting joint priorities.
- It provides seven Core Tenets representing the values and assumptions for planning.[16]

Actions

- The *National Plan* establishes 12 specific "Calls to Action", to guide efforts to achieve national goals which would be worked collaboratively with government and industry partners. [17] They are grouped in three categories:
  - **Build upon Partnership Efforts**
    1. Set National Focus through Jointly Developed Priorities
    2. Determine Collective Actions through Joint Planning Efforts
    3. Empower Local and Regional Partnerships to Build Capacity Nationally
    4. Leverage Incentives to Advance Security and Resilience
  - **Innovate in Managing Risk**
    5. Enable Risk-Informed Decision-Making through Enhanced Situational Awareness
    6. Analyze Infrastructure Dependencies, Interdependencies, and Associated Cascading Effects
    7. Identify, Assess, and Respond to Unanticipated Infrastructure Cascading Effects During and Following Incidents
    8. Promote Infrastructure, Community, and Regional Recovery Following Incidents
    9. Strengthen Coordinated Development and Delivery of Technical Assistance, Training, and Education

[16] DHS, "NIPP 2013," www.dhs.gov/sites/default/files/publications/National-Infrastructure-Protection-Plan-2013-508.pdf#page=19
[17] DHS, "NIPP 2013," www.dhs.gov/sites/default/files/publications/National-Infrastructure-Protection-Plan-2013-508.pdf#page=27

10. Improve Critical Infrastructure Security and Resilience by Advancing Research and Development Solutions

- **Focus on Outcomes**
  11. Evaluate Progress toward the Achievement of Goals
  12. Learn and Adapt During and After Exercises and Incidents

References

- **Glossary** -- a comprehensive listing and short description of the many entities and terms that are relevant to critical infrastructure security and resilience[18]
- **Acronyms**[19]

[18] DHS, "NIPP 2013," www.dhs.gov/sites/default/files/publications/National-Infrastructure-Protection-Plan-2013-508.pdf#page=35
[19] DHS, "NIPP 2013," www.dhs.gov/sites/default/files/publications/National-Infrastructure-Protection-Plan-2013-508.pdf#page=33

Appendix C – Sector Case Studies

Chemical Sector Case Study

I. Sector Landscape:

The Chemical Sector is a large and diverse part of the global economy. It is almost entirely in the private sector, and provides a broad range of products and services. The sector accounts for more than $770 billion in revenue annually, employing more than 784,000 domestically. It accounts for 12 percent of U.S. exports.[20] More than 96 percent of all manufactured goods depend on the sector through the products or goods produced by companies that fall within the Chemical Sector designation. It is estimated that more than 50,000 facilities in the United States house sufficient quantities of chemical assets to require the reporting of that information to the Department of Homeland Security's Chemical Facility Anti-Terrorism Standards (CFATS) program.

Infrastructure within the sector is classified by functional area within the industry supply chain, and falls into one of four categories: manufacturing plants; transportation systems; warehousing and storage systems, including stockpile and supply areas; and chemical end users. Manufacturing infrastructure comprises plants that convert raw materials into intermediate and end products. Transportation systems – such as Rail, Highway, Maritime, Air, and Pipeline assets – serve as the method for providing raw materials to the manufacturing plants, as well as to transport intermediate products within and among facilities, and distributing products to end users. Warehousing and storage systems ensure that the proper quantities of chemicals are efficiently situated for cost-effective and timely delivery to customers across the country. End users comprise the public and almost all of the nation's businesses – including aerospace, transportation, computers, apparel, food products services, agriculture, healthcare, mining, science and other fields of technology.[21] End users leverage chemicals for many purposes, such as sanitizers, refrigerants, crop productivity, explosives, industrial and residential coatings, pharmaceutical products, and for high-tech research and development (R&D).

In general, private sector partners collaborate on and share industry best practices for safety and security across the sector through forums established by their trade associations. Consequently, many industry or trade associations' host or sponsor safety or security committees for this purpose, in addition to their purpose as advocates for their industries as lobbyists. In general, these associations are organized by product or services. Such associations include:

[20] American Chemistry Council, "Proven Progress: 2013 year in review," 2013.
[21] *American Chemistry Council*, "Chemical Industry Profile," 2014, accessed February 4, 2015, www.americanchemistry.com/Jobs/EconomicStatistics/Industry-Profile

- **Agricultural Retailers Association** – The ARA is a non-profit trade association that represents the interests of agricultural retailers and distributors across the United States on legislative and regulatory issues.[22]
- **American Chemistry Council** – The ACC represents leading sector companies and works to safeguard chemical facilities by addressing all aspects of the security and resilience mission.
- **American Coatings Association** – The ACA is a voluntary, non-profit organization focused on the paint and coatings industry and advocates on behalf of that industry and its positions on legislative, regulatory, and judicial issues at the federal, state and local levels.[23]
- **American Fuel and Petrochemical Manufacturers** – The AFPM is a trade association representing the manufacturers of virtually the entire U.S. supply of gasoline, diesel, jet fuel, other fuels and home heating oil, as well as the petrochemicals used in thousands of other products.[24]
- **American Petroleum Institute** – The API is represents all aspects of America's oil and natural gas industry, including producers, refiners, suppliers, pipeline operators and marine transporters, and service and supply companies.[25]
- **Ammonia Safety Training Institute** – The ASTI brings together leaders from industry and public safety organizations and to reduce risk associated with ammonia, and provides safety management support.[26]
- **The Chlorine Institute** – The Chlorine Institute is a technical trade association of companies engaged in ensuring the safe and proper handling of the industry's products throughout the value chain, by developing and sharing technical information, training and best practices for the industry, its customers, emergency responders and the community.[27]
- **Compressed Gas Association** – The CGA represent all facets of the industry – manufacturers, distributors, suppliers, and transporters of gases, cryogenic liquids, and related products – in the development and promotion of safety standards and safe practices in the industrial gas industry.[28]
- **Council of Producers & Distributors of Agrotechnology** – The CPDA provides advocacy support on issues specific to the manufactures, formulators, and distributors of post-patent pesticide products, as well as on opportunities and challenges facing the adjuvant and inert ingredient industry and other agrotechnologies.[29]
- **The Fertilizer Institute** –The Fertilizer Institute addresses the public policy, communication and statistical needs of producers, manufacturers, retailers and transporters of fertilizer on issues such as international trade, energy, transportation, the environment, worker health and safety, farm bill and conservation programs.[30]
- **International Institute of Ammonia Refrigeration** – The IIAR organizes member organizations and professionals within the industrial refrigeration community around important industry issues,

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[22] *Agricultural Retailers Association,* "About," accessed February 4, 2015, www.aradc.org/ARADC/About/About/

[23] *American Coatings Association*, "Who We Are," accessed February 4, 2015, www.paint.org/about-aca/who-we-are.html

[24] *American Fuel and Petrochemical Manufacturers*, "About AFPM," accessed February 4, 2015, www.afpm.org/about-afpm/

[25] *American Petroleum Institute,* "Overview and Mission," accessed February 4, 2015, www.api.org/globalitems/globalheaderpages/about-api/api-overview

[26] *Ammonia Safety Training Institute,* "About Us," accessed February 4, 2015, www.ammonia-safety.com/

[27] *Chlorine Institute,* "About Us," accessed February 4, 2015, www.chlorineinstitute.org/index.cfm

[28] *Compressed Gas Association,* "About Us,", accessed February 4, 2015, www.cganet.com/about.php

[29] *Council of Producers & Distributors of Agrotechnology*, "Who We Are," accessed February 4, 2015, www.cpda.com/who-we-are/

[30] *Fertilizer Institute*, "About," accessed February 04, 2015, www.tfi.org/about

as well as initiating and managing programs with governmental and non-governmental agencies, presenting industry positions and supporting documentation on key issues. [31]

- **International Liquid Terminals Association** – The ILTA focuses on improving the safety of the bulk liquid terminals industry operations and the level of environmental responsibility demonstrated at their facilities, as well as advocating on behalf of the industry.[32]
- **Institute of Makers of Explosives** – The IME is the safety and security institute of the commercial explosives industry, promoting safety and security practices throughout the life cycle of industrial explosive products.[33]
- **National Association of Chemical Distributors** – The NACD is an international association of chemical distributors who process, formulate, blend, re-package, warehouse, transport, and market chemical products, as well as their supply-chain partners.[34]
- **Society of Chemical Manufacturers & Affiliates** – SOCMA is a leading authority on the specialty chemical industry, providing programs, resources, and representation for a diverse membership of small, medium and large chemical companies.[35]

In addition, sector trade associations and their members support an array of Federal programs that give multiple agencies the authority to regulate chemical security, while minimizing the burden on operations. Some of the key agencies and programs include:

- The Department of Homeland Security (DHS) Chemical Facilities Anti-Terrorism Standards
- The Coast Guard Maritime Transportation Security Regulations
- The Transportation Safety Administration (TSA) Rail Transportation Security Rule
- The Department of Transportation (DOT) Hazardous Transportation Security Plan
- The Customs and Border Protection (CBP) Customs and Transportation Partners against Terrorism

Under these programs, the regulated community within the sector must submit security plans for review and approval and be subject to rigorous site inspections. Several agencies have the authority to fine or shut down a facility if it fails to be in compliance.

The sector has established an active Sector Coordinating Council (SCC which operates and engages with the Federal government under the Critical Infrastructure Partnership Advisory Council (CIPAC) on issues such as the safety of the water supply, energy production, increased food production, housing, healthcare, computer technology, and transportation. Its membership is institutional and is composed of representatives from industry associations and owner and

[31] *International Institute of Ammonia Refrigeration*, "About Us," accessed February 4, 2015, http://www.iiar.org/iiar/WCM/About_Us/WCM/About.aspx?hkey=be11c6f5-3de2-45df-8918-aeaed863f650
[32] *International Liquid Terminals Association*, "About ILTA," accessed February 4, 2015, http://www.ilta.org/iltasite/aboutilta.htm
[33] *Institute of Makers of Explosives*, "About IME," accessed February 4, 2015, www.archive-org.com/page/4470203/2014-08-24/http://www.ime.org/dynamic.php?page_id=2
[34] *National Association of Chemical Distributors*, "About," accessed February 4, 2015, www.nacd.com/about/
[35] *Society of Chemical Manufacturers and Affiliates*, "About SOCMA," accessed February, 4, 2015, http://www.socma.com/about/

operator companies.[36] Industry associations on the SCC provide representation of the perspective of small to medium sized institutions who would not have the resources to engage regularly with the Federal government otherwise. The SCC provides associations in the industry the opportunity to collaborate on issues of sector and national importance. Leadership of the Chemical SCC – the chair and vice chair – are identified from owner or operator institutions. Based on volume of products produced, the SCC represents a significant majority of the owners and operators in the sector.

The Sector heavily relies heavily on power to run its processes, both steam and electricity. Major chemical facilities may generate a portion of their own power or contract with utilities for electricity and steam, a concept called co-generation, while smaller sites will rely on utilities to provide electricity or natural gas for power. In addition to power, materials extracted from natural gas are major raw materials, often called feedstock. Failure or disruption of supply of utilities, feedstock or water will impact operations and the sector's supply chain. In addition, the Sector also has a major dependency on the Transportation Sector.

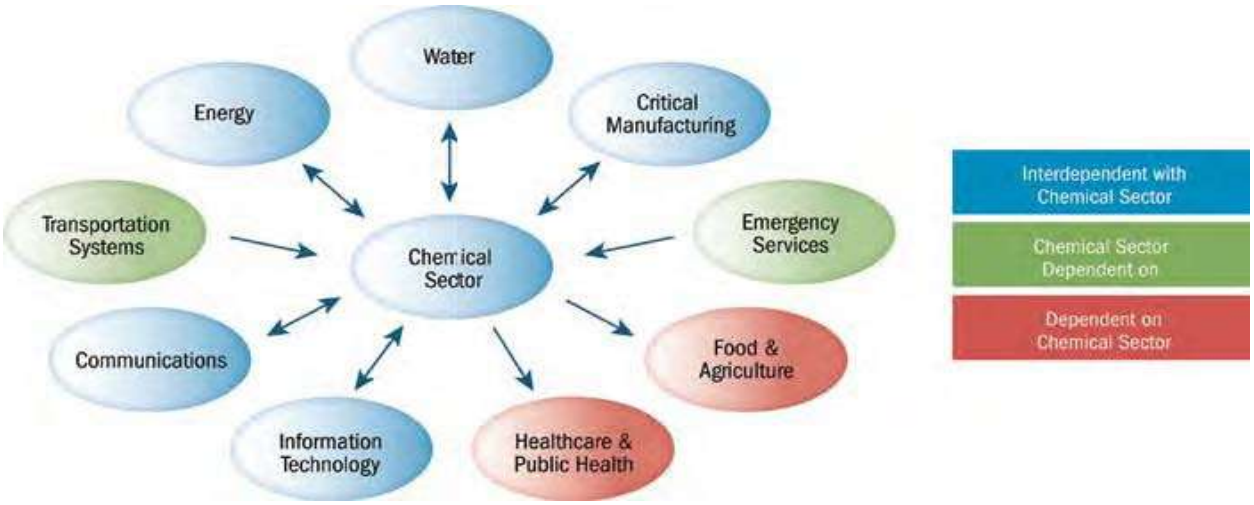

Figure 10 – Chemical Sector Dependencies and Interdependencies[37]

II. CEO Landscape:

Chief Executive Officers (CEO) in the Chemical Sector almost never engage with the Federal government directly as a collective group, because of its scale and diversity of interests. They primarily work within and through their industry associations to address industry-wide, national and international issues.

The Sector is highly regulated for safety and security of its operations. The chemical industry, because of the competitive nature of the markets and the fact there are many cross company

[36] *Critical Infrastructure Partnership Advisory Council (CIPAC),* accessed February 4, 2015, www.dhs.gov/critical-infrastructure-partnership-advisory-council

[37] "Chemical Sector Specific Plan: An Annex to the NIPP," 2010, 15, accessed February 4, 2015, www.dhs.gov/xlibrary/assets/nipp-ssp-chemical-2010.pdf

interactions, needs to assure both anti-trust and competitive issues are managed appropriately. Compliance with this framework will at times create some unintended obstacles to issue resolution. Even the appearance of collusion is always a concern. To maintain continuing consciousness of anti-trust, codes of conduct to comply with anti-trust regulations are reviewed at every meeting of many industry associations, such as the ACC. Managing hazardous shipments of material is a good example of having to reconcile competitiveness and antitrust issues while enhancing security and safety. Exposing a company's product shipment costs or pricing to other companies is a competitiveness concern. Consequently, lack of this information can be a challenge in setting the distance and route of product shipped for finding the most efficient routes.

CEOs, working through trade associations such as the ACC and the Chemical SCC, have committed to working with regulators to make safety and security regulatory programs more effective and efficient through improved implementation and better use of private and public sector resources.

CEOs convene primarily within their industry associations. CEO members within the ACC, for example, meet collectively twice a year. There is a working group of CEOs within the ACC that oversees policy and structure. Every quarter, they review policies at the board level which consists of CEOs. There is a sponsoring CEO for every major issue activity, such as rail transportation. A CEO usually chairs each sub-committee that is created to address an issue area. Cross sector coordination does occur with other sector associations when an issue arises that require their members' participation. While the work of implementation and execution may be delegated to working groups of executives, the tone is created by the CEO who sponsors or chairs the working group or sub-committee. It was noted by one industry CEO that: "When it comes down from the top and the CEO is responsible, it usually works."

III. Topics/Issues that CEOs Focus on:

Safety and security are essential to the sector, both in terms of the chemical assets produced by sector organizations, but also in terms of mitigating potential dangers to employees, customers, suppliers, and communities. Primary concerns the sector sees are: 1. release of chemicals; 2. theft or diversion; 3. sabotage or contamination.

With this focus in mind, many Chemical Sector infrastructure owners and operators voluntarily implement protective measures related to the physical, cyber, and human aspects of their individual chemical facilities as part of facility security programs. Many in the sector recognize the need to provide coordination and oversight on matters that have critical importance to the entire industry. Consequently, when CEOs recognize that an issue could affect the viability, cost or market structures of the entire industry, they will organize and convene to develop a strategy to address. As a common perspective for industry in general, maintaining the confidence of the public and its customers in the reliability, safety and security of its operations are paramount to

the chemical sector's sustainability and cost-effectiveness. Consequently, the sector, in general, has a well-developed and highly regarded best practices approach to risk management with regard to safety and security issues.

The role of the CEO in driving an issue is illustrated by the industry-wide development, implementation and deployment of the Responsible Care® Program through ACC. The Program, as described in Section VI of this Case Study, emerged as a result of the industrial tragedy that occurred in 1984 in Bhopal, India. The program was initiated by industry CEOs who determined that the Responsible Care® Program was necessary to promote voluntary continuous improvement on best practices in security as well as safety, environmental and health protection. Several companies, led by their CEOs, convened within ACC and developed the direction, desired outcomes, and deliverables for the program and provided oversight for implementation. Through the association's sub-committee and working group structure of members throughout the industry, the Program was implemented and deployed. The CEOs monitored and tracked progress and provided guidance on issues as they emerged. Because of the strict anti-trust regulations that apply to the industry, lawyers were present in all the discussions to confirm compliance with all laws. In order to be a member of the ACC, the CEO of a company must sign the Responsible Care® Code and is held accountable for compliance by his company. The Program also encourages that suppliers to Responsible Care® Program members assume Responsible Care® as well, which requires CEOs of those suppliers also sign the commitment. The model in most companies is that there is a management system in place to assure compliance. Implementation of policies and activities are done through a delegation of authority. A Responsible Care® company then audits periodically to make sure service supplier management is implementing Responsible Care® to their standards. In addition, third party validation is required of members to stay a member of the association. Accountability for execution of the program in the company is built into management policies, controls and reporting.

It was also noted that the ACC represents about 100 of the larger companies. The Responsible Care® Program beyond the ACC is voluntary. Companies from other associations have other management approaches. For example the Society of Chemical Manufacturers & Affiliates (SOCMA), which represent over 200, in general, smaller companies than in ACC, has ChemStewards® as their environmental, health, safety and security (EHS&S) management program. Companies which are not represented establish their own management system or pull for other standard bodies.[38]

[38] *Society of Chemical Manufacturers and Associates*, "ChemStewards® Overview," accessed February 4, 2015, www.socma.com/ChemStewards/

Cyber security has recently emerged as a topic that would have industry wide impact as a threat and risk. The Chemical Sector, like many other sectors depend operationally on cyber systems. The threat is seen as creating a requirement to be addressed across the Chemical Sector, along with its supporting sectors. The challenge is the diversity of the sector and potential conflicts with existing multiplicity of regulatory frameworks under which many members of the Sector fall. The Chemical Sector may have to work with transportation to address an issue, but there is the possibility of having issues with the Department of Justice due to anti-trust. For example, minimizing routes for efficiency and public safety may make a lot of sense, but addressing that issue gets into conflicts with anti-trust.

At the regional level, individual companies cooperate with other sectors, as demonstrated by relationships with local or regional Electricity Sub-Sector and Transportation Sector companies. Preparedness, planning, and investments are critical to sustaining resiliency, which primarily are situated at the local level where the plants and delivery systems operate.

IV. Lessons learned:

The Chemical Sector, due to its market structure, must have a greater focus on anti-competitive and anti-trust compliance than some other sectors. The sector is subject to regulation by multiple regulators. Assuring compliance with some of the very strict, and at times, conflicting restrictions to open sharing and collaboration between institutions within the sector can slow risk information flow and often make resolution of issues challenging. Addressing the cyber threat and its required pace of information flow can be a challenge. Agencies, with regulatory oversight over the industry, such as DHS, create some reluctance to collaborate and share information. It was also seen by at least one CEO member of the Sector that DHS, as a regulator, may pose a barrier to partnership, illustrated by its slowness to share sector-relevant threat and cross sector best practices and lessons learned information. Interaction with the regulatory components of DHS is much more common and more highly visible than interaction with the voluntary program component of DHS.

Because of its diversity, there have been only a few issues that would convene the entire sector as it is defined. Members of the Sector have historically organized themselves around specific issues or issues that affect a particular segment of the Sector. The SCC is seen as a forum within which different parts of the Sector can and do come together to address, coordinate and collaborate on critical infrastructure issues and programs with the Federal government. However, the issues articulated so far have not risen to the level of requiring direct participation by sector CEOs, and instead are represented by their associations within the Council.

V. Summary of Findings and Conclusions:

Findings for the Chemical Sector based on the information collected for this case study include:

- Compliance with anti-trust regulations and competitiveness issues can limit collaboration and coordination within the sector and requires greater thoughtfulness by participants in engaging with each other.
- Within such a framework, it is seen that DHS and the Federal government could better facilitate information sharing, particularly on risk information and cross sector best practices and lessons learned sharing.
- The multiplicity of security and safety regulatory regime under which the Chemical Sector operates, creates complexity for developing security and safety enhancements, even across sectors, and would benefit from greater coordination within government.
- Because of the diversity of the segments of the Sector, the Chemical SCC is seen as the primary forum for engagement with the Federal government and has provided a useful forum for coordinating across the Sector, although CEOs have had no reason to participate in the SCC.
- CEOs in the Sector, when they engage on an issue, can cause deployment of industry-wide programs and standards, and promulgate practices through management of their supply chains through their industry associations.
- The Sector is relatively well organized around specific issues and lines of business upon which to focus the owners and operators' resources. It is also very diverse with multiple lines of business and type of operations. Consequently, voluntary CEO engagement within this sector with the Federal government and with other sectors will likely require a specific problem of great enough impact to their companies that cannot be managed at the company level and the engagement will likely be with that segment of the sector to which the issue has the most relevance.

VI. Illustrative Example of a CEO/Senior Executive Industry wide Engagement: The Responsible Care® Program

Security in the Chemical Sector is seen as a shared responsibility. As such, the achievement of enhanced security is seen as requiring actions by all members of the Chemical Sector – including customers, suppliers, service providers, and government officials and agencies.

Responsible Care is a global initiative that began in Canada in 1984 and is practiced today by 57 national and regional associations in more than 60 economies around the world[39].

On December 3, 1984, a tragic incident in Bhopal India occurred. Many people died and others were injured as a result of exposure to gas released from a plant. As a result of the incident, the Responsible Care® Program was developed to strengthen focus on process safety standards, emergency preparedness, and community awareness.[40] Twenty-five years later, in response to

[39] *American Chemistry Council*, "Responsible Care," accessed February 4, 2015, www.responsiblecare.americanchemistry.com/
[40] "Statement of The Dow Chemical Company Regarding the Bhopal Tragedy," accessed February 4, 2015, www.dow.com/sustainability/issues/bhopal/

September 11, 2001, ACC members took the lead to enhance security against terrorism. Without waiting for government direction, the ACC Board of Directors adopted the Responsible Care® Security Code to further enhance the security of facilities, communities and essential products.[41]

Security Code of Management practices were developed to help protect people, property, products, processes, information, and information systems by enhancing security, including against potential terrorist attacks. The code, which is voluntary, is designed to assist companies in achieving continuous improvement in security performance using a risk-based approach to identify, assess, and address vulnerabilities; prevent or mitigate incidents; enhance training and response capabilities; and maintain and improve relationships with key stakeholders. These protections are implemented throughout the chemical industry value chain, which encompasses company activities associated with the design, procurement, manufacturing, marketing, distribution, transportation, customer support, use, recycle and disposal of Chemical Sector products. Participating in the Program by a company requires its CEO to sign a commitment to the Code and its processes. The Responsible Care® Management System process requires a mandatory certification by an independent, accredited auditor, which must be renewed every three years.

The Responsible Care® Program provides the framework and foundation for managing security risk across an organization by providing an integrated approach that encompasses all aspects of the chemical supply chain: physical plant security; cyber and IT security; and transportation and value chain security. When treated as a system, an organization can implement a comprehensive approach to managing security risk by looking at vulnerabilities across the organization in a holistic way. From that position, an organization can then develop sound solutions that minimize risks while maximizing the value of the business operation and protecting the critical assets of the company. Core elements of the Security Code are represented in the Enhancing Chemical Security document, which has been included below.

[41] *American Chemistry Council*, "Responsible Care® Security Code," accessed February 4, 2015, www.responsiblecare.americanchemistry.com/Responsible-Care-Program-Elements/Responsible-Care-Security-Code/default.aspx

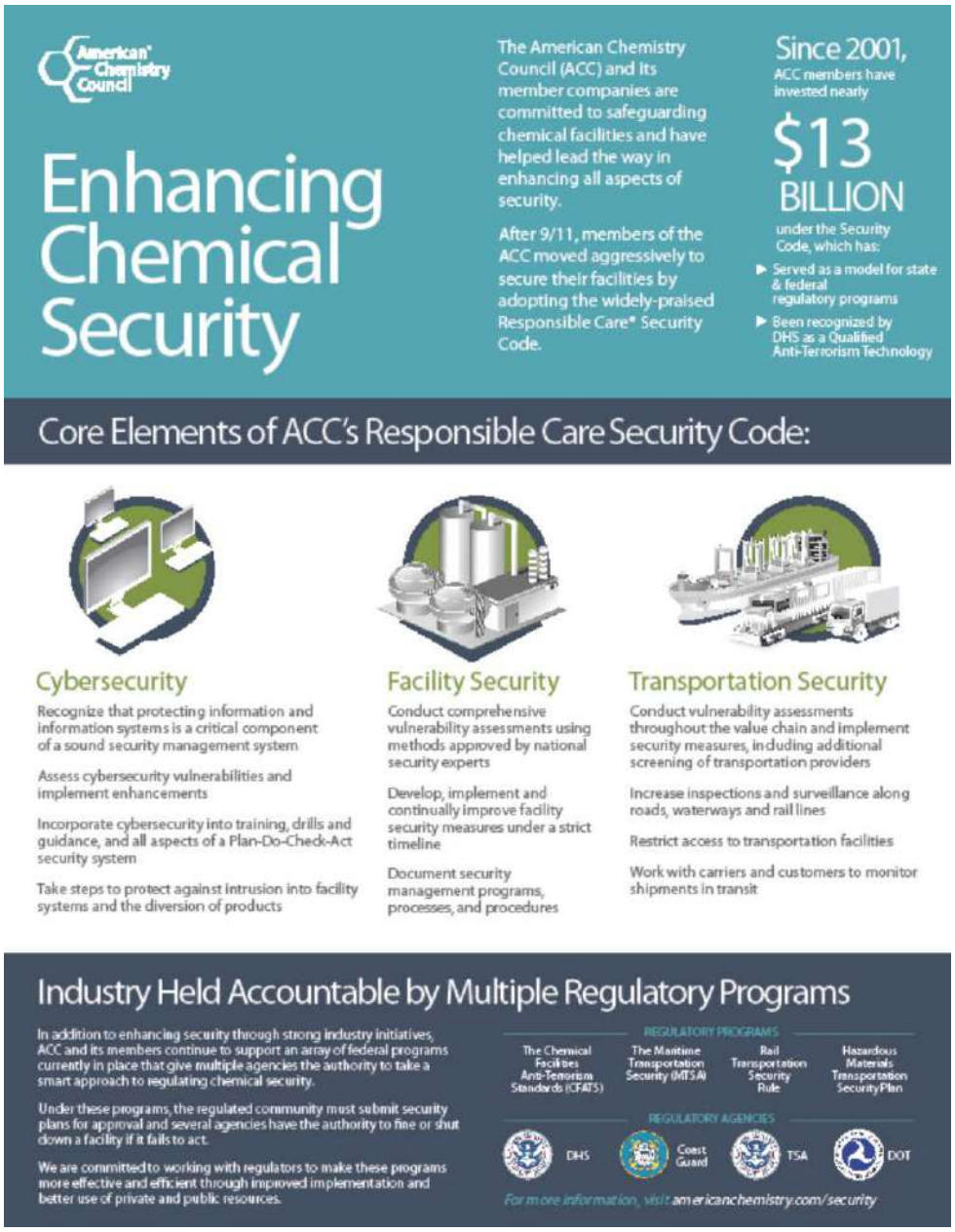

Figure 11: Enhancing Chemical Security[42]

Implementation of the Security Code is mandatory for all members of the ACC. All companies have made CEO-level commitments to uphold the following program elements, which are the pillars of the Responsible Care® Program:

- Adhering to the Responsible Care® Guiding Principles
- Implementing the Responsible Care® product safety, process safety and security codes

[42] *American Chemistry Council*. "Enhancing Chemical Security, Core Elements of ACC's Responsible Care® Security Code."

- Measuring and publicly reporting performance , using the Responsible Care® performance measures
- Applying the modern Responsible Care® management system to achieve and verify results

In the time since the code was created, it has become the standard for the industry, and both the approach to its creation and the code itself have served as models for other regulatory programs.

Communications Sector Case Study

I. Sector Landscape:

The Communications Sector is diverse, complex, and highly competitive. At the same time, many segments are seen as "pervasively" regulated by the Federal government which includes regulations that facilitate market competition. Rapid technological innovation continuously changes the markets, services, products, and capabilities. Innovation also creates more competition. Because of the extensive competition within this sector, participants are very sensitive to anti-trust considerations in their interactions with other members of the sector. Most of the largest participants in this sector are businesses that are global in nature and must consider and address issues that can affect their operations, competiveness and risks internationally as well as domestically. In addition to the energy sector, the communications sector is considered one of two "core" infrastructures within Presidential Policy Directive 21 (PPD-21): Critical Infrastructure Security and Resilience. The innovation and growth of the communications sector is a major engine for growth in the nation's gross domestic product. In 2014, the sector invested $1.3 trillion in its infrastructure, representing more than 25% of all global communications investment.[43] [44]

The Communications Sector has evolved historically from basic radio communication and telephone services into a multi-faceted sector. The Sector is made up of five industry segments:[45]

(1) Wireline- Consists primarily of the Public Switched Telephone Network (PSTN), but also includes enterprise networks. The PSTN is a domestic communications network accessed by telephones, key telephone systems, private branch exchange (PBX) trunks, and data arrangements. The wireline segment remains the backbone of the communications infrastructure and includes landline telephone, the Internet, and submarine cable infrastructure

(2) Wireless- Refers to telecommunication in which electromagnetic waves (rather than some form of wire) carry the signal over part of or the entire communication path. This industry segment consists of cellular phone, paging, personal communication services, high-frequency radio, unlicensed wireless, and other commercial and private radio services

(3) Satellite - This is a platform launched into orbit to relay voice, video, or data signals as part of a telecommunications network. Signals are transmitted to the satellite from earth

[43] "Telecommunications Industry Association's 2014-2017 ICT Market Review & Forecast," Arlington, VA: Telecommunications Industry Association, accessed February 20, 2015, www.tiaonline.org/resources/market-forecast

[44] *Telecommunications Industry Association*, "The Most Dangerous Animal on the Internet," accessed February 20, 2015, www.tiaonline.org/about/

[45] Maggie Wilderotter, letter to NIAC Designated Federal Officer, November 21, 2014

station antennas, amplified, and sent back to Earth for reception by other earth station antennas. Satellites use a combination of terrestrial and space components to perform many types of functions, such as the bi-directional transmission of voice, video, and data services; data collection; event detection; timing; and navigation

(4) Cable-Provides high-speed wired and wireless internet access service, video programming service, and digital telephone service

(5) Broadcasting- Consists of free, over-the-air radio and television stations that offer analog and digital audio and video programming services and data services. Broadcasting has been the principal means of providing emergency alerting services to the public for six decades

Despite the seeming diversity and complexity of this Sector, members of each segment must interact with the others to ensure the availability, integrity and confidentiality of the services that pass across their collective networks.[46] Another Chief Executive Officer (CEO) noted that the industry will grow even more complex. Cable industries are starting to provide Wi-Fi services which ultimately will carry broadband and voice traffic, causing overlap between segments.

The Federal Communications Commission (FCC) is the primary regulatory agency for the sector. An independent U.S. government agency overseen by Congress, the FCC regulates interstate and international communications by radio, television, wire, satellite and cable in all 50 states, the District of Columbia and U.S. territories. The FCC states as its responsibility, the ensuring of an orderly policy framework within which communications products and services can be efficiently and effectively provided to consumers and businesses. The FCC must also address the communications needs of public safety, health, and emergency operations; ensure the universal availability of basic telecommunications service; make communications services accessible to all people; and protect and empower consumers in the communications marketplace.[47]

Established FCC strategic goals for 2014-2018 include:[48]

- Maximizing access to and use of affordable fixed and mobile broadband
- Maximizing the availability of spectrum in order to provide diverse and affordable communications services to consumers
- Empowering consumers by ensuring that they have the tools and information they need to make informed choices in their use of communications services; protect consumers from harm in the communications market

[46] Maggie Wilderotter, letter to NIAC Designated Federal Officer, November 21, 2014
[47] *Federal Communications Commission*, accessed February 20, 2015, www.fcc.gov/
[48] "Federal Communications Commission Strategic Plan 2014-2018," Washington, DC: Federal Communications Commission, accessed February 20, 2015, www.fcc.gov/document/fcc-strategic-plan-2014-2018

- Promoting innovation, investment, and the nation's ability to compete in the global economy
- Ensuring a competitive market for communications and media services to foster innovation, investment, and job creation, and to ensure consumers have meaningful choice
- Promoting the availability of reliable, interoperable, redundant, rapidly restorable critical communications infrastructures that are supportive of all required services.

Because of its authorities and role in facilitating competition within the industry, including consideration and incorporation of new technologies, reliability, and access to capabilities as part of its oversight, the decisions of the commission plays a prominent role in business decisions, and, sometimes, even implementation and operational actions of sector owners and operators. An example that was given was the withholding of a launch of satellite service roll-out because there was insufficient quorum for a vote on a ruling by the Commission. Because of the Commission's impact on the market place of this sector, the Commission has established several advisory committees, such as the Communications, Security, Reliability and Interoperability Council (CSRIC) composed or subject matter experts to collect information to better inform its decisions on rule-making. The FCC, unlike the Federal Energy Regulatory Commission (FERC), a regulator for bulk power and transmission in the electricity sector, is not an economic regulator setting rates for the services and products delivered by the industry. The FCC is seen as more of technology and economic regulator through promotion of competition.

As with other sectors, the members of the sectors organize themselves through trade and professional associations in order to focus on particular issues of common interest. Although there may be dependencies between segments, there are also major differences and emphases on types of issues. Consequently, the diversity of the sector is reflected in the diversity of the trade associations with each segment being represented by their own trade associations. [See Section VI for partial list.] Innovation in technology or services can drive additional new market segments to emerge with the creation of new special interest groups. At the same time, services or capabilities can begin to converge, which then results in businesses from one segment to enter to provide products or services in another one. As one CEO interviewed noted, "Competition is cut-throat."

As in other sectors, trade associations are best known for their role is their policy advocacy role. However, some play expanded roles. An example is the Telecommunications Industry Association (TIA). It is accredited by the American National Standards Institute (ANSI) to develop voluntary, consensus-based industry standards for a wide variety of Information and Communication Technologies (ICT) products. It operates 12 engineering committees, which develop guidelines for private radio equipment, cellular towers, data terminals, satellites, telephone terminal equipment, accessibility, VoIP devices, structured cabling, data centers,

mobile device communications, multimedia multicast, vehicular telematics, healthcare ICT, machine-to-machine communications, and smart utility networks. To ensure that these standards become incorporated globally, TIA is also engaged in the International Telecommunication Union, the International Organization for Standardization, and the International Electrotechnical Commission.[49]

The Sector has a very active Sector Coordinating Council (SCC) that engages with its counterpart Government Coordinating Council in the Federal government under the Critical Infrastructure Partnership Advisory Council (CIPAC) framework regularly. It consists of 40 members, representing segments of the entire industry and includes trade associations to assure representation of smaller businesses who may not participate as regularly with their limited resources.[50] It establishes working groups to address specific issues composed of members from across the five segments. It sees as part of its purpose to integrate and align multiple initiatives from various forums such as the FCC's CSRIC cyber security best practices for risk management, the implementation of the National Institute of Standards and Technology (NIST)'s Cyber Security Framework, and DHS' Cyber Security Voluntary Cyber Security Program. A member of the SCC stated that the industry has committed substantial resources to these efforts. He estimated that about 30 senior executives are meeting weekly on the cyber security working group of the SCC, about 100 industry representatives working on the CSRIC activity, and dozens of people working on the NIST efforts.

All other sectors depend on the communications sector. In turn, the dominant dependency for the Communications Sector is electrical power. Every node in the communications architecture - whether it is a switching center, radio relay site, cell site, other remote site, or any other facility - relies on electrical power for its operation. Electricity powers the communications systems equipment, the central control/management/operating systems, and even the environmental control systems surrounding the communications equipment. In order to overcome any loss of commercial power, most communications locations have some form of alternative power capability inherent to the facility which generally is limited and dependent on fossil fuels or natural gas. Most communications facilities require environmental control to maintain nominal conditions for equipment to operate; this may require either water for cooling or gas for heating. The next critical dependency for the Communications Sector as well as the other sectors is dependency on its supporting control systems that are provided by the Information Technology Sector. [51] For daily operations, the sector depends on financial services for payroll and

[49] *Wikipedia*, "Telecommunications Industry Association," accessed February 20, 2015, www.en.wikipedia.org/wiki/Telecommunications_Industry_Association

[50] *Department of Homeland Security*, "Communications Sector: Council Charters and Membership," accessed February 20, 2015, www.dhs.gov/communications-sector-council-charters-and-membership

[51] *Federal Communications Commission*, "Tech Topic 19: Communications Interdependencies," accessed February 20, 2015, www.transition.fcc.gov/pshs/techtopics/techtopics19.html

purchases, critical manufacturing for its parts and transportation to deliver parts and people to where they are operationally needed.[52]

FIGURE 4 — Communications Sector Interdependencies.[53]

II. CEO Landscape:

Trade associations and industry engineering committees are focal points for CEO (or equivalent) discussions on relevant issues that implicate the entire industry. CEOs most often convene themselves through trade associations and on a routine basis. The trade associations provide the staffing to address common issues and often to do the research necessary to inform the CEOs understanding and decision-making on specific topics. Consequently, the trade associations represent the means to reach many CEOs. Data collected from several trade association CEOs indicated that trade associations can assist in making discussion agendas meaningful to bring value to the CEOs to participate in those discussions.

There is an array of trade associations. It is important to define what is to be accomplished and who can achieve the end result. For example, the broadcasting industry could have different segments within that industry. Depending on how you define services that are provided via satellite, there could be multiple organizations involved, including representation of users of a particular product or service. The associations see themselves spending a lot of time coordinating among themselves with regard to standards, processes, policy objectives and technology advances. They see themselves as a series of "interconnected networks" with ownership and operations by small and large companies, rural and urban, so it is "important that policies work for the entire industry".

An association, such as the US Telecom Association (USTA), has a board of directors composed of senior executive decision-makers. USTA's Board of Directors consists of 18 members. The

[52] *Department of Homeland Security*, "Sector Risk Snapshots May 2014," accessed February 20, 2015, www.hsdl.org/?view&did=754033
[53] *Department of Homeland Security*, "Sector Risk Snapshots May 2014," accessed February 20, 2015, www.hsdl.org/?view&did=754033

largest companies are represented by senior executives who report directly to their CEOs. Other members are CEOs of smaller companies but still often multi-billion dollar companies. The association has a diverse member base ranging from large publicly traded communications corporations to small companies and cooperatives – all providing advanced communications services to markets both urban and rural.[54] Trade associations, such as USTA, provide smaller companies with a voice that they might not have otherwise, and consequently the majority of its members are medium to small businesses. The Board of USTA oversees committees, including standards and engineering policy, and technology, with working groups on issues of common interest. The Board meets four times a year, and devotes portion of their meetings to items such a cyber-security.

Given the size and diversity of the network service providers, the Communications Sector aligns its public-private-partnership activities in three tiers of activity: Policy, Planning and Operational Coordination. While there are policy components to the Planning and Operational activities, CEOs are most highly engaged at the Policy level where discussion between industry and government is necessary to address strategic risks, segment-specific concerns, or to address new initiatives.[55]

In addition to convening within their trade associations, CEOs engage at the Policy level with the Federal government on advisory committees that fall under the Federal Advisory Committee Act (FACA). Two such forums are the President's National Security Telecommunications Advisory Committee (NSTAC) which provides advice to the President on national security telecommunications and emergency preparedness matters and the Communications Security, Reliability and Interoperability Committee (CSRIC) which provides advice to the FCC to inform its understanding of communications issues related to inform its rule-making responsibility and role, which includes promulgation of best practices. As FACA committees, their responsibility is limited to provision of advice. However, CEO members who participate in these forums often make independent commitments to work with the Federal government to promote and implement their own recommendations.

The Sector Coordinating Council addresses the vast majority of Planning activities with Government, while Operational Coordination is addressed through special-focus, closed trust groups, such as the Department of Homeland Security's National Coordinating Center (NCC), which provides the 24/7 Watch Desk support for information sharing across the network providers in steady state and in an incident. All Planning and Operational activities conducted in the public-private-partnership mode are developed consistent with the overarching policy guidance set by industry CEOs of the participants and based on their CEOs' commitment of

[54] U.S. Telecom; http://www.ustelecom.org/

[55] Maggie Wilderotter, Letter to NIAC Designated Federal Officer, November 21, 2014.

resources to support the activity, some of which is extensive.[56] Since the SCC includes trade associations from all industry segments, as well as representatives from the larger industry companies, it acts as a planning forum across the industry.[57]

Although some of these structures and processes have been established for years, there appears to be less awareness of them than one might expect in parts of the industry. An interview with a new trade association CEO indicated that he was not aware of the existence nor the activities and role of the NSTAC, NCC or CSRIC.

III. Topics/Issues that CEOs Focus on:

The topics that CEOs focus on are reflected in the agendas and priorities of the trade associations in which they participate. All of the major segment trade associations focus on areas that represent potential impacts to the security, reliability and availability of their members' services. These all represent foundations for profitability and relationships with customers which is critical in a highly competitive industry. Profitability is also affected through the direction of technology development, its pace, and its application. Consequently, CEOs may find particular aspects of technology development compelling enough to engage together with government, particularly with the FCC, whose rulings have much impact over the technological path forward for many segments of the sector.

For network service providers, one trade association CEO observed that "Every CEO in our industry understands that his core business is making sure that the network doesn't go down. Every CEO is laser focused on this." Operations continuity and service availability has been the core foundation for the establishment of the NSTAC and its relationship with the Federal government. There is integration at many levels in the industry, through associations, alliances for telecommunications and the supply chain side because businesses in the sector want to make sure that any equipment they buy is not going to be adulterated. Technology advances and the use of them have changed the landscape. Where, previously, the focus was on keeping the network system up, it is now keeping the system of systems up. Any issue that threatens this continuity becomes a focal point for the industry's leadership. One trade association CEO noted that, "Of course it's voluntary, but it's voluntary for a taxi driver to make sure his car operates, but if he doesn't, he doesn't have a business." The engagement of the CEO does vary according to the size of the organization. A large organization is more likely to have a strong continuity of operation and have more people responsible for certain details. In a smaller company, with fewer resources, the CEO will have greater awareness of the plan itself, and be the driver for establishing a continuity of operations plan.

[56] Ibid.
[57] Ibid.

When CEOs do participate, the issues range from specific reported and unreported events that are threats to the network, long term strategic planning, the appropriate role of government and industry. However, given the competitive nature of the markets in the sector, anti-trust regulations and loss of competitive advantage are both considerations. For example, in order to coordinate with government or with other businesses, who could be competitors, information sharing is the necessary enabler. However, both liabilities and loss of competitive position are big issues. Because of a host of somewhat dated regulations and policies, members of the industry see that there are real legal impediments to being able to share threat information. Even the sharing of continuity plans are seen as a potential loss of market positioning.

However, when there are dependencies between goods and services providers, there could be a compelling case for engagement. One CEO gave an example that wireless services are dependent on the tower owners. A meeting to address specific issues between these two groups might be considered compelling. He also observed that the wireless industry would not survive long without electricity. For example, if consumers cannot recharge their phones, no one will be using them. He explained that perhaps it is not just a telecommunications industry focused effort for CEO engagement, but one where they see they are dependent upon certain sectors to receive certain services. Therefore, if the utilities are going to be involved because they see the importance of an issue, it becomes more attractive across the sectors to engage. The telecommunications industry players will want to engage as well. He thought that the government is suited to pull together the sectors, because the telecommunications industry may not have the contacts needed to engage with the groups with which they are dependent on.

CEOs regularly become engaged when new issues or information that may impact the availability or security of networks come to light. Many times, government has information that would not otherwise be known, or alternatively, government may wish to initiate new programs that might have operational impact. Under these circumstances, CEOs sometimes become engaged. One CEO observed that CEOs concentrate on keeping their own areas operable and many of their motivations to engage with the government stems from this. The majority of CEOs that would engage in partnership are looking for solutions or information to identify and to address their potential risks.[58] When engaging with government, one CEO observed that providing a clear agenda would help. Every time there is engagement with the government, there is concern of who will be there and how information shared will be used. Operating companies are responsible for the safety of employees and their subscriber base, along with continuity of operations. These were the common elements that would bring CEOs to the table.
One CEO also observed that because the Federal government is a customer of multiple telecommunications providers, they are in a position to incent engagement, not as a coordinator but as a customer.

[58] Maggie Wilderotter, Letter to NIAC Designated Federal Officer, November 21, 2014.

IV. Lessons learned:

The primary fallout from Hurricane Sandy for some service providers was not the major loss of cellular towers but the lack of power available to the Communications Sector facilities, and the fact that there was not enough backup power available. One proposal is to pass a law requiring all cities and towns to have backup power sources such as generators on hand for use in emergency situations. However, as became apparent in the aftermath of Hurricane Sandy, generators would have to be stored away from a potential flooding or other natural hazards.

Many thought that the Communications Sector was responsible rather than the Energy Sector which led to discussions about responsibility for the production and management of backup power and whether or not it should be federally mandated. Many facilities do not have backup generators. In the case of Sandy, many of the backup generators in New York were in basements that were flooded; their required chosen location possibly due to zoning laws or noise ordinances, but ideally, generators should not be put in locations subject to flooding. These issues require cross sector discussion but no such cross sector forums exist at the present time.

The NSTAC has engaged with some members from the Electricity Sub-Sector through a one-time cross sector working group under its advisory structure to develop a report and recommendations on addressing power issues affecting the telecommunications industry.[59]

V. Summary of Findings and Conclusions:

Findings for the Communications Sector based on the information collected for this case study include:

- The Communications Sector is highly diverse, complex with many competing interests; it is highly competitive and its members, therefore, are sensitive to anti-trust and loss of competitiveness issues, particularly as it relates to information sharing
- The largest organizations have a vested national security role which began historically with the break-up of AT&T, and have a well-established structure of engagement with the Federal government
- Trade associations are the focal point for engagement of CEOs and the channel for coordination with other segments of the industry
- The Sector Coordinating Council for the sector is very active and is acting as a bridge across the segments of the sector through trade associations as well as individual representation from the larger organizations within the sector
- Because of its diversity, the issues that will likely cause engagement may be specific to a segment of the industry

[59] Maggie Wilderotter, Letter to NIAC Designated Federal Officer, November 21, 2014.

- The sector is very focused on market competitiveness and managing its market share and profitability within the industry's regulatory framework, that further CEO or senior executive decision-maker engagement with groups outside of its regulator and the White House/national security agencies which are large customers, will need a very clear focused agenda with a substantive value proposition to the parts of the industry to be engaged

VI. Partial List of Trade and Professional Associations [60]

- Association of Public Television Stations
- Alliance for Telecommunications Industry Solutions (ATIS)
- CableLabs
- CTIA – The Wireless Association
- Internet Security Alliance
- National Association of Broadcasters
- National Cable & Telecommunications Association
- NTCA – The Rural Broadband Association
- Satellite Industry Association
- Telecommunications Industry Association (TIA)
- US Internet Service Provider Association
- USTelecom Association
- Utilities Telecom Council

[60] *U.S. Communications Sector Coordinating Council*, "About CSCC," accessed February 20, 2015, www.commscc.org/about/members/

Electricity Sub-Sector Case Study

I. Sector Landscape:

The electricity infrastructure consists of three major sub-components:

- Power generation
- Bulk transmission
- Distribution

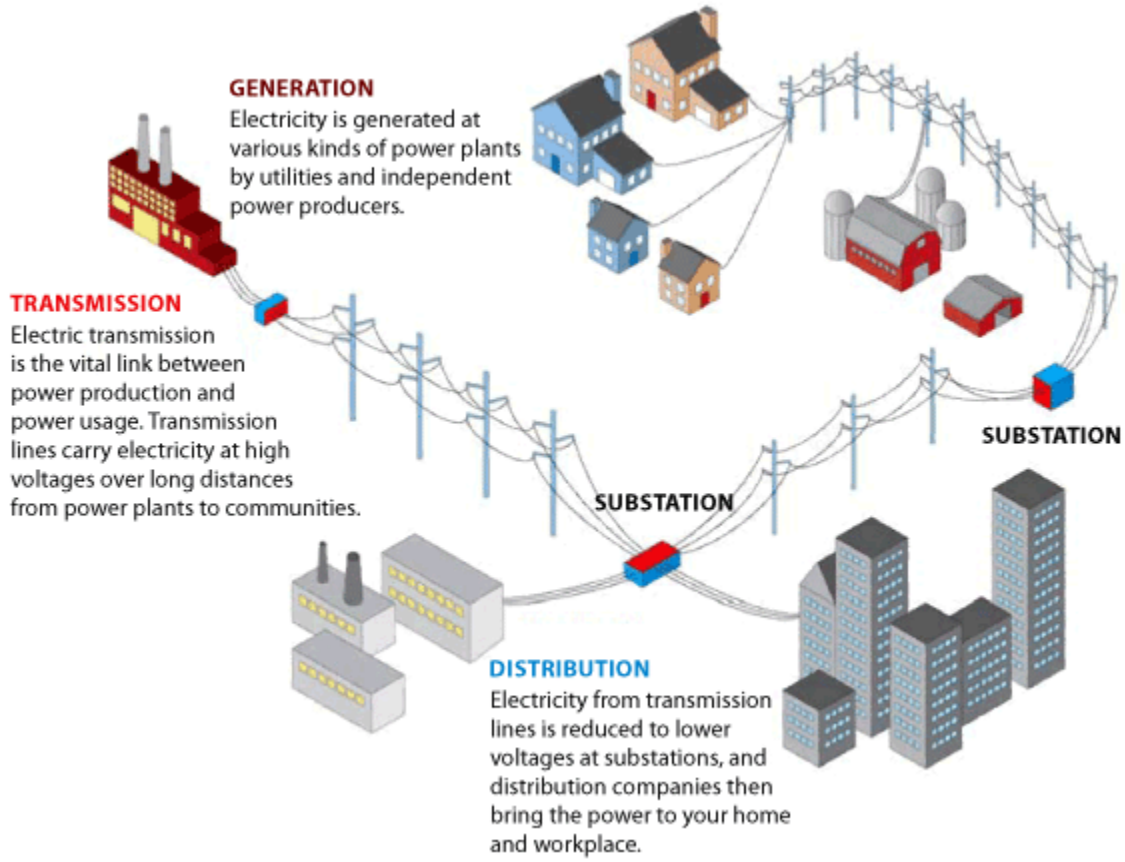

FIGURE 6 — Subcomponents of the Electricity Infrastructure.[61]

[61] *U.S. Department of Energy*, "Benefits of Using Mobile Transformers and Mobile Substations for Rapidly Restoring Electric Service: A Report to the United States Congress Pursuant to Section 1816 of the Energy Policy Act of 2005," 2006, accessed January 28, 2015, www.energy.gov/sites/prod/files/oeprod/DocumentsandMedia/MTS_Report_to_Congress_FINAL_73106.pdf

The operations of the electric sector touch virtually everyone. The regulated status of public electric utilities, in particular, "imposes special responsibilities in return for assurances of the opportunity to recover their costs, and for investor-owned utilities, to earn a reasonable return on their investments. Maintaining the reliable operations of the Nation's electric power systems requires a high degree of cooperation and coordination among sometimes competing utilities and adherence to stringent performance standards."[62]

"Electric utilities are the largest component of the electric power industry, a diverse patchwork of investor and publicly owned utilities; consumer cooperatives; Federal, State, and local government agencies; co-generators; and independent power producers. The distinguishing characteristic of most electric utilities is that they are regulated monopolies that sell power to retail customers."[63] The sub-sector is composed of over 3200 electricity providers.[64] "Private, or "investor-owned utility" (IOU) rates are highly regulated by state (public utility commissions (PUC)) or federal (Federal Energy Regulatory Commission(FERC)) authorities, whereas public utility (municipal electric companies, and electric cooperatives) rates are generally set by a locally elected electric board without much oversight by utility regulators. Currently, investor-owned utility companies serve approximately three quarters of all electric consumers with most of the rest served by coops, municipals, and federal authorities."[65] Consequently, not only are utilities subject to laws and regulations governing financial transactions, employment practices, health and safety, and environmental impacts, they are also subject to economic regulation through rates setting by local, state and Federal entities.[66]

Although market deregulation has occurred in the generation markets of the sub-sector, the owners and operators of the rest of the transmission and distribution components remain monopolistic in the areas over which they operate. The sub-sector is capital intensive.

The members of the Electricity Sub-Sector have a history of working together because of their dependency on the national electric grid that connects the majority of them together, from generation to transmission to distribution at the local level. The sub-sector has had mutual aid agreements established across the sub-sector across the nation for decades. Members of the sub-sector engage with each other on matters of mutual interest, particularly on reliability of the national grid. The sub-sector established the National Electric Reliability Council (NERC) for this purpose to establish voluntary standards for management, construction and maintenance, and

[62] "Electric Utility Industry Structure, Regulation, and Operations," in *Energy Efficiency: Challenges and Opportunities for Electric Utilities*, 32, accessed January 25, 2015, www.princeton.edu/~ota/disk1/1993/9323/932305.PDF
[63] ibid
[64] *American Public Power Association*, "*2014-15 Annual Directory & Statistical Report*, " 2015, 26, accessed January 25, 2015, www.publicpower.org/files/PDFs/USElectricUtilityIndustryStatistics.pdf
[65] ibid
[66] Electric Utility Industry Structure, Regulation, and Operations, *Energy Efficiency: Challenges and Opportunities for Electric Utilities,* page 34, accessed January 25, 2015, www.princeton.edu/~ota/disk1/1993/9323/932305.PDF

operations. NERC transitioned into a regulatory organization in 2006[67] under the oversight of the FERC, but its purpose, to assure reliability of the national grid, remains.

In addition, when the need arises, the members of the sub-sector coordinate with each other through established industry wide consortiums and trade associations. Trade associations are more often recognized in their lobbying roles, but they also often provide forums for sharing of best practices for management, operations, and research and development planning and coordination. Trade associations enable members to pool resources, expertise and staffing to address industry wide issues and initiatives, and sometimes, acceptable practices or standards. The trade associations often provide the pooled resources required for staffing public-private partnership initiatives, since individual companies primary attention has to be on their core business operations, their shareholders and customers/ratepayers. Examples of such consortia include:

- **American Public Power Association (APPA).** APPA is the service organization for the nation's more than 2,000 community-owned electric utilities. APPA was created in 1940 as a nonprofit, non-partisan organization to advance the public policy interests of its members and their consumers, and provide member services to ensure adequate, reliable electricity at a reasonable price with the proper protection of the environment.[68]
- **Edison Electric Institute (EEI).** EEI is the association that represents all U.S. investor-owned electric companies. EEI's mission is to ensure members' success by advocating public policy, expanding market opportunities, and providing strategic business information.[69]
- **Electric Power Supply Association (EPSA).** EPSA is the national trade association representing competitive power suppliers, including generators and marketers. These suppliers, who account for nearly 40 percent of the installed generating capacity in the United States, provide reliable and competitively priced electricity from environmentally responsible facilities serving global power markets. EPSA seeks to bring the benefits of competition to all power customers.[70]
- **National Rural Electric Cooperative Association (NRECA).** NRECA is the national service organization for more than 900 not-for-profit rural electric cooperatives and public power districts providing retail electric service to more than 42 million consumers in 47 states and whose retail sales account for approximately 12 percent of total electricity sales in the United States. NRECA's members include consumer-owned local distribution systems — the vast majority — and 66 generation and transmission (G&T) cooperatives that supply wholesale power to their distribution

[67] *North American Electric Reliability Corporation*, "History of NERC," 2013, accessed January 28, 2015, http://www.nerc.com/AboutNERC/Documents/History%20AUG13.pdf

[68] *American Public Power Association*, "About American Public Power Association," accessed January 28, 2015, www.publicpower.org/about/index.cfm?navItemNumber=37583

[69] *Edison Electric Institute*, "Mission & Vision," accessed January 28, 2015, www.eei.org/about/mission/Pages/default.aspx

[70] *Electric Power Supply Association*, "Overview," accessed January 28, 2015, www.epsa.org/about/index.cfm?fa=history

cooperative owner-members. Distribution and G&T cooperatives share an obligation to serve their members by providing safe, reliable and affordable electric service.[71]

- **North American Electric Reliability Corporation.** (NERC) is a not-for-profit international regulatory authority whose mission is to assure the reliability of the bulk power system in North America. NERC develops and enforces Reliability Standards; annually assesses seasonal and long-term reliability; monitors the bulk power system through system awareness; and educates, trains, and certifies industry personnel. NERC's area of responsibility spans the continental United States, Canada, and the northern portion of Baja California, Mexico.[72]
- **Nuclear Energy Institute (NEI).** NEI's mission is to foster the beneficial uses of nuclear technology before Congress, the White House and executive branch agencies, federal regulators, and state policy forums; proactively communicate accurate and timely information; and provide a unified industry voice on the global importance of nuclear energy and nuclear technology. NEI's objective is to ensure the formation of policies that promote the beneficial uses of nuclear energy and technologies in the United States and around the world.[73]
- **The Electric Power Research Institute, Inc. (EPRI)** conducts research, development and demonstration (RD&D) relating to the generation, delivery and use of electricity for the benefit of the public. It is an independent, nonprofit organization, which brings together scientists and engineers as well as experts from academia and the industry to help address challenges in electricity.

The sub-sector has a very active Sector Coordinating Council (SCC) which engages with the Federal government under the Critical Infrastructure Partnership Advisory Council (CIPAC) framework. Membership is institutional to assure that the appropriate level of expertise and decision-making, whether it be leadership, operational or technical is available for joint problem solving within the partnership. Participation of trade associations in the Sector Coordinating Councils were established to assure representation of the perspective of small to medium sized companies which often do not have the resources to participate regularly in the partnership.[74]

All the other sectors have some dependence on the Electricity Sub-Sector. In turn, the Electricity Sub-Sector depends on other sectors. Communications, IT, and Oil and Gas Sectors are the most important sectors for the Electricity Sub-Sector to coordinate with. Open source data provides additional information on this sector's dependencies and interdependencies.

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[71] *National Rural Electric Cooperative Association*, "About Us," accessed January 28, 2015, www.nreca.coop/what-we-do/about-us/
[72] *North American Electric Reliability Corporation*, "Homepage," accessed January 28, 2015, www.nerc.com/Pages/default.aspx
[73] *Nuclear Energy Institute*, "About NEI," accessed January 28, 2015, www.nei.org/About-NEI
[74] National Infrastructure Advisory Council, "Sector Partnership Model Implementation: Final Reports and Recommendations by the Council," October 11, 2005, accessed January 28, 2015, www.dhs.gov/xlibrary/assets/niac/NIAC_SPMWGReport_Feb06.pdf

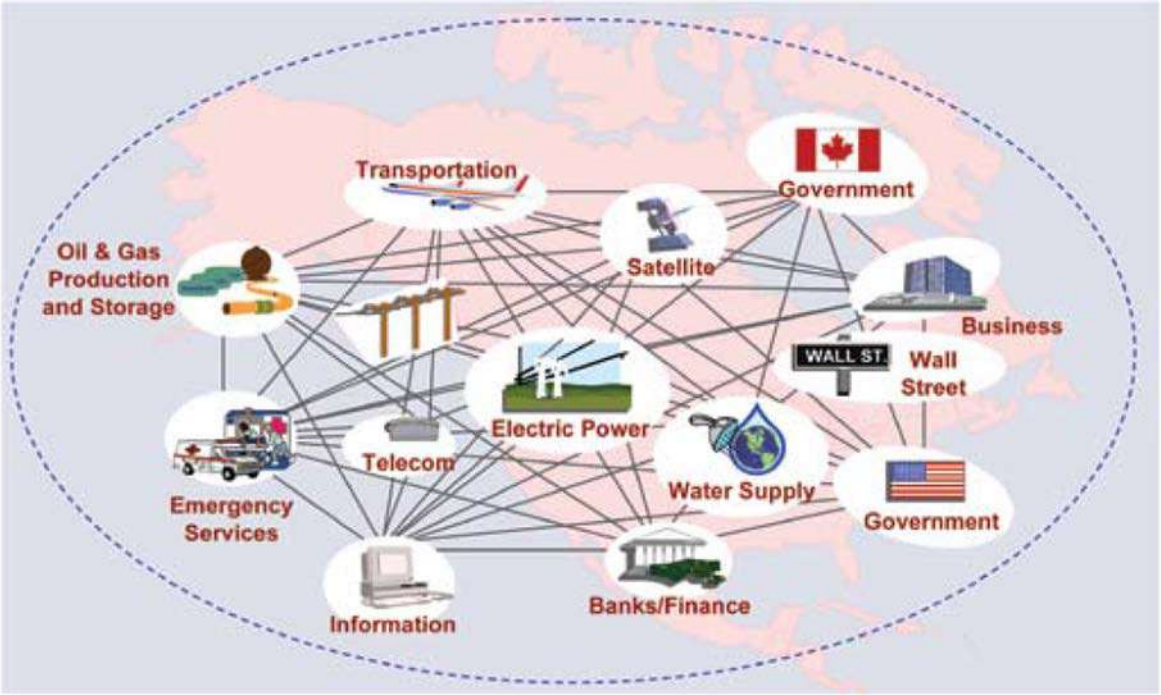


FIGURE 7— Dependencies and Interdependencies of the Electricity sub-Sector.[75]

II. CEO Landscape:

The CEOs of this sub-sector, as in other sectors, have primarily engaged with each other through established trade associations. In most cases, membership is institutional with participation of specific knowledge-based representatives depending on the issue. Some, however, have purposes that require participation by CEOs more than others. An example is the Electric Edison Institute, under which CEOs of investor-owned utilities convene regularly to address priority industry wide issues. CEOs of this sub-sector, as in other industries, participate on boards or executive steering committees or chair working groups, as appropriate to the issue within many of their trade associations. Working groups or committees addressing issues critical to the members are established through the association boards and often chaired by a CEO or senior executive decision-maker from a member company. Many of the trade associations and equivalent consortia have established security, operations and reliability committees or working groups, even before 9/11.

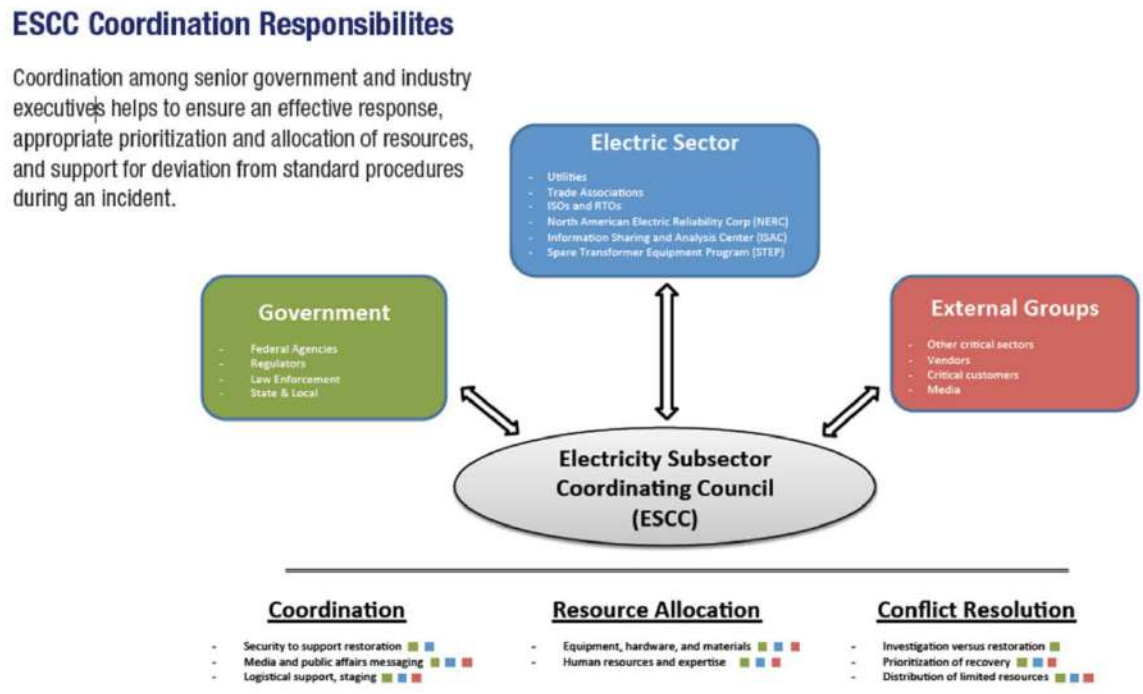
Involvement of this sub-sector's CEOs in a dialogue directly with the Federal government was catalyzed in 2012 by the 2011 NIAC report on establishing a framework for resilience goals for

75 Department of Homeland Security and Department of Energy, "Energy Sector-Specific Plan: An Annex to the National Infrastructure Protection Plan," 2010, 28, accessed January 28, 2015, www.dhs.gov/xlibrary/assets/nipp-ssp-energy-2010.pdf#page=28

the nuclear and electric industries.[76] That dialogue eventually led to the establishment of the current form of the Electricity Sub-Sector Coordinating Council (ESCC). The Electricity Sub-Sector Coordinating Council (ESCC) is the industry side of the electric sub-sector's partnership with the Federal government to advance collective action toward national critical infrastructure security and resilience.

The SCC is composed of 30 CEO level representatives from the sub-sector's electric companies of varying sizes and operating service territories across the country, and representing various components of the infrastructure; and trade associations.

"The (ESCC) serves as the principal liaison between the federal government and the electric power sector, with the mission of coordinating efforts to prepare for, and respond to, national-level disasters or threats to critical infrastructure. The ESCC includes utility CEOs and trade association leaders representing all segments of the industry. Its counterparts include senior Administration officials from the White House, relevant Cabinet agencies, federal law enforcement, and national security organizations."[77]



[76] National Infrastructure Advisory Council, "A Framework for Establishing Critical Infrastructure Resilience Goals: Final Report and Recommendations," 2010, accessed January 28, 2015, www.dhs.gov/xlibrary/assets/niac/niac-a-framework-for-establishing-critical-infrastructure-resilience-goals-2010-10-19.pdf

[77] Electric Subsector Coordinating Council, "ESCC Overview Brochure," 2014, 2, accessed January 26, 2015, www.publicpower.org/files/PDFs/ESCC%20Overview%20Brochure%20-%20February%202014.pdf

FIGURE 8 — ESCC Coordination Responsibilities.[78]

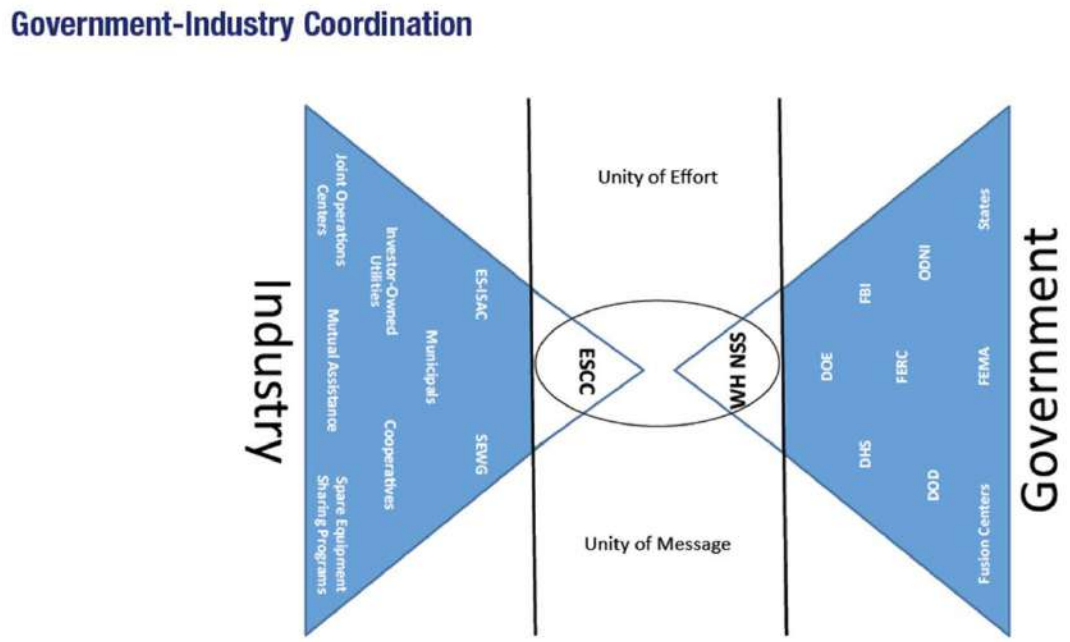


FIGURE 9 — Government-Industry Coordination[79]

The ESCC under the new membership representation, in conjunction with their counterpart Federal government agency leaders, have agreed to focus on three main areas[80] :

- Tools and technology to support information sharing and improve situational awareness of threats to the national grid
- Information flow to assure actionable intelligence are communicated between government and industry in a timely manner
- Incident response by planning and exercising coordinated responses to attacks

III. Topics/Issues that CEOs Focus on:

In private industry, the role and primary responsibilities of CEOs are commonly understood to be:

- Setting strategy, providing leadership and direction
- Setting priorities

78 Electric Subsector Coordinating Council, *ESCC Overview Brochure*, 2014, accessed January 26, 2015, http://www.publicpower.org/files/PDFs/ESCC%20Overview%20Brochure%20-%20February%202014.pdf

79 Electric Subsector Coordinating Council, *ESCC Overview Brochure*, 2014, accessed January 26, 2015, http://www.publicpower.org/files/PDFs/ESCC%20Overview%20Brochure%20-%20February%202014.pdf

80 "ibid.

- Allocating and providing resources including money, people, staff and time; and
- Holding people in the organization accountable for accomplishing the priorities and achieving the identified strategic objectives

The topic that CEOs typically pay attention to is risk reduction for a company or sector. Private sector CEOs have fiduciary responsibilities to their shareholders and in the case of publicly owned utilities, to the public within their communities. Consequently, their individual focus will be always to accomplish their individual business goals. For the Electricity Sub-Sector, there is a common focused mutual interest in the health of all parts of the power system, which are highly interconnected. Reflecting drivers that cause the current CEO-led ESCC to emerge, CEOs engaged as a group when it became evident that an issue required coordinated direction on a sector-wide issue, when consequences were shown to exceed the sector's ability to self-manage, and because there was a high order of interconnectedness and interdependency of operations among its members. The current environment of growing threat and uncertainty to the electric system as a whole underpins the Sub-Sector CEOs motivation to engage with the Federal government.

Acknowledging the role of the CEO, in order to advance implementation of initiatives agreed upon within the partnership, the ESCC established a Senior Executive Working Group to support its part of the agreements with the government. The SCC meets three times a year, identifies priorities, makes decisions, and receives progress reports. The Senior Executive Working Group, composed primarily of Chief Operating Officers, Chief Information Officers, and other senior executives with relevant expertise, meets by phone on a monthly basis and creates industry teams to accomplish the goals jointly identified by the ESCC CEOs and Federal agency senior leadership at the Deputy Secretary or Secretary level.

Experience in the Electricity Sub-Sector indicates that engagement of CEOs effect rapid communication of important information and provide critical guidance throughout the industry. This creates industry and company-wide strategy vs isolated stove-piped actions. An example was how quickly and effectively needed actions were taken industry wide in the Electric Sector as a result of convening CEOs to share information on "Heartbleed" vulnerabilities and implications for the entire industry and corporate operations as a whole.

CEO level engagement in the Electricity Sub-Sector has been found to be very important in catastrophic disasters. During disasters such as Hurricane Sandy, a many requests come into the government from the field that can be conflicting and confusing. An Administration official noted that "When you get a CEO on the phone with Administration officials, they "cut to the heart" of the issue; and get right to what is needed to restore power. The CEOs and the government have the same goal, to get and keep the power on."

The Electricity Sub-Sector has been successful in convening CEOs whenever needed, not just in emergencies. In steady state, an established CEO communication and engagement process has also allowed for a 'pulsing' of the industry for best practices as well as for better understanding on topics and relevant subject matter expertise information to speak to Congress on various matters. At the same time, CEO Engagement has resulted in government partners bringing their most capable people and expertise to the partnership table.

IV. Lessons learned:

For the Electricity Sub-Sector and the nature of its business, CEO preparedness is needed.

The Electricity Sub-Sector is very focused. Presidential Policy Directive 21's (PPD 21's) agenda underpins this sub-sector's activities. Other sectors, such as oil and gas, may have different priorities. An Administration official noted that the CEO Engagement model for the Electricity Sector does not work for the Oil and Gas Sub-Sector. The majority of the members of that sub-sector are usually international vs domestic. Consequently, it has been a challenge in bringing together oil and gas CEOs in the same way. More work will need to be done to identify the appropriate senior executive level decision-makers for the sub-sectors to engage. The sub-sector also has to deal with a greater level of antitrust issues than the electricity sub-sector does.

Coordinating and collaborating with other interdependent sectors may be a challenge. An example of interdependency is that for every mile of electricity lines, there are also fiber optic lines. Recently, a communications company contacted the Department of Energy when it found itself in conflict with the FCC because it was directed to 'shore up' electricity around its facilities after Hurricane Sandy. The company felt that it was the Electricity Sub-Sector's responsibility to address this problem. Consequently, the Communications industry has reached out to the Department of Energy for help. The Communications Sector, like the oil and gas industry, must deal with anti-trust issues to a greater extent than the Electricity Sub-Sector. Communications Sector CEOs also operate at a different level, similar to the oil and gas sub-sector, because of the global nature of their operations. An Administration official noted that the antitrust issues are tough problems but not insurmountable.

The Electricity Sub-Sector CEOs have been very successful engaging and meeting regularly with the government through their SCC under CIPAC. A lesson learned was that initially, the list of agreed upon actions became so large that it began to become unmanageable. There seemed to be far less action being taken to implement and execute the agreements than generating agenda items. Consequently, the engagement began to "bog down". It was observed that the engagement could not be sustainable without outcomes and results.

In 2013, NERC conducted its second industry wide tabletop exercise, titled "GridEx II".[81] The value of an exercise or scenario is to create reality. It involved 2,000 people at over 200 locations. Nonexecutives participated in response mitigation and recovery activities in the exercise. However, this exercise also included an Executive Tabletop portion. Thirty-one senior executive level people, at the CEO and agency Secretary or deputy Secretary, participated. The extraordinary value of the exercise to both public and private senior executive participants came from identifying the gaps in response that required senior executive decision-making on policy, strategy, and investments that needed to be addressed to improve the overall resilience of the Electricity Sub-Sector in much clearer terms. The findings illuminated assumptions that proved inappropriate, and understanding of real current capabilities and reactions based on those assumptions.

Ten recommendations came out of the exercise that focused and became the mutual agenda of priorities of the sub-sector CEO engagement with the Federal government. (The Executive Summary of the GridEx II After Action Report is attached in Section VI of this case study.) The Executive Tabletop identified concrete actionable issues and potential severe consequences if not addressed, creating a case for action at the senior executive level. An example of a lesson learned from the exercise was the understanding of consequences of large transformers being destroyed. Such an event would cause large outages over an extended period of time. The sector does not have warehouses of transformers. As a result, both government and industry are now working on a transformer program to accelerate replacement, as well as programs so continuity of electric operations do not have to rely on transformers. Another result from the exercise on the mutual senior executive agenda is the development of a playbook between the sub-sector and Federal government leadership to document coordination processes for communication and appropriate prioritization and allocation of resource decisions. This deliverable is in progress.

It was observed by both public and private sector participants of the sub-sector's CEO engagement that the Electricity Sub-Sector has made substantial progress to establish a sustainable point of interaction at the senior executive and government level to deal with adversarial actions taken on the grid on a sustainable basis. CEOs in the sub-sector remain engaged because they perceive that their time applied to the engagement is balanced with the value received through progress towards achieving mutually agreed upon deliverables and goals. Along the way, another lesson learned has emerged. Achieving the agreed upon goals with action has become a struggle on both sides. Resourcing to follow up on action items on both sides has been limited and has slowed implementation efforts.

[81] North American Electric Reliability Corporation, "Grid Security Exercise (GridEx II) After-Action Report," 2014, accessed January 28, 2015 www.nerc.com/pa/CI/CIPOutreach/GridEX/GridEx%20II%20After%20Action%20Report.pdf

It was noted that it is natural to communicate internally among members of the Electricity Sub-Sector. However, a CEO noted that cross-sector communications is more difficult. The Transportation Sector is broken down by modes, which hampers engagement for the Electricity Sub-Sector. However, she noted that joint sector meetings are making it more effective, allowing lifeline cross sector partnerships to launch. Currently, cross sector engagement occurs by individual sectors reaching out to each other on an ad hoc basis. Organizing engagement across sectors to develop mutually agreed upon agendas will require much more focused attention, structure and process.

V. Summary of Findings and Conclusions:

Primary findings for the Electricity Sub-Sector based on the information collected for this case study include:

- The Electricity Sub-Sector has a mutual and focused interest across the members of the sector: the reliability and security of the national grid. It has had a history of coordination and collaboration among its members around this focus.
- Skepticism by private sector of public-private engagement at the senior executive levels must be overcome with commitment to consistent participation by their counterparts in agency leadership at the Secretary/Deputy Secretary level and an agenda that leads to joint action and results.
- Information sharing articulated appropriately at the senior executive level makes the value proposition of risk reduction more meaningful and tangible to support decision-making and action. If senior executives understand the risk, the value proposition that they seek out of engagement is more easily identified.
- Threat briefings, designed specifically and couched in terms relevant to CEOs' roles, assist them to identify and understand their part of the value proposition ("what's in it for them") for sustainable engagement.
- Incorporating high level CEO relevant components for CEO participation in selected exercises with their senior executive level counterparts in government has proven to be effective in focusing and developing prioritized agendas for mutual engagement and action.
- Progress in implementation sustains the value proposition for both partners, but requires commitment to resources by both parties to staff the actions.

VI. Example of a CEO/Senior Executive Industry wide or Public-Private Sector Engagement: GridEx II and Results

Abstract from the Grid Security Exercise (GridEx II) After Action Report, March 2014[82]

Executive Summary

NERC conducted its second industry-wide grid security exercise, GridEx II, on November 13 and 14, 2013. The exercise brought together NERC, industry, and government agencies, as well as participants from Canada and Mexico. GridEx is an example of industry's ongoing efforts on cyber and physical security. It was the largest, most comprehensive effort addressing security by the electricity industry to date and serves as an example of the commitment of stakeholders to continuously improve cyber and physical security.

The NERC GridEx II scenario was built on the objectives, outreach, and findings from GridEx 2011. The exercise, a coordinated cyber and physical attack on the Bulk Power System (BPS), promoted coordination and highlighted urgent issues facing the industry. The simulated cyber-attack impacted corporate and control networks, while the concurrent simulated physical attack degraded reliability and threatened public health and safety. NERC encouraged participating organizations to modify the GridEx II baseline scenario to achieve entity-specific objectives and ensure relevance to local conditions.

Over 234 organizations with more than 2,000 individuals from all key BPS functions, as well as relevant government agencies such as the Department of Homeland Security (DHS), the Federal Bureau of Investigation, and the Department of Energy, participated in the simulated exercise play. Participants received sequenced email messages that detailed scenario conditions throughout the one-and-a-half-day exercise. Based on this information, "Players" engaged in both internal response measures and external coordination activities across the industry. An Exercise Control (ExCon) cell transmitted scenario updates, simulated nonplaying entities, monitored exercise play, and recorded response activities.

GridEx II's objectives were to:

- Exercise the current readiness of the electricity industry to respond to a security incident, incorporating lessons learned from GridEx 2011.
- Review existing command, control, and communication plans and tools for NERC and its stakeholders.
- Identify potential improvements in cyber and physical security plans, programs, and responder skills.

82 North American Electric Reliability Corporation, *Grid Security Exercise (GridEx II) After-Action Report*, Pages 2-4, 2014, accessed January 28, 2015 http://www.nerc.com/pa/CI/CIPOutreach/GridEX/GridEx%20II%20After%20Action%20Report.pdf

Recommendations

Following the exercise, planners conducted a review to discuss recorded exercise communication and request input from after-action surveys. The following key lessons learned and recommendations emerged from the comprehensive review:

- **Continue to Enhance Information Sharing**
  - Exercise formal communication paths to strengthen crisis response information sharing.
  - Share information early using multiple pathways to allow analysis centers to conduct more rapid analysis and provide mitigation response.
- **Continue to Enhance NERC Coordination**
  - Expand Electricity Sector Information Sharing Analysis Center (ES-ISAC) conference call capabilities to ensure appropriate personnel can be accommodated in crisis situation briefings.
  - Clarify ES-ISAC subject matter experts' functions and membership and communicate those roles across industry.
  - Continue refinement and promotion of the ES-ISAC portal as a central coordination point and reporting tool in crisis.
- **Challenge of Simultaneous Attack**
  - Clarify reporting roles and functions within entities in the event of a coordinated cyber and physical event.
  - Estimate surge resource requirements before a crisis.
  - Continue using risk-based vulnerability assessments to potentially increase protection of physical and cyber assets.
  - Evaluate and potentially increase participation in recovery programs such as the Spare Transformer Equipment Program or the Spare Equipment Database.
- **Continue Improvement of Incident Response**
  - Assess business and operational implications of isolating IT assets during a cyber-event to ensure critical functions are maintained.
  - Develop mechanisms to preserve evidence and collect forensic data following a suspected physical or cyber-attack.
  - Align incident response escalation plans among business units to promote consistent response across the organization.
  - Review communications infrastructure and identify redundancies or alternatives to ensure viable communications channels during a crisis.
- **Continue Improvement of Situational Awareness Content**
  - Continue to build relationships with relevant government stakeholders to establish communication procedures prior to a crisis.
  - Filter and consolidate industry and government communication and advisories so relevant information can be processed quickly.

- **Continue to Improve the Grid Exercise Program**
  - The GridEx program has matured since GridEx 2011, and exercise participants want that growth to continue with programmatic and scope-related enhancements for GridEx III in November 2015.

Executive Tabletop

After the Distributed Play portion, an Executive Tabletop involving electricity industry executives and senior officials from the U.S. federal government took place. The goal of the Tabletop was to examine the policy-level issues and management decisions that would need to be made in the case of a Severe Event.1 Participants in this Tabletop discussion identified a number of observations and recommendations for industry and the federal government.

- **Situation Assessment Scalability**: One of the most important aspects of responding to a crisis is the ability to quickly and accurately assess the situation, share that assessment with decision-makers, and take action. The electricity industry's primary capability to perform situation assessments at the North American level is through the ES-ISAC and BPS functions. For government, the DHS National Cybersecurity and Communications Integration Center (NCCIC) serves as a centralized location where operational elements involved in cybersecurity and communications are coordinated and integrated. The ES-ISAC provides personnel to the NCCIC as needed to share information related to emerging cybersecurity threats and vulnerabilities. While coordination with the NCCIC is a good initial step toward addressing a cybersecurity threat or attack, response, communication, and coordination processes need to be scalable to meet the extraordinary challenges of a Severe Event.

- **Public Communications**: Efforts to restore electricity would be supported—or hindered—by information provided to the public through print, radio, television, and social media. The public's need for frequent, timely, relevant, accurate, consistent, and credible information would be particularly acute through a Severe Event.

- **Unity of Effort**: A unified approach is required to identify, discuss, and decide the many policy-level issues that result from a Severe Event. This requires industry executives and senior government officials at local, state, federal, and potentially international levels to be directly involved.

- **Cyber Attacks Create Unique Restoration Challenges**: Unlike storms that can be predicted and tracked with some degree of accuracy and equipment failures that tend to be random and limited in impact, cyber-attacks present unique challenges for how the electricity industry restores power.

- **Physical Attacks Create Unique Restoration Challenges**: While the electricity industry has experienced occasional acts of sabotage or vandalism, a well-coordinated physical attack also presents particular challenges for how the industry restores power.

- **Mutual Aid and Critical Spares:** The extreme challenges posed by the Severe Event scenario provided an opportunity for participants to discuss how the electricity industry's mutual aid arrangements and inventories of critical spare equipment may need to be enhanced.

- **Regulatory Relief**: The electricity industry is highly regulated by mandatory standards and state and federal government regulations administered by various government agencies. Some of these regulations would constrain the operation of certain generators, and specific relief provisions should be considered before a Severe Event.

- **Legislation to Deal with Emergencies:** Existing statutes might be useful to help recovery efforts in a Severe Event (Defense Production Act, Stafford Act, etc.) but may not have been used in that capacity. A review of these statutes to determine if there is a need to develop legislation to facilitate recovery during a Severe Event would be helpful.

Conclusion

Participating entities found GridEx II useful for identifying opportunities to enhance their physical and cyber incident response plans. Interaction with the ES-ISAC was found to be "effective" or "very effective," and use of the ES-ISAC tools, such as the secure portal, were considered important progress since some of these tools were not available for the first GridEx. Tabletop participants agreed that the discussion provided a unique opportunity to better understand the respective challenges that both the electricity industry and government would face under extraordinary circumstances. The discussion identified opportunities to enhance how the public–private partnership must coordinate on an event of this scale, optimize efforts to mitigate impacts on public health and safety, and restore power.

NERC will continue to work closely with industry, government stakeholders, the Critical Infrastructure Protection Committee, the ESCC, and other relevant bodies to address the recommendations and further strengthen the electricity sector's physical and cybersecurity programs.

Financial Services Sector Case Study

I. Sector Landscape:

The Financial Services Sector is made up of five key components:

Deposit and payment systems and products: (i.e., banks, thrifts, and credit unions) These are the primary providers of wholesale and retail payments services, such as wire transfers, checking accounts, and credit and debit cards. These institutions use and/or operate the payments infrastructure, which includes electronic large value transfer systems, automated clearinghouses (ACH), and automated teller machines (ATM).[83] At the end of 2012, the U.S. banking system had $14.45 trillion in assets.[84]

Credit and liquidity products: This component provides liquidity and credit for a wide variety of needs, such as mortgages to purchase homes, lines of credit to expand business operations, and the issuance of sovereign debt obligations by governments. Such needs are met through a multitude of financial products developed various entities in the sector. Some of these entities provide credit directly to the end customer, while others do so indirectly by providing wholesale liquidity to those financial services firms that provide these services on a retail basis.[85]

Investment products: These products provide for both short- or long-term investments and include debt securities (such as bonds and bond mutual funds) and equities (such as stocks or stock mutual funds), and derivatives (such as options and futures). These investment products are issued and traded in various organized markets, from physical trading floors to electronic markets. Members within this component include securities firms, depository institutions, venture capitalists, and pension funds. The U.S. asset management sub-sector, an element within this component is currently meeting the pension management needs of over 55 percent of the global retirement market. Total U.S. pension assets were $18.9 trillion at the end of 2012.[86]

Risk transfer products: These products enable the transfer of financial risks, such as financial loss due to theft or the destruction of physical or electronic property resulting from a fire, cyber-attack, or other loss event, or the loss of income due to a death or disability in a family. A wide variety of financial institutions provide risk transference

[83] "2010 Banking and Finance Sector-Specific Plan"

[84] *Select USA,* The Financial Services Industry in the United States, accessed February 19, 2015, www.selectusa.commerce.gov/industry-snapshots/financial-services-industry-united-states

[85] "2010 Banking and Finance Sector-Specific Plan"

[86] *Select USA,* The Financial Services Industry in the United States, accessed February 19, 2015, www.selectusa.commerce.gov/industry-snapshots/financial-services-industry-united-states

products to meet this market need. For example, insurance companies, futures firms, and forward market participants offer financial products that allow customers to transfer various types of financial risks under a myriad of circumstances. [87] In 2012, the insurance industry's net premiums written totaled approximately $1.27 billion.[88]

Insurance: "Within the sector, there are more than 18,800 federally insured depository institutions; thousands of providers of various investment products, including roughly 18,440 broker-dealer, investment adviser, and investment company complexes; providers of risk transfer products, including 7,948 domestic U.S. insurers; and many thousands of other credit and financing organizations." [89] The sector is highly diverse, highly competitive, and at the same time highly regulated. Many members participate in multiple components of the sector. Several of the components are dominated by a few very large global institutions. For example, in the banking sector, six firms (Bank of America Corp, J,P, Morgan Chase & Co., Citigroup Inc., Wells Fargo & Co., Goldman Sachs Group Inc., and Morgan Stanley) own over 60% of the assets while community banks report 27% of the total number of industry offices and 15% of industry assets.[909192]

The sector is heavily regulated both at the Federal and state levels around safety and soundness to create reliability of the US financial system. The financial risk that is transferred around the country on a daily basis numbers in the trillions of dollars.[93] The effectiveness of financial systems depends greatly on public confidence. Regulations and high levels of regulatory oversight are intended to maintain the public's confidence in the financial system as well as to assure its sustainability of operations. Consequently, some financial institutions may have multiple regulators, regulating different aspects of their operations. For example banks are subject to oversight from the Federal Reserve Board, Comptroller of the Treasury, Federal Deposit Insurance Corporation (FDIC) and State Regulatory Bodies. In addition, certain elements of the infrastructure, when disrupted can have catastrophic impact on the country's or even the global economy. Consequently, many elements of the sector are heavily regulated to prevent such potential disasters from happening.[94] Illustrating the complexity of the regulatory

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87 "2010 Banking and Finance Sector-Specific Plan."

88 *Select USA,* The Financial Services Industry in the United States, accessed February 19, 2015, www.selectusa.commerce.gov/industry-snapshots/financial-services-industry-united-states

89 *Department of Homeland Security*, "Financial Services Sector, " accessed February 19, 2015, www.dhs.gov/financial-services-sector

90 Stephen Gandel, "By Every Measure The Big Banks are Bigger," *Fortune*, September 13, 2013, accessed February 19, 2015, www.fortune.com/2013/09/13/by-every-measure-the-big-banks-are-bigger/

91 *National Information Center*, "Holding Companies with Assets Greater than $10 Billion, 2014," accessed February 19, 2015, www.ffiec.gov/nicpubweb/nicweb/Top50Form.aspx

92 "FDIC Community Banking Study," 2012, 1-4, Federal Deposit Insurance Corporation, accessed February 19, 2015, www.fdic.gov/regulations/resources/cbi/report/cbi-full.pdf

93 "Banking & Finance Sector Specific Plan: An Annex to the National Infrastructure Protection Plan," 2010, 18, accessed February 19, 2015, www.dhs.gov/sites/default/files/publications/nipp-ssp-banking-and-finance-2010.pdf

94 "Banking & Finance Sector Specific Plan: An Annex to the National Infrastructure Protection Plan," 2010, 18, accessed February 19, 2015, www.dhs.gov/sites/default/files/publications/nipp-ssp-banking-and-finance-2010.pdf

regime and the composition of the sector, the Financial Banking Infrastructure Information Committee (FBIIC) is composed of Federal financial regulators, and associations of State financial regulators. Through the FBIIC, the Treasury Assistant Secretary for Financial Institutions coordinates certain policies, procedures, and responses to crises for the Federal and State financial regulators.[95] A list of the members of the FBIIC can be found at https://www.fbiic.gov/about/members.htm.

- Although heavily regulated, competition in the industry drives continuous innovation to develop new products and services and differentiate old ones, particularly through the application of technology. This continuing innovation or differentiation of products and services continuously creates new market segments with different and sometimes conflicting interests in the various sector components. Due to this diversity and continued evolution, the sector has numerous trade and professional associations aligned with regulatory regimes, sizes of institutions, professions, and service and product offerings. Examples reflecting the diversity, scope and number of these groups are listed in Section VI of this case study.

Competitiveness makes anti-trust a heavy consideration when institutions interact within the sub-components of the sector and at times even across sub-components of the sector. One bank CEO observed that the differences between small and large organizations within this sector needs to be noted and their interests tend to be overlooked. Larger institutions was seen as inherently not having the same interests of the smaller institutions just because of size, resulting differences in operations, and competition for market share.

"As of 2011, community banks made up 92 percent of FDIC-insured banks and 95 percent of U.S. banking organizations. The study shows that community banks hold the majority of banking deposits in U.S. rural and micropolitan counties, and that there are more than 600 counties—or almost one out of every five U.S. counties—that have no other physical banking offices except those operated by community banks...they held 14 percent of banking industry assets, but 46 percent of the industry's small loans to farms and businesses."[96] Successful community banks play a key role in a community's resilience.

The larger institutions form their own associations and represent themselves because they are more complex. A Chief Executive Officer (CEO) of a smaller bank noted that only when events that involve smaller institution might injure the larger institutions do the larger institutions take interest. The smaller institutions depend on processing vendors for many of their operations. For

[95] ibid

[96] "FDIC Community Banking Study," 2012, 1, accessed February 19, 2015, www.fdic.gov/regulations/resources/cbi/report/CBSI-ExecSumm.pdf

example, most do not maintain their own information technology infrastructure. Regulators examine these vendors separately.

The Sector has an active Sector Coordinating Council whose members meet with the other sector councils periodically under the Critical Infrastructure Partnership Advisory Council (CIPAC). Its membership is representational of the sector's components. Membership is institutional and is listed at http://www.dhs.gov/critical-infrastructure-partnership-advisory-council The Treasury Department acts as the Sector Specific Agency (SSA) for the sector. The Treasury Department plays a key role and preventing and managing financial system crises as part of its overall mission. Its role includes examining potential risks to the Sector, testing the emergency protocols, making sure they function properly, and developing the relevant types of research useful to the sector.[97]

The sector is seen as dependent on the electricity and communication grids because, as one CEO observed, "…physical currency only represents 1% of moving currency. Most currency is moving electronically, which means it needs electricity to operate. If a disaster occurs that takes out either of the grids for a period of time, the event could harm currency and transaction flow."

The sector sees itself heavily dependent on the communications and information technology (IT)infrastructure. Most of the efficiencies and innovation which is the basis for market growth and competitiveness in this sector has become essential elements of financial systems operations.

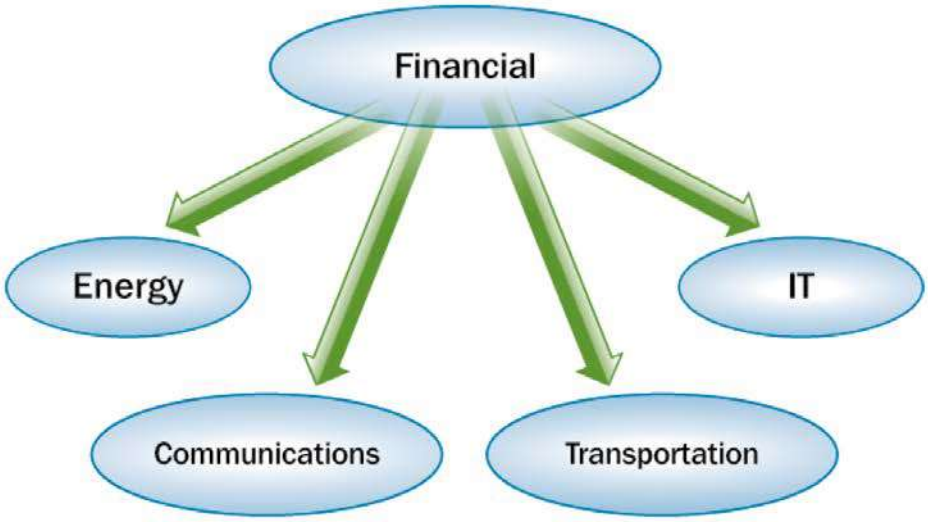

FIGURE 5 — Financial Services Sector Dependencies.[98]

[97]"Banking & Finance Sector Specific Plan: An Annex to the National Infrastructure Protection Plan," 2010, 18, accessed February 19, 2015, www.dhs.gov/sites/default/files/publications/nipp-ssp-banking-and-finance-2010.pdf

[98]"Banking & Finance Sector Specific Plan: An Annex to the National Infrastructure Protection Plan," 2010, 24, accessed February 19, 2015, www.dhs.gov/sites/default/files/publications/nipp-ssp-banking-and-finance-2010.pdf

The sector's dependency on other key sectors and the resulting risks have risen in priority so that one of the goals of the sector as voiced in its Sector Specific Plan in 2010 was to "address and manage the risks posed by the dependence of the sector on the Communications, IT, Energy, and Transportation Systems Sectors."[99] One of the aspects of the sector's Research and Development (R&D) agenda is to improve the resilience and quality of electronic communications systems.[100]

II. CEO Landscape:

Like the other sectors, the Financial Services Sector CEOs organize themselves and convene under the umbrellas of trade associations. Trade associations are seen as, one of the more efficient means to do so. Some are CEO-only membership, such as the Financial Services Round Table. Reflecting the great diversity within the sector, the sector has a large number of trade and professional associations focused on particular issues. Their magnitude and variety of purposes is reflected in the partial list in Section VI.

Dealing with trade associations in this sector can be complex as many initiatives do not merit a full-time person. There are also political and regulatory considerations that can cause additional complexity and challenges that require skilled navigation. Most parts of the sector use their trade or professional associations to advocate, address issues and develop solutions that are relevant to their particular part of the community. Like trade associations in other sectors, CEOs serve on the Boards of the many of the trade associations. For example, the American Bankers Association,[101] Futures Industry Association,[102] National Association of Federal Credit Unions,[103] and Independent Community Bankers of America[104] all have Boards on which member CEOs serve. One former financial services CEO observed that there are multiple means to reach CEOs through the trade associations beyond their role as advocates. He noted that "It would be a real breakthrough if we could use the trade associations in a way they have not been used in a number of years."

There are also government study groups and task forces where CEOs are asked to participate. It was observed that depending on their schedule or how important they think an issue is, they may

[99] "Banking & Finance Sector Specific Plan: An Annex to the National Infrastructure Protection Plan," 2010, 34, accessed February 19, 2015, www.dhs.gov/sites/default/files/publications/nipp-ssp-banking-and-finance-2010.pdf

[100] "Banking & Finance Sector Specific Plan: An Annex to the National Infrastructure Protection Plan," 2010, 43, accessed February 19, 2015, www.dhs.gov/sites/default/files/publications/nipp-ssp-banking-and-finance-2010.pdf

[101] *American Bankers Association*, "2014-2015 Board of Directors," accessed January 28, 2015 , www.aba.com/About/Pages/ABABoardMembers.aspx

[102] *Futures Industry Association*, "Board Members," accessed January 28, 2015, www.futuresindustry.org/board-members.asp

[103] *National Association of Federal Credit Unions*, "Board of Directors," accessed January 28, 2015, www.nafcu.org/Tertiary.aspx?id=17818

[104] *Independent Community Bankers of America*, "2014-2015 Executive Committee," accessed January 28, 2015, www.icba.org/aboutICBA/index.cfm?ItemNumber=536&navItemNumber=187354

or may not join in. When meetings are long, the results are general and often unclear, the participation "is not an exciting proposition" and deters CEO involvement.

III. Topics/Issues that CEOs Focus on:

As in other sectors, the CEOs in this sector engage with each other and at times with the government on issues related to financial viability of their businesses, regulatory issues affecting their markets, the efficiency and effectiveness of their operations, potential sector wide threats to the continuity and public confidence in the integrity of their operations. Simply put, as one CEO observed, "CEOs attention pay attention to not losing money, threats to business, or threats that will get them in trouble."

Overall, if meetings and results were more efficient and the subject matter was items that really related to the CEOs, they would be more involved. A common theme regarding the interests of CEOS in was that CEOs work to develop solutions to the hard complex problems to improve the function of the overall system. It was also noted that CEOs do not like actions to be dictated to them, but want to be part of the problem solving. The Treasury Department periodically reaches out to CEOs through briefings or speeches by their Secretary on specific issues to increase awareness. Currently, the primary topic is cyber security.

The Sector Specific Agency for the sector noted that agencies face obstacles when situations occur that require establishing contact directly with a CEO, particularly in larger organizations. The key for CEO collaboration is to ensure a clear and articulate objective of the contact is relayed to CEOs for engagement; having a clear pathway to answer questions from CEOs is vital. CEO interest in participating on a particular issue may vary with the size of their institutions since, at times, an issue which may be minor to a large institution may be major for a smaller institution. In addition, the larger the institution, the more removed the CEO if from decisions managing operational risks or, if international in scope, regional operations. The management of business risks is delegated to senior executive decision-makers, either by line of business or region. As many meetings are technical in nature, it would be an effective practice to use the CEOs' key executives as subject-matter experts to identify and develop recommendations, particularly in large institutions. Afterwards, they can reach out to the CEO for final direction and affirmation. An idea can be developed by deputies with final review and approval and activation of the results. CEO awareness is needed so there is a need for outreach for a specific problem to reach a broad audience first. Then it is important to recognize the level at which an issue should be addressed determined by the action to be taken or decision to be made. For example, with cyber security, the Secretary of Treasury gave speeches at high-level forums. However, the Secretary would not need to convene CEOs unless there was a clear well

defined element of the issue relevant to CEOs' authority and their roles which might include advancing the entire sector, or a segment of it, towards a solution.

One sector CEO observed that before reaching out to a CEO, other sectors and the government must do their homework. Issues need to be specific and relevant to the proposed participants. There has to be a sense of urgency and priority in dealing with issues across sectors and collaboration, such as recognizing good security in one organization can mean good security in others. One problem is that CEOs are often concerned about whether other sectors service providers, like Telecommunications, might "tend to profit off of the problems they have".

Most sectors do not rely on the Financial Services Sector for day-to-day operations. Instead, the Financial Services Sector is highly dependent on other sectors. In order to effectively collaborate with those sectors, it was deemed important to identify specific key issues and projects. The Financial Services Sector in general wants to participate in cross-sector engagement to ensure proper information is shared with the appropriate customers. The Heartbleed cyber threat, a flaw in the open-source encryption standard used by the majority of websites that need to transmit data that users want to keep safe, was not a Financial Services Sector issue, but the sector was affected through products such as online banking.[105] The Financial Services Sector needed to work with IT service providers in order to protect the system. Fostering cross-sector relationships is important for such scenarios. However, these various examples of cross sector engagement reflect engagement at the operation al levels rather than the CEO or senior executive decision-maker level.

IV. Summary of Findings and Conclusions:

Lessons learned from the last recession of 2007 [106] have shown that a strong financial services system, particularly the banking components, is critical to the national security of a country. As an infrastructure, it recognizes that it does not stand alone. Its sheer diversity and complexity will require some thoughtfulness for cross sector engagement.

Findings for the Financial Services Sector based on the information collected for this case study include:

- The Sector is highly diverse with multiple market segments within its major components and encouraged to be highly competitive within its market segments and often across its market segments in order to provide consumers more choice --- conflict can occur between the interests of the very large and smaller enterprises. This complex environment

[105] *Business Insider*, "Here's How to Protect Yourself from The Massive Security Flaw That's Taken Over the Internet", 2014, accessed January 28. 2015, www.businessinsider.com/heartbleed-bug-explainer-2014-4

[106] "Business Cycle Dating Committee, National Bureau of Economic Research", 1, accessed January 28, 2015 at http://www.nber.org/cycles/sept2010.html

creates complexity for engagement on issues, particularly in identifying relevant parties and inclusiveness in participation to ensure appropriate level of sector representation. Anti-trust and competition is seen as critical considerations that impede sharing information, even in cross industry interactions; sustaining market competitiveness in many of the sector market segments is a major requirement for the sector

- Building trust for collaboration can be a challenge with other critical infrastructure suppliers in their supply chain when they are seen as profiting from their problems
- Particularly for large corporations, engagement with other sectors on interdependency issues may generally be delegated to senior executive decision-makers by the CEOs
- Engagement must be issue specific and will drive composition of the participants---no one group represents all interests, even on such sector wide issues such as catastrophic disaster and recovery and cyber security. Clear articulation and analysis of relevant stakeholders and cross agency coordination will be essential preparation for effective cross-sector engagement

V. Partial List of Financial Services Trade and Professional Associations

- American Council of Life Insurers
- American Bankers Association
- American Institute of Certified Public Accountants
- American Insurance Association
- American Society of Pension Professionals and Actuaries
- Bank Insurance and Securities Association
- Certified Financial Planner Board of Standards Inc.
- Consumer Bankers Association
- Credit Union National Association
- CFA Institute
- Closed-End Fund Association
- Financial Industry Regulatory Authority
- Financial Planning Association
- Financial Services Institute
- Futures Industry Association
- Independent Community Bankers of America
- Investment Advisor Association
- Investment Company Institute
- Investment Management Consultants Association
- LIMRA International
- The Managed Funds Association

- The Money Management Institute
- NACHA- The Electronic Payments Association
- National Association of Active Investment Managers
- National Association of Alternative Benefit Consultants
- National Association of Independent Broker/Dealers
- National Association of Insurance and Financial Advisors
- National Futures Association
- National Association of Insurance Commissioners
- The National Association of Personal Financial Advisors
- The Association for Insured Retirement Solutions
- North American Securities Administrators Association
- Retirement Income Industry Association
- Security Industry and Financial Markets Association
- Society of Financial Service Professionals
- American College of Forensic Examiners Institute
- American Institute of Professional Bookkeepers
- Accounting and Financial Women's Alliance
- American Women's Society of Certified Public Accountants
- Association of Government Accountants
- Association of Latino Professionals in Finance and Accounting
- Association for Management Information in Financial Services
- Alpha Beta Psi
- Institute of Internal Auditors
- Institute of Management Accountants
- National Association of Black Accountants
- National Society of Accountants
- American Bankers Association
- Financial Managers Society
- Mortgage Bankers Association
- National Association of Federal Credit Unions
- National Association of Mortgage Brokers
- National Association of Professional Mortgage Women
- National Reverse Mortgage Lenders Association
- Urban Financial Services Coalition
- American Rehabilitation Economics Association
- International Health Economics Association
- National Association of Business Economics
- National Economic Association

- American Academy of Actuaries
- American Institute for Chartered Property Casualty Underwriters
- Property Causality Insurers Association of America (PCI)
- Association of Professional Insurance Women
- Council of Insurance Agents and Brokers
- Independent Insurance Agents and Brokers of America
- Insurance Accounting and Systems Association
- International Association of Insurance Fraud Agencies
- International Association of Special Investigation Units
- National Association of Health Underwriters
- Risk and Insurance Management Society
- Royal Bank of Scotland (RBS)
- American Society of Appraisers
- Appraisal Institute
- Council of Real Estate Brokerage Managers
- Institute of Real Estate Management
- National Association of Independent Fee Appraisers
- National Association of Real Estate Brokers
- National Association of Realtors
- National Association of Rental Property Managers
- National Multi Housing Council
- Realtors Land Institute
- Society of Industrial and Office Realtors
- Association of Investment Management Sales Executives
- Commodity Floor Brokers and Traders Association
- Managed Funds Association
- National Association of Stock Brokers
- New York Society of Security Analysts
- Security Traders Association
- Securities Industry and Financial Markets Association (SIFMA)

Transportation Sector Case Study

I. Sector Landscape:

The National Transportation System (NTS) is often referred to as a network of interconnected systems of airways, roads, tracks, terminals, and conveyances.[107] The transportation sector includes seven modes—aviation, freight rail, highway, maritime, mass transit and passenger rail, pipelines, and postal and shipping—each of which comprises an extensive system that is highly interconnected with the other modes. The *Transportation Statistics Annual Report 2012*, compiled by the Department of Transportation (DOT) Bureau of Transportation Statistics (BTS), provides some relevant statistics of the system.[108]

- The NTS has 4.1 million miles of highways, 139,000 miles of railroads, more than 12,000 miles of inland and intercostal waterways, 2.6 million miles of pipelines, more than 5,000 public use airports, 8,000 commercial waterway and lock facilities, more than 170 maritime ports, and more than 3,100 transit stations
- The NTS accounts for $1 trillion in purchases and investments, and $134 billion of public expenditures on operations and maintenance. The estimated value of U.S. transportation assets exceeded $7 trillion in 2010
- By value, one-half of the assets (highways and streets, airports, waterways, and transit facilities) were owned by the public sector. Private companies owned more than 31% of transportation assets (railroads, pipelines, trucks, planes, and ships), and consumer-owned motor vehicles accounted for the remaining 18%+ of asset ownership

DOT has modal administrations which operate under very different statutory authority and unique procedures for implementing authorizing legislation, executing rules of engagement and managing funding sources. One transit authority General Manager noted that each mode is governed separately which makes it a challenge for the Secretary of Transportation to coordinate among the modes.

This sector has three designated Sector Specific Agencies: Department of Transportation and the Transportation Security Agency and the US Coast Guard in the Department of Homeland Security (DHS). The sector is vast, diverse complex. One General Manager of a public transit system described the transportation sector as “fragmented”. The Council identified two contrasting modes, mass transit/passenger rail and freight rail, on which to collect information in

[107] “Transportation Systems Sector-Specific Plan: An Annex to the National Infrastructure Protection Plan,” 2010, 1, Washington, DC: Department of Homeland Security, accessed February 20, 2015, www.dhs.gov/xlibrary/assets/nipp-ssp-transportation-systems-2010.pdf.

[108] “Transportation Statistics Annual Report,” 2012, Washington, DC: Bureau of Transportation Statistics, U.S. Department of Transportation's Research and Innovative Technology Administration, Department of Transportation, accessed February 20, 2015, www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/transportation_statistics_annual_report/2012/index.html

order to identify and understand the sector's diversity from a Chief Executive Officer (CEO) (or senior executive decision-maker) perspective. The data on each, collected from interviews and public open sources are summarized in the next three sections of this case study.

The transportation system and network's efficient operations are increasingly dependent upon functions, products, and services provided by Communications and Information Technology (IT) Sectors to increase efficiency and capabilities to accommodate increasing usage. Loss of communications services would have a significant cascading effect on the Nation's transportation system, both through supply chain effects and interconnectedness of several modes' operations. Like other sectors, this sector depends on the Financial Sector to process and secure all of the financial transactions necessary to run a business including lines of credit, deposits, payments, investments, and insurance. The sector depends on the Energy Sector for the many types of energy needed to operate offices, terminals, railroad switches, airports, and other support structures.[109]

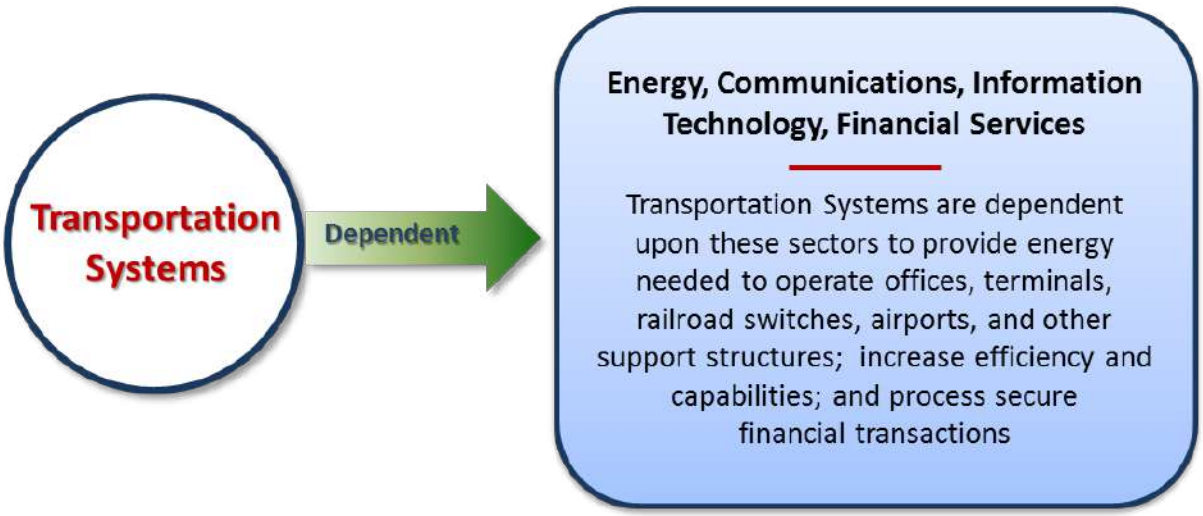

FIGURE 2 — Dependencies of the Transportation Sector[110]

II. Modal Landscapes:

Mass Transit and Passenger Rail

This mode is complex and composed of a number of types of transportation: bus, bus rapid transit. commuter bus, commuter rail, demand response transportation, ferryboat, heavy rail, hybrid rail, light rail and other rail modes, public, street car, transit vanpool and trolleybus. Public transportation was provided in the United States during 2012 by more than 7,100 organizations ranging from large multi-modal systems to single-vehicle special demand response

[109] *Critical Infrastructure Resource Center*, "Understanding the Transportation Systems Sector," accessed February 20, 2015, www.training.fema.gov/emiweb/is/is860b/circ/transport1.htm
[110] Ibid.

service providers. More than 1700 transit agencies operate in rural areas and 815 transit agencies provide service in urbanized areas. [111]

The Passenger Rail element of this mode consists of approximately 98 urban and rural passenger rail transit service providers in the United States, which may be categorized as[112]:

- **Commuter Rail** service is provided on freight railroad tracks or former railroad rights-of-way, and is powered by a locomotive that either pulls or pushes the train. Service is characterized by long routes with relatively large distances between stops, and typically provides regional service from outlying areas into central metropolitan areas.
- **Heavy Rail (rapid transit, subway, or metro)** service is provided on exclusive rights-of-way within metropolitan areas, has the ability to quickly carry "heavy" loads of passengers, and has stations that are separated from the street level, either subway or elevated.
- **Light Rail (streetcar, tramway, or trolley)** service is provided by single rail vehicles or short trains.
- **Intercity Passenger Rail (long-distance rail)** provides interregional passenger rail services primarily over freight-railroad tracks. There are currently three long-distance rail systems operating in the United States: o Alaska Railroad, Amtrak, and Pullman Rail Journeys.

Heavy rail accounts for the majority of ridership across the different Passenger Rail modes, making up 77 percent of total ridership in 2013. [113] The Passenger part of the mode includes thousands of computerized networks, which facilitate operations and ensure efficient and reliable service. Rail transit systems own track and rights-of-way, stations, administrative buildings, and maintenance facilities.[114] Transit agencies in urbanized areas carried more than 98 percent of all transit passenger trips in 2012; those in rural areas carried about 1½ percent of passenger trips. [115]

The vast majority of the mass transit and passenger rail are owned and operated by the public sector, mostly at the state, regional and local levels. In each of the states, the secretaries of transportation have authority to allocate federal and state funding. Although there are similarities between some states, there are many differences between most. In 2012, total public

[111] *American Public Transportation Association,* "Public Transportation Fact Book 2014," accessed February 20, 2015, www.apta.com/resources/statistics/Documents/FactBook/2014-APTA-Fact-Book.pdf
[112] Department of Homeland Security, *Sector Resilience Report Transportation- Passenger Rail,* 2015, 2-3.
[113] Department of Homeland Security, *Sector Resilience Report Transportation- Passenger Rail,* 2015, 4.
[114] Department of Homeland Security, *Sector Resilience Report Transportation- Passenger Rail,* 2015, 2.
[115] *American Public Transportation Association,* "Public Transportation Fact Book 2012," accessed February 20, 2015, www.apta.com/resources/statistics/Documents/FactBook/APTA_2012_Fact%20Book.pdf

transportation expenditures were $57.9 billion, with $39.7 billion spent on operations and $18.2 billion spent on capital investments.[116]

This mode's primary oversight and support agencies in the Federal government are the Federal Transit Administration (FTA) agency within DOT, and the Transportation Security Administration (TSA) in DHS.

Complementing state and local public sources of funding, FTA provides financial assistance in the form of grants and technical assistance to local governments to develop new transit systems and improve, maintain, and operate existing systems. Receivers of grants are responsible for managing their programs in accordance with federal requirements, and the FTA is responsible for ensuring that grantees follow federal mandates along with statutory and administrative requirements. The Office of Transit Safety and Oversight within FTA administers a national transit safety program and program compliance oversight process to advance the provision of safe, reliable, and equitable transit service through adherence with legislative, policy and regulatory requirements as established by FTA.[117] TSA oversees and regulates security within the mode.[118]

The diversity of the associations related to this mode is reflected in the non-inclusive list in Section IV A of this case study. The most prominent is the American Public Transportation Association (APTA). APTA members are public organizations that are engaged in the areas of bus, paratransit, light rail, commuter rail, subways, waterborne passenger services, and high-speed rail. Members also include large and small companies who plan, design, construct, finance, supply, and operate bus and rail services worldwide. Government agencies, metropolitan planning organizations, state departments of transportation, academic institutions, and trade publications are also part of its membership. Over ninety percent of passengers using transit in the U.S. and Canada are carried by APTA members. Its stated primary role is advocacy, innovation and information sharing in "advancing public transportation". APTA established the Transit Development Corporation, Inc. (TDC), a nonprofit educational and research organization which co-sponsors the Transit Cooperative Research Program (TCRP), in cooperation with the Federal Transit Administration (FTA); the National Academies, acting through the Transportation Research Board (TRB). Program research is funded by the public through the FTA.

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[116] *American Public Transportation Association*, "Public Transportation Fact Book 2014," 2, accessed February 20, 2015, www.apta.com/resources/statistics/Documents/FactBook/2014-APTA-Fact-Book.pdf

[117] *Transit Safety and Oversight* "Overview," Federal Transit Administration, Department of Transportation, accessed February 20, 2015, www.fta.dot.gov/tso.html

[118] *Transportation Security Administration*, "About TSA," accessed February 20, 2015, http://www.tsa.gov/about-tsa

The mode has a recognized sector modal coordinating council with 14 members.[119] It did not meet jointly with the Federal government in 2013 nor 2014, but representatives participated in joint cross sector CIPAC meetings.[120]

Freight Rail

The freight rail mode is a $60 billion industry operating over an estimated 140,000 rail miles operated by seven Class I railroads (railroads with operating revenues of $433.2 million or more), 21 regional railroads, and 510 local railroads.[121]

Freight railroads account for approximately 40 percent of intercity freight volume — more than any other mode of transportation. Together with their counterparts in Canada and Mexico, North America's freight railroads form, what is considered by many, the most efficient, cost effective, and reliable freight rail system in the world. It moves more freight than any other freight rail system worldwide.

U.S. freight railroads are overwhelmingly owned by private sector. Unlike most other modes of transportation, freight railroads operate over infrastructure they build and maintain with private funds. They operate almost exclusively on tracks the railroads build and maintain themselves. The members of the mode are highly interconnected, somewhat similar to the Electricity Sub-Sector because they are required by regulation to support interchanges to assure continuity of freight traffic flow throughout the system among the different owners and operators.

From 1980 to 2014, railroads spent approximately $575 billion of their own funds on locomotives, freight cars, tracks, bridges, tunnels, and other infrastructure and equipment. In 2015, America's freight railroads plan to spend an estimated $29 billion to sustain and enhance their nationwide network.[122] They invest one of the highest percentages of revenues to maintain and add capacity to their system. [123]

[119] *Department of Homeland Security*, "Transportation Sector - Mass Transit and Passenger Rail Modal Subsector: Council Membership," accessed February 20, 2015, www.dhs.gov/transportation-mass-transit-and-passenger-rail-modal-subsector-membership
[120] *Department of Homeland Security*, "Critical Infrastructure Partnership Advisory Council (CIPAC) Archived Meeting Agendas," accessed February 20, 2015, www.dhs.gov/cipac-archived-meeting-agendas
[121] *U.S. Department of Transportation*, "Freight Rail Today," accessed February 20, 2015, www.fra.dot.gov/Page/P0362
[122] Association of American Railroads, *2015 Outlook*, accessed February 20, 2015, www.aar.org/Documents/Outlook%202015/2015OutlookReport.pdf
[123] *U.S. Department of Transportation*, "Freight Rail Today."

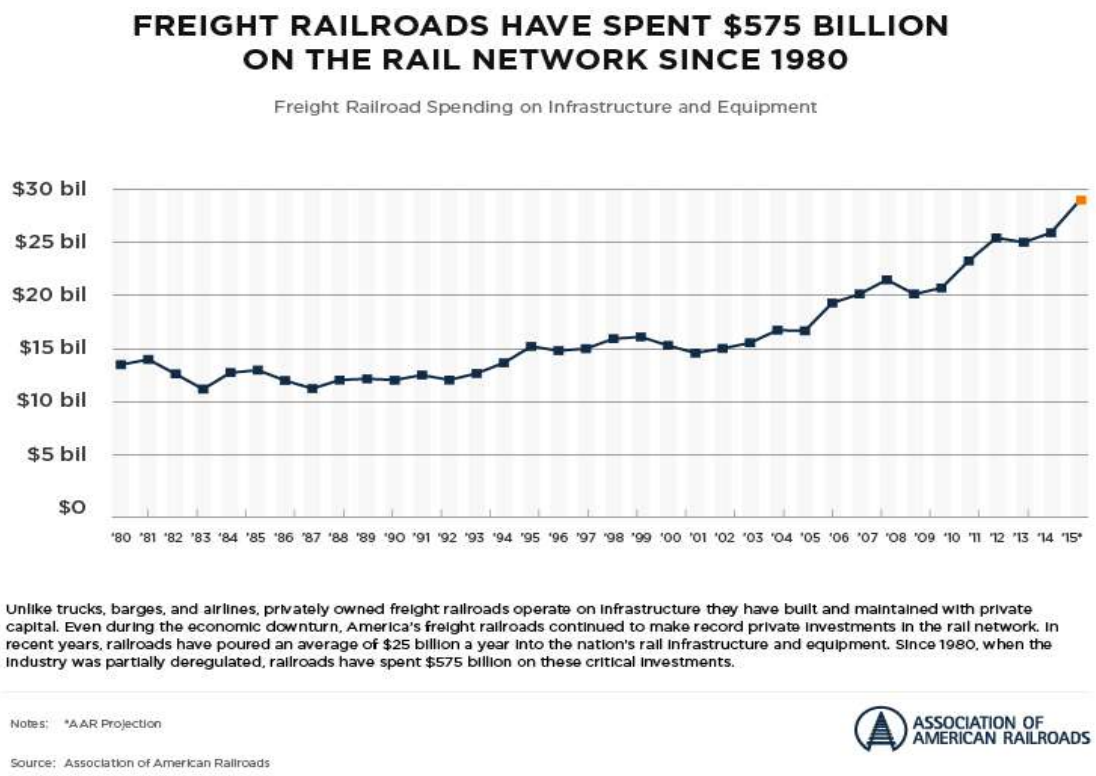

FIGURE 3 —Private Freight Rail Infrastructure Spending[124]

The estimated $29 billion in 2015 to build, maintain and grow the nationwide freight rail network represents more than $79 million each day — or $3 million each hour — on investments in safety and capacity enhancing infrastructure such as more locomotives and freight cars, new equipment and technology, and improving network performance during periods of extreme weather. [125]

The owners and operators within the mode organize and coordinate among themselves primarily through two trade associations:

- Association of American Railroads (AAR) - represents the major freight railroads of North America and Amtrak. It has two associate member programs which include medium and small sized freight railroads, commuter rail and suppliers. Its purpose is to improve efficiency, safety, productivity, and service of the freight railroad industry. It engages in standards setting and operational coordination activities for the entire mode as approved by its Board of Directors, composed of member CEOs in the association.

[124] *Association of American Railroads*, "2015 Outlook," accessed February 20, 2015, www.aar.org/PublishingImages/Annual%20Outlook%202015/High%20Resolution%20Images/Chart%201_575%20Billion_FINAL.pdf
[125] ibid

- American Short Line and Regional Railroad Association (ASLRRA) - represents the interests of its 450 short line and regional railroad members in legislative and regulatory matters. Short lines and regional railroads operate and maintain 30 percent of the American railroad industry's route mileage, and account for 9 percent of the rail industry's freight revenue and 12 percent of railroad employment.[126]

The mode has an active Sector Coordinating Council, with 27 institutional representational members, which has met periodically with its counterpart Federal Government Coordinating Council.[127]

The mode is regulated primarily through the US Surface Transportation Board (STB) and the Federal Railroad Administration (FRA) within the Department of Transportation, and TSA, within DHS.

FRA's mission is to enable the safe, reliable, and efficient movement of people and goods for a strong America, now and in the future. [128] The FRA oversees and regulates safety within the mode.

TSA's mission is to protect the Nation's transportation systems to ensure freedom of movement for people and commerce. TSA oversees and regulates security within the mode.[129]

The STB regulates economic activity of the freight railroads. It also has the authority to take action, including setting maximum allowable rates, to protect rail customers against unreasonable railroad actions. Because of the requirement that all railroads interchange traffic with one another, the STB regulates railroad mergers, track construction, track abandonments, service discontinuance, transportation rates (for commodities and services that are still regulated), and service practices. Anti-trust laws are not applicable for these activities. There is still no guaranteed rate of return (as in electric utility regulation, for example), but economic regulatory oversight allows market forces to regulate where sufficient competition exists. Where competition is insufficient, STB regulates.[130]

III. CEO Landscape:

Mass Transit and Passenger Rail

CEO-equivalents in the mass transit and passenger rail industry generally have titles of directors or general managers. A transit general manager observed that "There is currently no mechanism

[126] *American Short Line and Regional Railroad Association*, "About ASLRRA," accessed February 20, 2015, www.aslrra.org/about_aslrra/
[127] *Department of Homeland Security*, "Transportation Sector - Freight Rail Modal Subsector: Council Membership", accessed February 20, 2015, www.dhs.gov/transportation-freight-rail-modal-subsector-membership
[128] *Department of Transportation*, "About the Federal Railroad Administration," accessed February 20, 2015,
[129] *Transportation Security Administration*, "About TSA," accessed February 20, 2015, www.tsa.gov/about-tsa
[130] *Department of Transportation*, "Surface Transportation Board," accessed February 20, 2015, www.stb.dot.gov/stb/index.html

in place to encourage CEOs from the different transit systems to collaborate. There is, however, an understanding of the need to address the fragmentation and redundancy across the sector [mode] and agencies are beginning to articulate common safety goals, provide mutual assistance … and encourage planners to consider connectivity."

As in other industries, senior executives in this industry organize and convene through their trade and professional organizations. For example, APTA has a structure of committees/subcommittees to provide interaction among members to address issues of common interest and devise strategies, plans, and programs aimed at upgrading the state-of-the-art generally and information exchange specifically. It has played a major role in the development of voluntary, consensus based standards through its volunteer committees on areas including bus, rail transit and commuter rail operations, maintenance, procurement and information systems. This program provides access to public transportation-related research, reports, and products from the Transportation Research Board (TRB). APTA's Board of Directors consists of 101 public transportation systems general managers or equivalents.[131]

Freight Rail

Like other sectors, the CEOs of this mode organize themselves through trade associations to address issues that they deem of common interest across the members of the mode, to build consensus and to take action to implement. The requirement for interchange of freight traffic throughout the mode in turn creates a need for efficient coordination and consistent practices through establishment of operational, safety and security standards.

Both of the primary trade associations, the AAR and the ASLRRA, representing the owners and operators in this mode, play national policy advocacy roles to the Federal government. However, AAR has taken on a more expansive role for the entire mode.

AAR has an operational coordination and information sharing role within the mode to a greater extent than many other trade associations. This role appears similar to the National Electric Reliability Council, which is not considered a trade association but a self-regulatory body for reliability standards for the Electricity Sub-Sector. AAR is the administrator and facilitator of the Interchange Agreement for exchange of freight traffic on railroad tracks, allowing continuity of flow of traffic across rail networks under different ownership. Interchange is a regulatory requirement.[132] The ability to safely and efficiently support interchange requires consistent standards for operations, safety, security and equipment, which includes longer term design of infrastructure and equipment. As a result of its role for administering and facilitating the

[131] *American Public Transportation Association*, "Board of Directors," accessed February 20, 2015, www.apta.com/about/governance/Pages/boardofdirectors.aspx

[132] Wilson, Nancy L. "Association of American Railroads: Role, Products and Processes." Letter to National Infrastructure Advisory Committee. 10 Feb. 2015

industry's interchange agreement, the standards AAR produces are not voluntary -- the standards are required to be implemented by all railroads operating in interchange service.[133]

The largest freight railroads which generate the majority of the freight rail traffic in North America are all members of AAR and their CEOs serve on its Board. The Board's membership also includes AMTRAK and several smaller railroads. The majority of AAR's activities, under the leadership of its Board, support the improvement of efficiency, safety, productivity, and service of the railroad industry. Standards are established through a structure of committees or working groups composed of representatives from across the mode, including the small and medium sized owners and operators. These committees report through a safety and operations management committee composed of the Chief Executive Operating Officers (COOs) of AAR members which, in turn, is overseen by AAR's Board of Directors, composed of members' CEOs.

In order to support this role, AAR has implemented additional capabilities, such as a wholly owned research and development technology facility, an internationally recognized testing center for operational procedures, and equipment, and an industry-wide security incident operations center.[134] The structure and operations of AAR inherently provides an existing forum for freight railroads and their CEOs to identify, and oversee development and implementation of strategic and operational initiatives of highest priority to assure operational efficiencies, safety and security across the freight rail network. A specific illustration of how AAR is structured and how it develops and promulgates an industry wide initiative in its modal coordination and operational role are described further in Section VI.B of this case study.

IV. Topics/Issues that CEOs focus on:

Mass Transit/Passenger Rail

The roles, authorities, and reporting relationships of general managers in this mode vary widely, as determined by the diversity in the nation's regional, local and state governments. As government agencies, they are non-profits. Management processes and authorities can vary dramatically based on historical relationships, as well as where the agency may sit in the local or state or regional governance structure. Some may have multiple reporting relationships and decision-makers overseeing their operations, including the public. Most run their operations independently of other jurisdictions and come together at a regional level or the state level when the region or state determines the necessity for coordination and interoperability, usually motivated by requirements for cost efficiencies and effective service for the public. For example, most of the public do not live near where they work and must often travel across operational

[133] Nancy L. Wilson, "Association of American Railroads: Role, Products and Processes." Letter to National Infrastructure Advisory Committee. February 10, 2015
[134] Association of American Railroads, https://www.aar.org/

jurisdictions between home and work place. Consequently, the majority of the coordination and collaboration between owners and operators within this mode occur locally or regionally. Local and regional needs vary based on population, geographic and economic characteristics and, at times, history.

Many of the structures and processes, which general managers and their equivalents pay attention to, relate to funding allocation process and sourcing. Funding is very complex and often drives or impedes interaction. This complexity can cause the simplest of tasks to become difficult to do, such as creating universal fare cards. A transit general manager provided an example of the San Francisco Bay Area which has 26 different transit systems. It requires extensive regional coordination to provide efficient connectivity and inter-operable service for the public. She noted that fortunately, San Francisco also has one of the strongest Metropolitan Planning Organizations (MPOs) in the country. Engagement for collaboration occurs at the national level to advance a common issue such as availability of federal funding or grants. The grants processes themselves are often competitive which increases the complexity of collaboration and coordination within the mode. Local transit organizations can individually submit applications for grants. Public transportation funding reauthorization was seen as taking a great amount of time and effort as well as the grants application processes. As of the 1990s, the Federal government stopped providing operating assistance.

With the ownership and operations of organizations within this mode being diverse, multi-jurisdictional, and complex, acquiring and accomplishing lessons learned can pose a challenge. General Managers and directors have used their trade and professional associations to begin to develop some common voluntary standards based on lessons learned and leveraging knowledge and expertise across the sector. They do convene under those umbrellas to share ideas and best practices on information, funding, sharing facilities, staffing, etc. There are many trade associations, boards of directors, and committees that work together. The Federal Transit Agency (FTA), this mode's regulator, also provides a forum for public-private partnerships, but there has been no apparent need to convene CEO-equivalents within the mode to establish and promulgation of agreed upon action across the mode.

Freight Rail

For this mode of the transportation sector, the primary priorities of CEOs can be seen in the objectives of the associations in which they are very active. Safety, operational efficiencies, profitability, and regulatory risks are primary priorities for the CEOs of the sector. Security was added after 9/11 as a priority. In the Council's working group conversation with a Class I railroad CEO, safety was the highest priority topic of continuing focus for working together, then assuring interoperability efficiencies since the railroads often share the same tracks, and preventing disruptions. This sector is seen as highly interconnected because of the sharing of the use of tracks. These issues directly affect each institution's profitability, liabilities, including

potential regulation, and customer relationships. There was an understanding of the critical role that freight rail plays in national security because the Department of Defense is one of its major customers. Strategies, plans and required investments, as well as required coordination across the industry related to these issues attract the attention of the CEOs.

CEOs make decisions in large capital investments and approve strategic or operational plans, and which require industry-wide coordination and resource allocation. By approving plans, they commit their institutions to action and investment. CEOs will delegate operations to their Chief Operating Officers (COOs). During a catastrophic incident, a CEO would monitor a situation, but would not contribute unless the situation becomes chaotic and requires unforeseen requirements in resource allocation. Because of the industry's requirement for interchange that requires extensive coordination between railroads, the industry uses lessons learned from events to prioritize and invest time to develop plans and operational standards to address the lessons learned, followed by commitment to capital investments out of their profits.

AAR, as an example, has a well-defined process for taking on such issues to support the entire industry, when the issues are deemed of high enough priority. A priority is set when they have sufficient information to create a sense of urgency, such as 9/11 which brought home the reality of terrorism, and the lessons learned from recent catastrophic natural disasters. Because of the industry's interchange requirements, there is motivation at the CEO and COO levels to prepare and plan ahead to assure that interchange requirements are met under these identified circumstances, and that requires pre-established agreements for intra-industry and supply chain coordination.

Cross sector engagement occurs primarily at the regional and local level by individual owners and operators, mostly at operating levels below the CEO level. There was no issue identified within this mode requiring engagement with other sectors at the national level.

V. Summary of Findings and Conclusions for Sector Modes Studied:

Findings for the Transportation Sector based on the information collected for the two modes selected for this case study include:

- The structure, organization, governance and regulatory regimes, and operating approaches are very different between freight rail and mass transit and passenger rail modes within the Transportation Sector; and consequently the value proposition will be very different.
- Private sector CEOs have greater flexibility and independence for decision-making on investments, particularly capital investments and execution of commitments; while public sector senior executives have many more interests to which they are held accountable.
- Management practices and structures within private sector owned and operated organizations tend to be more homogeneous, while public sector owned and operated

institutions vary widely in their management roles and authorities, reflecting the jurisdictions within which they operate

- Although there is intersection of interests, which causes engagement by institutions in forums such as trade associations and in the public-private partnership forum sponsored by the FTA, organized CEO level engagement at the national level has been seldom required, if at all, outside of the modes.
- "Interconnectedness" of operations motivates engagement for collaboration at the CEO or equivalent levels:
    - The freight rail mode is required to manage traffic to provide seamless flow of goods across the nation and therefore is very well organized nationally to identify and take action on common issues
    - The transit and passenger rail mode operators are local and regional by the nature of their ownership and will engage locally or regionally with others to provide more efficient and seamless service to their local or regional residents

VI. Illustrative Examples:

A. *Mass Transit and Passenger Rail***:** Partial sample list of associations associated with the mass transit and passenger rail mode:[135]

- ATRA (Advanced Transit Association)
- ATTI (Advanced Transportation Technology Institute)
- AGTA (Airport Ground Transportation Association)
- AAUSA (All Aboard - USA
- AASHTO (American Association of State Highway and Transportation Officials)
- ABA (American Bus Association)
- ACGIH (American Conference of Governmental Industrial Hygienists)
- ACEC (American Council of Engineering Companies)
- APA (American Planning Association)
- APTA (American Public Transportation Association)
- APWA (American Public Works Association)
- AREMA (American Railway Engineering and Maintenance-of-Way Association)
- ARTBA (American Road and Transportation Builders Association)
- ASLRRA (American Short Line and Regional Railroad Association)
- ASAE (American Society of Association Executives)
- ASCE (American Society of Civil Engineers)
- AVA (American Vecturist Association)
- ACT (Association for Commuter Transportation)
- AACE (Association for the Advancement of Cost Engineering International)
- AAR (Association of American Railroads)
- ADS (Association of Diesel Specialists)
- AMPO (Association of Metropolitan Planning Organizations)

[135] *APTA*, "Resource Library", accessed February 20, 2015, www.apta.com/resources/links/Pages/others.aspx#a2

- RTUS (Association of Rail Travel in the U.S.)
- ARM (Association of Railway Museums)
- BOMA (Bus Owners Marketing Alliance)
- BIA (Buses International Association)
- CVSA (Commercial Vehicle Safety Alliance)
- CTAA (Community Transportation Association of America)
- CRSI (Concrete Reinforcing Steel Institute)
- COMTO (Conference of Minority Transportation Officials)
- CMAA (Construction Management Association of America)
- CTN (Contactless Technology Network)
- CUTC(Council of University Transportation Centers)
- ESI (Economic Strategy Institute)
- EDTA (Electric Drive Transportation Association)
- ERA (Electric Railroaders Association)
- EMA (Engine Manufacturers Association)
- ETF (Eno Transportation Foundation)
- Eurosmart
- GTI (Gas Technology Institute)
- IMA (Institute of Management Accountants)
- IRE (Institute for Railroad Engineering)
- ITE (Institute of Transportation Engineers)
- IARO (International Air Rail Organization)
- UITP (International Association of Public Transport)
- IDA (International Downtown Association)
- IRWA (International Right of Way Association)
- ITMA (International Transportation Management Association)
- LRTA (Light Rail Transit Association)
- MBS (Motor Bus Society)
- NACO (National Association of Counties)
- NAFA (National Association of Fleet Administrators)
- NARP (National Association of Railroad Passengers)
- NARC (National Association of Regional Councils)
- NBB (National Biodiesel Board)
- NCL (National Civic League)
- NLC (National League of Cities)
- NPA (National Parking Association)
- NPGA (National Propane Gas Association)
- NSTA (National School Transportation Association)
- NSCA (National Station Car Association)
- NTBA (National Transit Benefit Association)
- NGVC (Natural Gas Vehicle Coalition)
- NI (Nickel Institute)
- NAVC (Northeast Advanced Vehicle Consortium)
- NEPTA (NorthEast Passenger Transportation Association)

- PCA (Portland Cement Association)
- PVC (Propane Vehicle Council)
- REMSA (Railway Engineering-Maintenance Suppliers Association)
- RSS (Railway Systems Suppliers)
- SCA (Smart Card Alliance)
- SHRM (Society for Human Resource Management)
- SAE (Society of Automotive Engineers International)
- SNAME (Society of Naval Architects and Marine Engineers)
- SWTA (South West Transit Association)
- Transportation for America Coalition
- TLPA (Taxicab, Limousine and Paratransit Association)
- TSC (Transit Standards Consortium)
- UMA (United Motorcoach Association)
- USCM (United States Conference of Mayors)
- VESI (Value Engineering Society International)

B. *Freight Rail***:** Example of a CEO/Senior Executive Industry wide Engagement Process

Freight Rail Industry-Wide Security Management Plan Development and Promulgation

AAR supports an estimated 100 safety, operations and security committees whose work products, such as operating, equipment, safety and security standards, are reviewed and guided by AAR's Safety and Operations Management Committee composed of member COOs and its Board of Directors, composed of CEOs of member institutions. The committees have subject matter expert participation by owners and operators from across the mode often including small and large railroads (who have votes on the committees), as well as other relevant stakeholders on an issue. Matters brought to AAR committees can be generated in a number of ways, e.g., a notice from a federal agency, a proposal by an AAR member railroad, observations by railroads of unexplained/recurring equipment failures. The working committees study the issue or problem or recommendation in question, which includes, as necessary, reviewing federal regulations, collecting railroad data, performing tests, and structuring a proposal for further research. Based on their study and the topic, the committees make recommendations to a senior level committee. The COO level committee, in many cases, has final authority. In other cases, recommendations must be presented to the AAR Board for final approval.[136] [137]

Products resulting from the AAR committee process typically include changes to reduce risks and to increase productivity of the North American freight rail network. Changes in the design

[136] *Association of American Railroads*, accessed February 20, 2015, www.aar.org/

[137] Nancy L. Wilson, "Association of American Railroads: Role, Products and Processes." Letter to National Infrastructure Advisory Committee, February 10, 2015.

and/or function of rail cars and their many mechanical components are common. More effective ways to inspect infrastructure integrity and improve computer tracking systems are also developed through this process. New tank car safety standards were developed this way, as was a new design for rail car wheels in the 80's. A computerized train control system ("Positive Train Control") is in technology development currently within this structure.[138]

Illustrative of how this structure and process works is the development and adoption of the freight rail industry's Terrorism Risk Analysis and Security Management Plan (Security Management Plan), which involved the entire industry and both the primary trade associations, AAR and ASLRRA, to deliver in a very short time frame, with full engagement of CEOs in the decision-making process.

1. Immediately following 9/11/2001 terrorist attacks on the U.S., a need was identified for an industry security action plan to provide operational uniformity in response to terrorism threats and attacks.

2. An action plan was proposed for developing an industry-wide security plan by association staff; the Board approved the proposed industry-wide plan development initiative.

3. Outside experts in terrorism and physical and cyber security were hired to assist industry in developing an industry-wide plan, which would include aspects of required coordination between institutions. The driving force behind the plan was seen as protecting the industry's ability to provide critical services to the nation, after 9/11, recognizing railroad transportation is enormously important to national defense, the economy, and public health.

4. Subject matter experts who were employees of the AAR member railroads, having responsibilities for implementing the outcome of this effort in their home railroads, and representatives from the ASLRRA formed five "critical action teams" to assess the threats to and vulnerabilities of the railroad industry's a) critical infrastructure, b) train operations, c) transportation of highly hazardous materials, d) transportation of Department of Defense (DOD) traffic, and e) IT and communications systems. The outside experts and experienced AAR employees were assigned to facilitate each critical action team.

5. Each critical action team performed risk assessments in its area of study, using U.S. Government best practices available at the time. Based on its outcomes, each team developed lists of immediate countermeasures for upgraded baseline security and also recommended security actions to mitigate risks at three elevated alert levels.

6. While this process was underway, AAR established, with the assistance of DOD, a secure communications center to receive, assess, and distribute as appropriate threat and incident information.

[138] *Association of American Railroads*, accessed February 20, 2015, www.aar.org/

7. Methodologies, findings, list of critical industry assets, baseline countermeasures and alert level actions were reviewed and approved by the senior management committees of AAR and presented to the AAR Board, which provided final approval. The ASLRRA likewise approved.

8. The Security Management Plan became effective in December 2001. All U.S. railroads operating in interchange service, and all Canadian and Mexican railroads connecting with U.S. railroads, agreed to implement and be bound by the requirements of the Security Management Plan.

9. Annually, AAR and its member railroads conduct a comprehensive joint security exercise. This exercise tests the railroads' ability to implement the Plan. Lessons learned are captured and, as necessary, used to modify railroad response processes and the Plan. At least once since December 2001, the Plan was completely re-evaluated, updated and re-issued through the same AAR committee process.

AAR continues to run the operations center to communicate directly with railroad officials, DOD, federal agencies, and certain shipper organizations to share threat and incident information, directing appropriate actions pursuant to the approved plan.[139]

The AAR also owns two subsidiaries to assist the industry to research effective practices and to implement standards and agreed upon plans. The two wholly owned subsidiaries are:

- **RAILINC:** a provider of information technology, related network operations and financial services, and near rail-time network data to North America's railroads. Railinc's product lines help railroads, rail equipment owners, third party logistic providers, and others increase productivity, achieve operational efficiencies, and keep their assets moving safely.
- **Transportation Technology Center Inc**. (TTCI): a rail research and testing facility that works to improve the safety and efficiency of freight railroads throughout North America and the world. It is considered by many outside of the industry, to be world class, with state-of-the-art laboratory facilities and 48 miles of test tracks, TTCI's team of researchers, engineers, and other experts develop and test the emerging technologies that support innovation in the railroads. TTCI is also home to an in-depth training program for hazardous material (hazmat) scenarios. It manages the publications covering technical standards and quality assurance for the industry.[140]

[139] Nancy L. Wilson, "Association of American Railroads: Role, Products and Processes." Letter to National Infrastructure Advisory Committee. February 10, 2015,
[140] *Association of American Railroads,* "About Us," accessed February 20, 2015, www.aar.org/Pages/AboutUs.aspx

Water Sector Case Study

I. Sector Landscape:

The Water Sector is defined in the National Infrastructure Protection Plan (NIPP) to be composed of the drinking water system and waste water systems. These systems are comprised of: sewer lines and water treatment plants; storage for raw and treated water; and distribution and monitoring systems.

A water system generally has seven physical components: The Water Source, Conveyance, Raw Water Storage, Treatment, Water Storage, Distribution Systems, and Monitoring Systems. The first source -- the Water Source -- comprises of groundwater, surface water, or a combination of the two. The vast majority of Community Water Systems serves fewer than 10,000 people using groundwater as their source. Large water systems obtain most of their water from surface sources. The conveyance component brings water from a remote source to the treatment plant. Water systems may use pipes or open canals, which allows the water to be pumped or gravity-fed. The Raw Water Storage component is composed of reservoirs or lakes that hold water from the source before it is treated; such reservoirs may be in remote or urban areas. The Treatment component applies a variety of physical and chemical treatments, depending on the contaminants detected in the raw water. Water Storage is where treated water is stored before being distributed to customers. In a limited number of cases, treated water is stored in large, uncovered reservoirs. Distribution Systems are composed of the network of pipes, tanks, pumps, and valves that convey water to customers. The flow is adjusted so that the proper volume and pressure are delivered when and where needed. The Monitoring System component monitors for conventional regulated and unregulated contaminants. Some utilities have sensors installed at critical points to monitor a range of physical properties, such as water pressure and water quality.[141] The water infrastructure is capital intensive.

In the United States, there are over 155,000 water systems and about 100,000 wastewater treatment systems that are divided between federal, state, and local government ownership, as well as some that are owned jointly by public-private partnerships.[142] A representative from the Environment Protection Agency (EPA), which is the Sector Specific Agency for the Water Sector, provided information that of the approximately 155,000 public drinking water systems, about 400 very large systems serves half the population of the country. Slightly over 100,000 of the drinking water systems, serving about 48 million people, are owned by private sector, but local government owns about 32,500 systems, serving over 250 million people. The relative difference in numbers is also reflected in the ownership and population served for wastewater

[141] "Water Sector Specific Plan, an Annex to the National Infrastructure Protection Plan," 2010, 9.
[142] "PWSS Overview," August, 28, 2014

systems. Privately owned systems compose the majority of the sector, but systems publicly owned by towns, cities and counties serve the majority of the population.

The Water Sector is seen by its members as a very diverse and complex sector, differing in regional characteristics, and size of operations. Conditions in different regions generate very different priorities and requirements for investment. Locations can include cities as big as New York City, or cities as small as 30 inhabitants. The same agency might supply water and collect waste water, or it could be separate utility provider. Their operations and decision-making criteria are much different than those of a small-rural-privately-owned-utility provider. It was noted that any given utility is going to have a unique set of threats and utilities are encouraged by their Sector Specific Agency to look at the threats and see what makes sense to them. For example, in southern Nevada the biggest threat may be drought, but that would not be the case in Boston. These differences create challenges for the sector in finding common interests and create the necessity for finding solutions that are scalable and tailored. Such differences surface more often in addressing common issues at the national level.

Within the sector, the owners and operators engage with each other and with the government primarily through their trade and professional associations. There are approximately 40 trade associations that are linked with the Water Sector.[143] Reflecting the diversity of the sector's ownership, many of the trade associations are aligned with types and size of communities that water utilities serve. For example, the National Water Association serves rural communities. The Association of Metro Water Agencies represents larger publicly owned systems. The National Water Association represents privately owned systems only. All of these organizations have heavy interactions with Congress and the Federal government. These associations are an intermediary for the sector and spend time advocating, playing an influential role in the sector. There is also a long history of individual engagement by water utilities and their associations directly with the EPA on various matters. However, many of them also provide services beyond advocacy. Several of the larger trade associations, such as the American Water Works Association (AWWA), provide services for the entire sector such as information sharing and analysis. The associations in this sector support warning systems, mutual assistance programs, and maintain working groups focused on security. Other trade or professional associations establish best practices and perform research.

The Water Sector's Sector Coordinating Council (SCC) which participates in the Critical Infrastructure Partnership Advisory Council (CIPAC) has been operating for almost a decade and seen as very active. It is seen as the main forum for engagement for the Water Sector with the Federal government. The Sector Coordinating Council engages in critical infrastructure security and resilience sector-wide planning, coordinating, information sharing, and programmatic development with the Federal Government whose efforts are led by EPA as the designated

[143] *Department of Homeland Security*, "Water and Wastewater Systems Sector Committee Membership," accessed February 19, 2015, www.dhs.gov/water-sector-committee-membership

Sector-Specific Agency. The Water SCC relies heavily on the executives of utilities and the staff of associations which are also members in the SCC.

There are many interdependencies in the Water Sector, which include the Electricity Sub-Sector and the Transportation Sector.[144] An example given was during Hurricane Sandy, the water and waste water systems continued to work due to a water system plant's backup generators. However, these generators could only serve as backup sources for a short time. One senior executive provided information that his utility estimated that building their own plant would cost $100 million to generate 28 megawatts of backup power, and then they would have added costs to protect it. His utility eventually worked out a solution to connect directly to the electric transmission system as a solution rather than through the local electric distribution system. The Water Sector interacts with the power industry when cooling water is needed for new generator construction. Interdependencies also exist with Chemical and Transportation sectors; the Water Sector has limited chemical storage capabilities and there is a need to transport those chemicals.

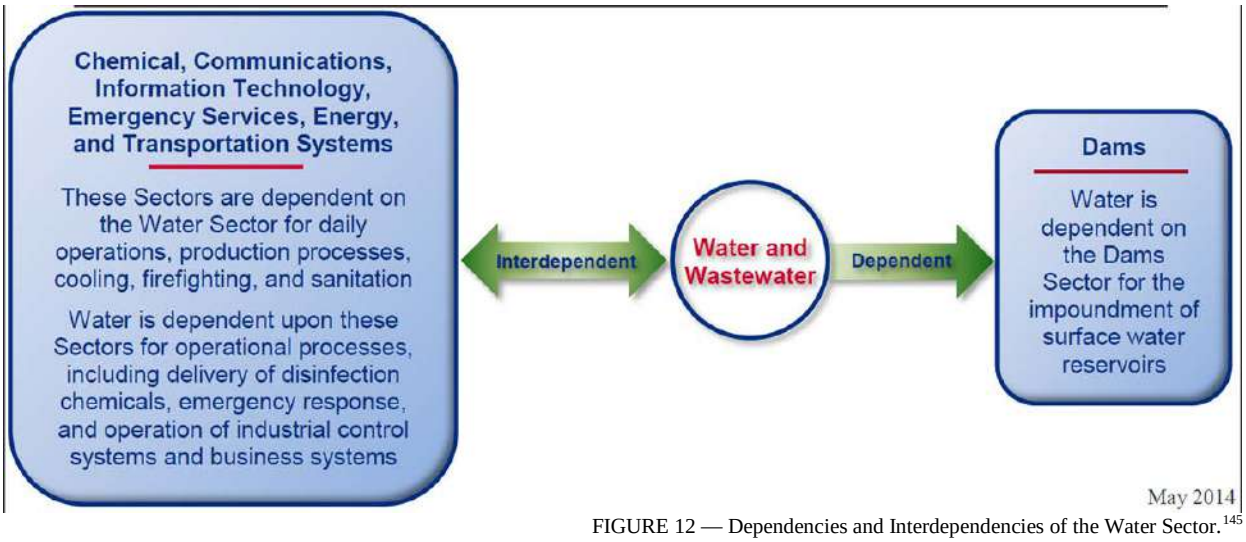

FIGURE 12 — Dependencies and Interdependencies of the Water Sector.[145]

II. CEO Landscape:

Like other lifeline critical infrastructure sectors, the Water Sector is composed of both private and public sector owners and operators. The public sector equivalent of the private sector CEO is a General Manager or in some cases, Executive Director. Usually, a general manager reports to a Water Board, whose membership is generally appointed by local governments. The Water Board sets water rates and often can issue municipal bonds, independent of the county. Counties issue

[144] Water Sector Specific Plan, an Annex to the National Infrastructure Protection Plan, Pg. 38, 2010.
[145] *Department of Homeland Security*, "Sector Risk Snapshots May 2014," accessed February 19, 2015, www.hsdl.org/?view&did=754033#page=50

general obligation bonds. General Managers in the Water Sector need to submit a capital improvement plan for approval to their Boards. For operations of the water utility, a general manager generally reports to a mayor and a city council or their equivalent in a county. Unlike the private sector companies, the public sector owned and operated utilities by their nature are non-profits. Consequently, they present their case for investment to political bodies to have resources allocated. There are different considerations that come into play in a political environment. One General Manager observed that when resources are not available which may cause discussions on reduction in service, maintenance investments that the public generally does not understand becomes a big challenge. The impact may not be immediately obvious in the near-term, but decisions or lack thereof will come back to haunt the utility. Private sector CEOs are seen as having more freedom and flexibility to make decisions on investments.

General Managers and CEOs in the Water Sector have historically organized themselves through their trade and professional associations, aligned with their interests, which for this sector is driven by size and geography. In common, with other sectors, they use their associations to primarily interact and advocate with the Federal government. General Managers and CEOs serve on the association boards to develop strategic direction and agendas for action for their associations. In addition, in common, with associations in other sectors, general managers or CEOs will chair working groups or sub-committees on topics of critical interest to their part of the sector.

The Water Sector's SCC is now seen as the primary means by which the sector's senior executives across the sector come together to engage with the Federal Government. Appointments are made to the Water SCC through the various water sector associations in which the General Managers and CEOs all participate. Executive directors, CEOs, and general managers from across the country are nominated and appointed to that council annually. Within the Water SCC, the members are very active, and meet semi-annually, with work proceeding in working groups in the interim.

General Managers also participate in regional security issues through the regional Council of Government which administer the use of grant funding.

III. Topics/Issues that CEOs Focus on:

Both private sector CEOs and public sector General Managers must focus on funding or revenue stream and its availability as major responsibilities of their role. The public sector organization must cover its operating, maintenance and rebuilding costs, while the private sector organization must also earn a profit. The CEO has a fiduciary obligation to his/her shareholders, while the General Manager is held accountable by the public, in a complex political and funding environment. Other topics that water CEOs or their equivalents pay attention to include burdensome regulations, mew legislation, and issues that affect the efficient and sustainable operations within the entire sector such as shortage of certain products. One General Manager

gave an example of a shift in product price of a good required by the sector going up 60% because there is now another use of that product that is more profitable for the manufacturers to utilize for another customer segment. These topics will cause CEOs/General Managers to examine and address as a group.

Emerging issues that affect the entire industry include climate change, aging infrastructure, regulatory compliance, and research and development to advance the capability of the sector. The latter includes a concern that there is only so much water in the US. There are many diverse views regarding these issues. Research will assist in finding commonalities and potential core solutions that are scalable and tailored. There is a need for strategic information sharing on technical advancements, such as cyber systems and their security, and more efficient plants that require less maintenance and operating costs. It was seen that the federal government has reduced its funding on research resulting in other countries passing us by in advances. It was seen that addressing research collaboratively across the sector and with other partners will maximize the resources everyone has to address the challenges and issues in the changing environment.

A great deal of attention is being paid to cyber systems at the present time, within the sector. Cyber assets include control systems at water treatment plants and dams that are considered critical.[146] However, many systems are not cyber dependent and can continue to operate manually if needed.

Responding to a query on cross sector coordination and collaboration, one General Manager observed, "Anytime we are facing similar issues, it's a time to come together and support each other and to understand better the issues that another sector is facing", particularly those sectors on which other sectors depend. He observed that 9/11; derechos and other catastrophic conditions have brought attention specifically to the electric industry. At the same time, the water sector is looking for alternative ways to reduce power costs; and to manage the consequences of their operations during power outages in catastrophic disasters.

Engagement with other sectors at the national level at the senior executive level is seen as uncommon (although coordination and partnership with other sectors are often seen at the local level). It was noted by one Water Sector senior executive that the Water and Energy Sectors were seen as reliant on each other to be successful. However, it was seen that there is no mechanism to have the two sectors meet in one room. Therefore, it was seen as difficult to discuss vulnerabilities and share solutions or collaborate.

Another water senior executive expressed view was that cross sector partnerships need to be formed and there has to be involvement at a senior executive level. Delegation is deemed as important given the senior executive's often overloaded plate, but it was also expressed that "if

[146] "Water Sector Specific Plan, An Annex to the National Infrastructure Protection Plan,", 2010, 32.

you don't see the senior level involved, the general view is that a topic is not getting much attention."

IV. Lessons learned:

An example was given that in the wake of Hurricane Isabel, a decade of communication was triggered within the water sector with their local power utilities. This communication identified improvements to water treatment plants and their operations dependent on electric power. Such conversations do not occur in all sectors, until there is specific need or issue identified. There are limited forums in which vulnerabilities and lessons learned can be shared at the senior executive level from which unified action can be taken by sector members at the local level as demonstrated by this example. In this case, a communication/dialogue at the local level was initiated by the water sector whose members had identified a specific issue which needed to be addressed. However, this sector-wide initiated dialogue at the local level, even though it occurred over a ten year period, led to greater preparedness and coordination when Hurricane Sandy hit nine years later.

V. Summary of Findings and Conclusions:

Findings for the Water Sector based on the information collected for this case study include:

- The Water Sector is seen as being very well organized at the CEO-equivalent level and there is a large amount of participation among its members on national issues.
- The Sector has very strong trade and professional associations with a history of strong advocacy capabilities with the Federal government which requires a thoughtfulness and careful balancing act by Federal agencies which also act as their regulators.
- The SCC for the sector has become established as a senior executive leadership council to engage with the Federal government and when appropriate with other sectors at the senior executive level
- Although fewer in number than private sector owned and operated water organizations, publicly owned and operated water organizations serve the greater part of the American population--- with an implication that public sector owned and operated water organizations face a different and complex environment within which decisions and commitments are made by senior executives, which requires a degree of mutual understanding within a partnership at the national level with predominantly private sector owned and operated sectors.
- There appears to be anecdotal evidence that cross sector partnerships and engagement would be valuable even if only for strategic information sharing at the senior executive level.

Appendix D – Acronym List

Overall Report	
CBP	U.S. Customs and Border Protection
CEO	Chief Executive Officer
CIPAC	Critical Infrastructure Partnership Advisory Council
COO	Chief Operating Officer
DHS	The Department of Homeland Security
DOT	The Department of Transportation
EO	Executive Order
FACA	Federal Advisory Committee Act
ISAC	Information Sharing Analysis Center
IT	Information Technology
NIAC	National Infrastructure Advisory Council
NIPP	National Infrastructure Protection Plan
NIST	National Institute of Standards and Technology
PPD	Presidential Policy Directive
PPP	public-private partnership
R&D	Research and Development
SCC	Sector Coordinating Council
SSA	Sector Specific Agency
SSP	Sector Specific Plan
TSA	The Transportation Security Administration
Chemical Sector Case Study	
ACA	American Coatings Association
ACC	American Chemistry Council
AFPM	American Fuel and Petrochemical Manufacturers
API	American Petroleum Institute
ARA	Agricultural Retailers Association
ASTI	Ammonia Safety Training Institute
CFATS	Chemical Facility Anti-Terrorism Standards
CGA	Compressed Gas Association
CPDA	Council of Producers & Distributors of Agrotechnology
IIAR	International Institute of Ammonia Refrigeration
ILTA	International Liquid Terminals Association
IME	Institute of Makers of Explosives
NACD	National Association of Chemical Distributors
SOCMA	Society of Chemical Manufacturers & Affiliates
Communications	
ANSI	American National Standards Institute
Comm-ISAC	Communications Information Sharing and Analysis Center

CSRIC	Communications, Security, Reliability and Interoperability Council
FCC	Federal Communications Commission
FERC	Federal Energy Regulatory Commission
ICT	Information and Communication Technologies
NCC	National Coordinating Center
NCS	National Communications System
NSIE	Network Security Information Exchanges
NSTAC	National Security Telecommunications Advisory Committee
PBX	Private Branch Exchange
PN	Public Network
PSTN	Public Switched Telephone Network
TIA	Telecommunications Industry Association
Electricity	
AEP	American Electric Power
APPA	American Public Power Association
BPS	Bulk Power System
DOE	Department of Energy
EEI	Edison Electric Institute
EPRI	The Electric Power Research Institute, Inc.
EPSA	Electric Power Supply Association
ESCC	Electricity Sub-Sector Coordinating Council
ES-ISAC	Electricity Sector Information Sharing Analysis Center
ExCon	Exercise Control
FERC	Federal Energy Regulatory Commission
GridEx	Grid Security Exercise
IOU	Investor-owned utility
NCCIC	The DHS National Cybersecurity and Communications Integration Center
NEI	Nuclear Energy Institute
NERC	North American Electric Reliability Corporation
NRECA	National Rural Electric Cooperative Association
OCIA	Office of Cyber and Infrastructure Analysis
PUC	Public Utility Commissions
Financial Services	
ACH	Automated Clearinghouses
ACSSS	American Council of State Savings Supervisors
ATM	Automatic Teller machines
CFTC	The Commodity Futures Trading Commission
CFTC	Commodity Futures Trading Commission
CSBS	Conference of State Bank Supervisors
FBIIC	Financial Banking Infrastructure Information Committee
FCA	Farm Credit Administration
FDIC	Federal Deposit Insurance Corporation

FHFA	Federal Housing Finance Agency
FRB	Board of Governors of the Federal Reserve System
FRBNY	Federal Reserve Bank of New York
GDP	Gross Domestic Product
GSE	Government Sponsored Enterprises
NAIC	National Association of Insurance Commissioners
NASAA	North American Securities Administrators Association
NASCUS	National Association of State Credit Union Supervisors
NASD	National Association of Securities Dealers
NCUA	National Credit Union Administration
NFA	National Futures Association
OCC	Office of the Comptroller of the Currency
OTS	Office of Thrift Supervision
SEC	The Securities and Exchange Commission
SEC	Securities and Exchange Commission
SIPC	Securities Investor Protection Corporation
SRO	Self-Regulatory Organization
Transportation	
AAR	Association of American Railroads
APTA	American Public Transportation Association
ASLRRA	American Short Line and Regional Railroad Association
BTS	Bureau of Transportation Statistics
DOT	Department of Transportation
FRA	Federal Railroad Administration
FTA	The Federal Transit Administration
MBTA	The Massachusetts Bay Transportation Authority
MPO	Metropolitan Planning Organization
NTS	National Transportation System
STB	US Surface Transportation Board
TCRP	Transit Cooperative Research Program
TDC	Transit Development Corporation
TRB	Transportation Research Board
TSA	Transportation Security Administration
TTCI	Transportation Technology Center, Inc.
Water	
AWWA	American Water Works Association
EPA	Environmental Protection Agency
PWSS	Public Water System Supervision
PUC	Public Utility Commissions