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Public Utility Commission Participation in GridEx V: A Case Study

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Introduction

A catastrophic physical or cyber attack on the electric grid can have devastating cascading consequences. When the lights go out or fuel stops moving for a prolonged period, the nation's security and public health and welfare are in jeopardy. A timely, coordinated response across an array of critical stakeholders is imperative to ensure a rapid recovery. Planning and preparation are necessary components to an effective response and exercises are important vehicles for testing stakeholder readiness.

GridEx is the preeminent international-scale exercise that specifically focuses on response and recovery from coordinated cyber and physical security incidents on the bulk power system (BPS). Sponsored by the North American Electric Reliability Council (NERC), GridEx is a biennial event, conducted most recently in November 2019. Dubbed GridEx V, more than 520 entities participated, including 18 public utility commissions.[1]

This case study examines the experiences of six public utility commissions who participated in GridEx V. It highlights the benefits they perceived as well as the challenges they encountered. The intent of this case study is to pave the way for more PUCs to actively engage in the planning, preparation, and play for GridEx VI, slated to take place in November 2021. Through GridEx, PUCs have the opportunity to build relationships, clarify roles, and strengthen their response capabilities in coordination with key partners.

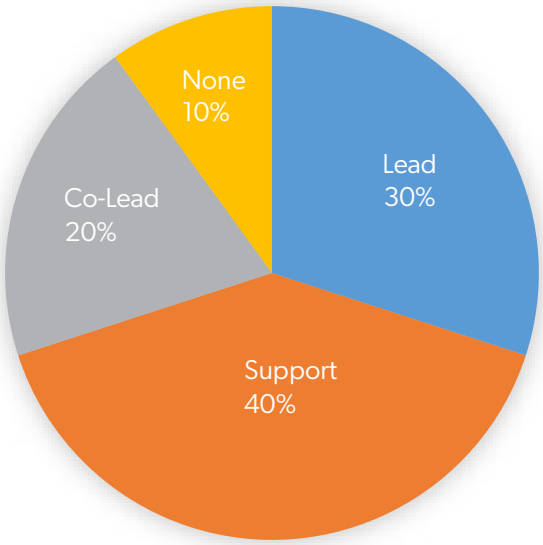
1 Alaska, California, Colorado, Connecticut, Florida, Hawaii, Idaho, Illinois, Indiana, Iowa, Maryland, Minnesota, Ohio, Oregon, Pennsylvania, Texas, Wisconsin, Wyoming

Grid Emergencies and the Role of PUCs

Most states have modeled their emergency response plans and organizational structure after the federal government's National Response Framework[2] and Emergency Support Function[3] (ESF) structure. States often assign Emergency Support Function #12 (Energy) roles and responsibilities to PUCs. Even in cases where PUCs may have no formally designated ESF #12 role, they may be called upon to provide subject matter expertise to first responders and other emergency management personnel in the event of an electric grid emergency.

PUCs with ESF-12 roles often cite collaboration with other ESF-12 partners, including state energy officials and emergency management teams, as a key success factor to effective emergency response and recovery efforts. Experts also suggest that participating in tabletop exercises is a vital mechanism for building and maintaining those relationships.[4]

PUC ROLES WITHIN STATE PLANS



2 National Response Framework: https://www.fema.gov/media-library-data/1582825590194-2f000855d442fc3c9f18547d1468990d/NRF_FINALApproved_508_2011028v1040.pdf.

3 Emergency Support Functions: https://www.fema.gov/emergency-managers/national-preparedness/frameworks/response#esf.

4 State Agency Coordination During Energy-Related Emergencies: https://pubs.naruc.org/pub/41DF9BEF-DEFF-B995-4865-37AB2367FA84

Benefits of PUC Participation in Exercises

Observing or actively playing in exercises such as GridEx helps participants appreciate the depth and breadth of activities that must be undertaken in response to a disaster, as well as the resource requirements to execute them. It allows them to practice their response plans and identify and rectify gaps before a real emergency should occur. For PUCs, the exercise can help them examine their response capabilities and those of utilities under their purview. Other benefits for PUCs of participating in exercises include:

- a better understanding of threats and their potential impacts on energy and other critical infrastructure sectors;
- knowledge of key partners' roles, responsibilities, and capabilities during a grid emergency;
- awareness of how information flows between stakeholders in real-time; and,
- identification of gaps that need to be addressed to ensure an effective response.

The relationships built during the exercise design and play phases are perhaps the most beneficial aspects of participating in an exercise. The act of meeting peers within other state agencies or utilities and exchanging contact information goes a long way in building trust and confidence in each other's abilities. Oftentimes, those trusted relationships are leveraged during developing emergencies.

It is important to note, however, that sensitive operational information may be exchanged during an exercise. PUCs should anticipate this and put controls in place beforehand to ensure such information is not used for regulatory compliance purposes. These controls ensure that participants are comfortable identifying areas ripe for improvement during the exercise, which allows for timely and effective action during a real-world restoration and recovery event.

Introduction to the GridEx Series

GridEx, shorthand for Grid Security Exercise, is produced by NERC's Electricity Information Sharing and Analysis Center (E-ISAC). NERC's mission is to ensure the reliability and security of the bulk power grid in North America. As a functionally separate entity under NERC, the E-ISAC, in coordination with the U.S. Department of Energy (DOE) and the Electricity Subsector Coordinating Council (ESCC), serves as the primary information sharing channel for the electric industry and enhances the industry's ability to prepare for and respond to cyber and physical threats, vulnerabilities, and incidents on the BPS.[5]

Inaugurated in 2011 and conducted biennially since, each GridEx iteration focuses on new and emerging threats that may affect the reliable operation of the BPS. The E-ISAC designs a new scenario for each GridEx exercise and distributes that scenario to participating organizations so they can play on their own or, ideally, in coordination with key partners. The objective is to test utilities' and critical partners' ability to respond effectively to cyber and physical threats and maintain power grid operations. The E-ISAC actively encourages participation from electric companies responsible for the BPS and non-BPS entities, such as distribution-only electric utilities or utilities not in the continental U.S., natural gas utilities, federal and state government partners, other critical infrastructure sectors, and supply chain stakeholder organizations. Incorporating non-BPS entities allows exercise participants to examine the cascading impacts of bulk electric grid outages on other lifeline sectors,[6] reaffirming and strengthening cross-sector and public-private capabilities along the way.

What is an exercise scenario?

A scenario is a sequential, narrative account of a hypothetical incident that provides the catalyst for the exercise and introduces situations that will inspire responses.

What is an exercise inject?

An inject is information designed to supplement the scenario, delivered during play, to prompt additional actions.

Source: NIST Guide to Test, Training, and Exercise Programs for IT Plans and Capabilities.

5 Electricity Information Sharing and Analysis Center, https://www.nerc.com/pa/CI/ESISAC/Pages/default.aspx.

6 Lifelines are Safety and Security, Food, Water, Sheltering, Health and Medical, Energy (Power & Fuel), Communications, Transportation, Hazardous Material. (See https://www.fema.gov/media-library-data/1544469177002-251a503b3717f0d6d483bae6169f4106/Revised_Community_Lifelines_Information_Sheet.pdf.)

About GridEx V

On November 13-14, 2019, the E-ISAC conducted GridEx V through virtual and distributed play with more than 7,000 players from 526 organizations participating. Most participants were electric utilities and members of the E-ISAC, but natural gas utilities, water utilities, telecommunication companies, and state/local organizations also participated.[7] At least 18 public utility commissions (PUCs) actively played in or observed GridEx V in coordination with other state agencies or utilities.[1]

The E-ISAC, working with industry participants on the GridEx Working Group, designed the exercise, including the scenario and recorded video and written injects. Exercise participants used these materials to bring their key partners together and play as a tabletop exercise.[8]

The GridEx V scenario focused on simulated cyber and physical attacks that threatened the reliable operation of the BPS, which, if successful, might cause cascading impacts on electricity distribution networks and other critical functions. The objective was to examine response actions and coordination efforts across many BPS-related stakeholders, including electric utilities, natural gas utilities, federal and state government partners, other critical infrastructure sectors, supply chain stakeholder organizations, and the E-ISAC.

The scenario encompassed the following events:

- Cyber-attacks targeting electric utility control systems,
- Physical attacks targeting key electricity generation and transmission facilities and natural gas transmission facilities, and,
- Widespread and prolonged electricity outages as a result of the attacks, affecting large population centers.

During the planning phase, the E-ISAC encouraged participants to customize their exercise experience by developing injects specific to their organizational needs. This tailoring makes the exercise more valuable as players can examine their plans explicitly in response to more localized, relatable events. For example, the E-ISAC developed a generic exercise inject for physical threats to the Northeast United States, but it did not include a specific threat to the state of Connecticut. Connecticut's Division of Emergency Management and Homeland Security (DEMHS), as an exercise planner, chose to specify that the threat was specific to electricity generators that power homes and businesses within Connecticut. This type of customization allowed exercise participants in Connecticut to have a more focused and fruitful exercise experience.

Throughout GridEx V, participants were able to interact with one another on SimulationDeck. This online platform mimics social media sites as well as traditional media outlets such as television and radio. While using the

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7 GridEx V Grid Security Exercise: Lessons Learned Report, March 2020, https://www.nerc.com/pa/CI/ESISAC/GridEx/GridEx%20V%20Public%20Report.pdf.

8 Tabletop Exercise (TTX): TTXs facilitate conceptual understanding, identify strengths, and areas for improvements, and/or achieving changes in perceptions. Participants are encouraged to problem-solve together through in-depth discussion. An effective TTX comes from active participants and their assessment of recommended revisions to current plans, policies, and procedures. It is important to have a facilitator who will keep the participants focused on the exercise objectives.

SimulationDeck, participants received injects in the form of simulated news of physical and cyber threats to the electrical grid as well as irrelevant information from "hacked or compromised" utility- and government-owned social media accounts to introduce confusion. Depending on how an organization planned its exercise experience, participants had to make crucial decisions and identify appropriate response actions using the information available to them and in accordance with their existing plans, processes and procedures.

PUC Experiences in GridEx V

This case study examines the experience of six PUCs — Alaska, Connecticut, Colorado, Florida, Idaho, and Iowa — who participated in GridEx V as either observers or active players. Active play means that PUC personnel assisted in the local exercise development and planning stages, and were integral contributors during play, engaging with other participants and working through the exercise scenario together. Conversely, observers watched as other energy emergency response stakeholders worked through the exercise scenario, but did not contribute to exercise play. Participation in this fashion allowed PUCs to appreciate others' capabilities and to identify resource and coordination gaps independently.

NARUC conducted interviews with each PUC to gather information about its GridEx experience. Questions explored resource requirements, partnering options, internal and external messaging before and after play, and overall level of effort. Several general findings emerged:

- The level of effort required to participate in GridEx was not overly burdensome. Depending on the PUC, one, two, or three staff members were involved in planning, design, and/or play.
- Planning typically began 10 to 12 months before the exercise date.
- Cost of participation was limited to staff time as NERC does not charge to play.

The level of effort exerted by each PUC depended on how they participated and their previous level of experience with exercises, especially GridEx. PUCs who observed GridEx V had few responsibilities beyond attending, taking notes, and documenting their experience. In contrast, PUCs that actively played participated in various planning meetings and helped develop customized injects specific to their states and worked to document lessons learned. As PUCs transition from observers to players, or become more experienced exercise planners, the level of effort will likely increase. More effort will result in more value derived from the exercise.

Observers

PUCs in Alaska and Florida participated in GridEx V as observers. They did so to learn more about the structure of the exercise and how it is played, to understand how utilities executed their response plans, and, if asked, to offer comments to players on their energy emergency response capabilities. Participating as an observer is a good introduction to the GridEx exercise and provides useful information that facilitates stepping into an active role during future exercises.

Regulatory Commission of Alaska[9]

After GridEx IV in 2017, the Regulatory Commission of Alaska (RCA) recognized the value of NERC's GridEx exercise and made it a priority to encourage Alaskan utilities to register and participate in GridEx V.[10] The RCA and utilities that

9 Interview, James "Jay" Layne, Engineering Analyst, Regulatory Commission of Alaska.

10 RCA Public Meeting Transcript – Dec. 11, 2019, http://rca.alaska.gov/RCAWeb/ViewFile.aspx?id=225284C0-E003-4010-B2E7-7CA34C85B8A5.

comprise Alaska's "Railbelt" participated in GridEx V as observers.[11] More specifically, the utilities' Railbelt Cybersecurity Working Group (RCWG) participated. The RCWG is comprised of IT subject-matter experts from the six Railbelt utilities and one additional utility.[12] From the RCA, one staff member observed the exercise.

Experience in GridEx V

RCA's primary goal in GridEx V was to encourage utilities to observe and learn the exercise's structure so they could actively participate in GridEx VI. The RCA successfully recruited the RCWG to observe the exercise in conjunction with a regularly scheduled RCWG meeting in Fairbanks, Alaska, while an RCA staff member observed from RCA headquarters in Anchorage, Alaska.

Because Alaska is not interconnected to the continent's bulk electric system, the RCWG realized early on that GridEx's default injects would not directly affect them. RCWG's lead planner took injects that were tailored for the Lower 48 and modified them to become highly relevant for the state of Alaska. Although the RCWG registered for GridEx V at the "observer level," RCWG members walked through the exercise scenario so they could learn from it and understand how they could play a larger role in the future. The RCWG captured lessons learned based on their experience and distributed to RCWG members for internal use only. For GridEx VI, the RCWG plans on actively playing and including additional internal departments at each utility, including generation/transmission operators, dispatchers, local law enforcement, and senior-level management.[10]

Overall, the utilities and RCA had a positive experience, but they did stress the importance of customizing injects to make sure the exercise is relevant to participants' own states/regions. Without any customization, there is no guarantee that simulated incidents will impact one's system, which may lead to an unfruitful exercise.

Preparation for GridEx V

One RCA staff member was responsible for encouraging utility participation in GridEx V and following up afterward. In early 2019, this staff member reached out to the GridEx V planning team at NERC to make sure they had all the relevant information, then used that information to recruit utilities to participate. This staff member also participated in the E-ISAC led planning sessions, which were very helpful. RCA successfully encouraged five major Alaska electric utilities to participate in the exercise, via email correspondence and formal presentations during regularly scheduled public commission meetings.

Advice to PUCs for GridEx VI

Take advantage of the opportunity to customize the exercise to ensure that injects impact your system and lead to valuable discussion among exercise participants. Additionally, start the planning process early. The planning process itself provides information and resources that require additional consideration and investigation. Getting an early start allows participants time to familiarize themselves with and address newly discovered information and resources.

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11 The "Railbelt" refers to a broad geographical area serviced by the Alaska Railroad or the electrical grid that covers that area. The Railbelt encompasses the most populous areas of Alaska.

12 Presentation, Railbelt Reliability Council and Enabling Legislation, http://www.commonwealthnorth.org/download/022820-EAC-Julie-Etsey_2.pdf.

Florida Public Service Commission[13]

A major regulated utility, Florida Power and Light (FP&L), participated in GridEx V along with the Florida National Guard, the Florida Office of Public Counsel, local governments, federal liaisons, and the Florida Public Service Commission (FL PSC). Exercise participants and observers convened over two days at an FP&L office to take part in the GridEx V experience.

Experience in GridEx V

From the FL PSC, one commissioner and one staffer attended the exercise as observers. Although the PSC had no official role in the exercise, they were able to discuss how the commission might coordinate with other state agencies, as appropriate. One beneficial aspect of the exercise was the opportunity to witness the wide range of complexities that go into responding to a cyber attack. Although an informal relationship on cybersecurity operations already exists between the FL PSC and its regulated utilities, the opportunity to discuss those operations in the context of a simulated cyber incident, as opposed to theoretical discussions, provided immense value.

> "The GridEx exercise demonstrated that it is not enough to just rely on preparation to respond to a cyber incident. We must continuously test the resiliency of our cyber infrastructure to improve the effectiveness of how our grid responds to cyber challenges." – Andrew Giles Fay, Commissioner, FL PSC

Exercise participants utilized the SimulationDeck platform to receive default threat injects from the E-ISAC and also took the opportunity to customize injects specific to Florida. Their customized inject included the possibility of a hurricane hitting the Florida coast while intense cybersecurity breaches were occurring across the U.S. and Canada. This customized inject complemented annual hurricane season preparation workshops hosted by the FL PSC and informed discussions on how to respond to cybersecurity incidents and hurricanes simultaneously.[14]

Preparation for GridEx V

Other than reviewing incident response plans before the exercise, the FL PSC had no preparation responsibilities. FP&L planned all logistics, coordinated the involvement of others, and facilitated the exercise.

Advice to PUCs for GridEx VI

Before participating in the exercise, commission staff should work with their legal office to ensure that their attendance would comply with any travel and communication requirements set by their state law. Depending on the legal authority provided to a commission, it may also be beneficial for commission staff to reach out to the utilities in their state and determine whether they would be willing to establish an informal relationship to share cyber-related information.

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13 Interview, Eddie Phillips II, Chief Advisor to Commissioner Andrew Giles Fay, Florida Public Service Commission.

14 Hurricane Season Preparation Workshops, http://www.psc.state.fl.us/ElectricNaturalGas/HurricanePreparationWorkshops.

Active Players

While observing an exercise increases understanding of how others will respond to an emergency, actively playing provides a holistic picture of key partners' capabilities. Actively playing means assisting in the planning of the exercise and working through exercise scenario and injects with other players via simulated phone, email, and text conversations. It is expected that players' actions be guided by their organizations' emergency response protocols. PUCs in Iowa, Colorado, Connecticut, and Idaho all actively played in GridEx V.

Iowa Utilities Board[15]

The Iowa Utilities Board (IUB) participated in GridEx V in coordination with the Iowa Energy Office, the Iowa Homeland Security and Emergency Management Department (HSEMD), and two Iowa utilities, MidAmerican Energy and Alliant Energy. All the entities participated virtually from their own offices. IUB's Emergency Management Coordinator staff member played on behalf of IUB.

Experience in GridEx V

IUB played a supporting role during the exercise. Their goal was to test reporting protocols outlined within Iowa's Energy Assurance Plan to facilitate situational awareness between utilities and other stakeholders. This goal was accomplished by instructing utilities on how to report new developments to IUB during an incident, then forwarding the information received to key IUB personnel. IUB's main takeaway from the exercise was a better understanding of the sheer speed and frequency at which incidents occur during a "Black Sky" event. Iowa utilities notified the IUB of nine distinct incidents on the morning of November 13 alone. Notifications were related to losses of service, potential cybersecurity breaches, and civil unrest. It was difficult for IUB to stay on top of every incident because so much was happening so quickly.

> "GridEx provides a great hands-on experience that helps participants gain a better understanding of the scale and speed of cascading 'Black Sky' emergencies." – Don Tormey, IUB

Throughout the exercise, utility participants followed their reporting protocols and the applicable rules and statutes when reporting simulated incidents to the IUB duty officer. The Iowa Energy Assurance Plan has clear thresholds describing when information must be escalated and shared by the IUB with other state agencies during an energy emergency. In a real world widespread outage, the IUB would communicate with the HSEMD, and the State Emergency Operations Center (SEOC) would be activated. This threshold was not reached during GridEx V.

Preparation for GridEx V

To prepare for GridEx V play, IUB met with representatives from MidAmerican Energy a few months before the exercise took place to review their response plans. A check-in call was held a few weeks before the exercise. The IUB also had a conversation with Iowa HSEMD before the exercise to discuss the possibility of a simulated SEOC activation, but thresholds were not met during the exercise, so no such activation occurred. IUB did not coordinate

15 Interview, Don Tormey, Director of Communications, Iowa Utilities Board.

with Alliant Energy before the exercise, but communicated with the utility during the exercise. As the events of the exercise unfolded, the IUB followed its disaster response plans, underscoring the necessity of reviewing protocols and processes in advance. Overall, preparation time was not overly time consuming.

Advice to PUCs for GridEx VI

PUCs should review and understand their incident response plans both before and after participating in GridEx. These plans should be reviewed before the exercise so that the thresholds for escalation are understood and then revisited afterward to address any inefficiencies and ultimately make the response plans more robust. PUCs should also develop good working relationships with utilities and their state's Homeland Security and Emergency Management offices for information sharing purposes.

Colorado Public Utilities Commission[16]

Colorado has participated in every GridEx exercise to date. For GridEx V, Colorado was competitively selected by the National Governors Association (NGA) to participate in a technical assistance project to enhance the state's overall experience.[17] NGA provided technical assistance as the Colorado Public Utilities Commission (CO PUC), Governor's Office, Governor's Office of Information Technology, Colorado Information Analysis Center (State Fusion Center), Colorado National Guard Cyber Unit, and Xcel Energy prepared to participate in GridEx V as a team. One staff member participated on behalf of the CO PUC.

Experience in GridEx V

During GridEx V, Colorado's PUC gained a unique perspective by participating from a regulated utility's facility. Instead of playing from the State Emergency Operations Center,[18] the CO PUC played from Xcel Energy's "war room." Xcel Energy is Colorado's largest investor-owned electric utility serving 1.4 million customers. The CO PUC acted as the ESF-12 lead when called upon during the exercise but primarily worked through the exercise in support of Xcel Energy to better understand how Xcel Energy executed its detailed plans and strategies when responding to an energy emergency. It is valuable for all parties involved in emergency response to understand one another's escalation protocols, roles and responsibilities, and practices. Experiencing a utility's response efforts firsthand can be extremely valuable to a PUC, though a positive and collaborative relationship with that utility must exist first.

> "Participating in these GridEx exercises as they become more challenging and complex has proven to be extremely valuable and has helped the PUC and the Colorado-based utilities recognize the importance of collaboration, preparation and preplanning to deal with the ever-evolving threats to the electric grid." – Larry Duran, CO PUC

16 Interview, Larry Duran, Risk Assessment Specialist, Colorado Public Utilities Commission.

17 Press release. National Governors Association Selects 4 States For Assistance In Energy Security Exercise, https://www.nga.org/news/press-releases/national-governors-association-selects-4-states-for-assistance-in-energy-security-exercise/.

18 Colorado Energy Assurance Emergency Plan, January 2016, https://www.colorado.gov/pacific/sites/default/files/atoms/files/2016%20Colorado%20Energy%20Assurance%20Emergency%20Plan.pdf.

Players used the SimulationDeck platform throughout the exercise, which provided scenario updates. As the simulated cyber incidents grew rampant, Xcel Energy requested cybersecurity support from the CO PUC, which worked with the Governor's Office to have the CO National Guard's Cyber Unit deployed to assist Xcel Energy. Before this request for National Guard assistance, the CO PUC provided updates regularly to the Governor's Office on the situation and indicated that resource requests might be on the horizon if the situation continued to escalate. These updates gave the Governor's Office, SEOC, and CO National Guard Cyber Unit time to prepare for possible deployment.

Another inject included concern for the physical safety of substations. Local law enforcement would typically be responsible for protecting these assets, but during the exercise they were busy with other duties such as traffic control (no electricity for traffic lights) and managing disruptive crowds. To overcome this challenge, Colorado discussed deploying non-cyber National Guard units to secure the vulnerable substations.

Preparation for GridEx V

Colorado was selected as one of four states to receive technical assistance from NGA to participate in GridEx V. Through the Colorado Governor's Office, relevant state agencies were encouraged to participate in GridEx V and NGA helped organize several planning sessions with onsite visits to facilitate Colorado's participation in the exercise.

The CO PUC contributed to the planning process in coordination with other agencies. This included input on the venue of the exercise and who else should participate based on the exercise scenario. NGA helped coordinate inter-agency participation and the CO PUC attended all planning meetings.

Advice to PUCs for GridEx VI

Reach out to both regulated and non-regulated utilities and begin collaborating before the exercise. An understanding of one another's roles, responsibilities, and expectations will allow the exercise to run smoothly. Also, review past GridEx "Lessons Learned" reports to set objectives and expectations, especially if you have never participated in a GridEx exercise before.[19]

Connecticut Public Utilities Regulatory Authority[20]

Since 2012, Connecticut's Division of Emergency Management and Homeland Security (DEMHS) has conducted an annual statewide exercise to prepare the state and its 169 municipalities and two tribal nations for natural and man-made disasters.[21] In 2019, the DEMHS used the GridEx V scenario for its annual statewide exercise. DEMHS convened the state's ESF responders at the state's emergency operations center for the exercise, including Connecticut Public Utilities Regulatory Authority (CT PURA) as a lead for Connecticut's ESF-12 (Energy & Utilities).

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19 NERC GridEx Series, https://www.nerc.com/pa/CI/ESISAC/Pages/GridEx.aspx.

20 Interview, Stephan Capozzi, Public Utilities Engineer, Connecticut Public Utilities Regulatory Authority.

21 Press release, DEMHS Announces Dates for the 2019 Governor's Emergency Planning and Preparedness Initiative (EPPI), October 3, 2019, https://portal.ct.gov/DEMHS/Press-Room/News-and-Announcements/2019/10-3-2019-EPPI-2019-Announcement.

Three CT PURA staff members actively played, and one commissioner observed. Other key partners who participated included FEMA, ISO New England, local governments, regulated and non-regulated electric utilities, a natural gas utility, a water utility, and a telecommunications utility.

Experience in GridEx V

Because DEMHS used GridEx V as a statewide exercise, state partners coordinated and developed injects for each of Connecticut's ESFs, including energy-related injects for ESF-12. Connecticut focused its exercise experience on large-scale natural gas and electric grid power disruptions as a result of cyber-related incidents that affected energy transmission and distribution systems. Customized injects simulated a loss of power generation and other detrimental impacts affecting all of New England. To build a sense of urgency to the restoration, extreme cold was added as state-specific inject. Connecticut's exercise included the following customized threats:

- Unmanned aircraft sightings
- Record cold temperatures with daytime highs in the 20s (°F)
- Physical sabotage of critical energy infrastructure
- Cyber attacks on energy sector infrastructure

Connecticut decided to expand its exercise play beyond GridEx's scheduled two-day play. A week before GridEx began, DEMHS emailed Connecticut's players multiple exercise injects on cyber and physical attacks on energy infrastructure and severe cold weather conditions. This "pre-exercise" play tested communication protocols outlined within Connecticut's State Response Framework and cybersecurity response plans.

During the exercise, CT PURA convened separately with ESF-12 partners to discuss the impacts to the energy sector. Discussion focused on how long term outages would affect other critical infrastructure sectors, including security and safety, health and medical, transportation, food/water/shelter, and communications. This led to deeper discussions on how utilities might take advantage of cybersecurity expertise and information sharing mechanisms through CT PURA, CT Fusion Center, DEMHS, and the Administrative Services Agency before an emergency cybersecurity incident.

Preparation for GridEx V

As a statewide exercise, DEMHS was responsible for most preparation activities, but CT PURA was tasked with contacting ESF-12 partners to encourage them to contribute to the discussion on energy-specific injects. CT PURA reached out to electricity, natural gas, telecommunications, and water utilities and successfully garnered their participation. This outreach task prompted CT PURA to update points of contact for utilities, local governments, and other ESF-12 responders.

Before the exercise was conducted, DEMHS distributed materials and encouraged participants to review the state's

severe cold weather protocol, cyber strategy and response plans,[22] and the State Response Framework.[23]

Advice to PUCs for GridEx VI

When preparing for the exercise, consider reaching out to more than just regulated electric utilities. The exercise will be more interesting, realistic, and beneficial if water, telecommunications, natural gas, and non-regulated electric utilities are included.

Idaho Public Utilities Commission[24]

Idaho was competitively selected by NGA to participate in a technical assistance project to enhance their experience in GridEx V. The Idaho Office of Emergency Management (OEM), with support from NGA, coordinated the participation of the Governor's Office of Energy and Mineral Resources (OEMR), National Guard, and the ID PUC. These state agencies played together from their state's Emergency Operations Center (EOC) and regularly communicated with Idaho Power, who played from its own operations center. Two staff members from the Idaho Public Utilities Commission (ID PUC) participated in the exercise.

> "GridEx helps us scrutinize our energy infrastructure and emergency management plans with adaptable variables that elevate the transparency of vulnerabilities and solutions. The discovery of these solutions is essential to our continual improvement of resilient infrastructure." – Joshua Haver, ID PUC

Experience in GridEx V

Throughout the two-day exercise, the ID PUC acted as the primary ESF-12 responder with OEMR serving as the secondary responder (though OEMR typically only responds to fuel disruptions). From the state EOC, participating state agencies used the SimulationDeck to stay up to date on developments across the country. The ID PUC did not customize injects, but Idaho Power did develop operational-specific injects, which allowed state agencies to respond exactly how they would during a real-life energy emergency. Idaho Power's specific injects included:

- Regionally relevant power generation disruptions (Hydro Dams)
- Patch management support that required on-site support across the entire state

One of the most beneficial aspects of the experience was the emergency communication between Idaho Power and the state's EOC. Primarily via phone and email, the ID PUC shared information between Idaho Power and the state's EOC, which allowed the state and Idaho Power to coordinate available resources. One identified resource was the PUC's contacts with federal government counterparts, including the Federal Bureau of Investigation, the U.S. Department of Homeland Security, and the U.S. Department of Energy. These federal agencies protect the nation's

22 Connecticut Cybercrimes and Cybersecurity, https://portal.ct.gov/DEMHS/Homeland-Security/Cybercrimes-and-Cybersecurity.

23 State of Connecticut State Response Framework, https://portal.ct.gov/-/media/DEMHS/_docs/Plans-and-Publications/EHSP0025-SRFV41pdf.pdf.

24 Interview, Joshua Haver, Utilities Analyst, Idaho Public Utilities Commission.

critical infrastructure and provide situational awareness or technical assistance during a significant cybersecurity incident.

Communication with Idaho Power also provided state agencies with an opportunity to highlight existing state cybersecurity resources available to the utility during a cybersecurity incident. In the event of a significant cybersecurity attack on a utility, the Idaho Air National Guard's Cyber Operations Squadron and Idaho's Division of Information Technology Services may be called upon to could provide on-site recovery assistance through patching and reimage implementation.[25] Idaho's Division of Information Technology Services also is Idaho's primary contact for the Multistate Information Sharing and Analysis Center (MS-ISAC). GridEx V demonstrated the value of the MS-ISAC's cybersecurity incident reports and its existing relationship with the E-ISAC to provide crucial situational awareness.[26]

Preparation for GridEx V

The OEM and NGA provided most coordination and logistical support for the exercise conduct. The ID PUC participated in planning meetings and a pre-exercise call to discuss roles, responsibilities, and capabilities and to set expectations. Even without support from other agencies or the NGA, the ID PUC does not believe it would be overly burdensome to organize exercise play on its own in the future.

Advice to PUCs for GridEx VI

Begin preparing for the exercise 10 to 12 months before the exercise start date and include more than one utility. Working with one utility provides a great one-on-one learning approach, but it does not provide a holistic picture of how an incident will impact your entire state. If you're going to simulate activating your state's EOC, invite as many electric and natural gas utilities, non-regulated utilities, state agencies, and federal partners as possible.

25 Idaho Air National Guard, https://www.imd.idaho.gov/idaho-air-national-guard/.

26 Idaho Office of the Governor – Information Technology Services, https://its.idaho.gov/incident-response/.

Preparing for GridEx VI

GridEx VI will take place on November 16-18, 2021.[27] Planning has already begun but it is not too late for PUCs to get involved. For PUCs that observed GridEx V, or have exercise experience, consider active play. Start by seeking out key partners. Begin the planning phase by organizing a group to develop relevant state injects. For PUCs new to GridEx, consider participating in GridEx VI as observers to gain familiarity with the exercise experience. Regardless of a PUC's intended level of participation, stay abreast of E-ISAC activities as the planning for GridEx VI proceeds.

All PUCs interviewed for this case study found their GridEx experience valuable and would encourage peers to participate. For PUCs new to GridEx, NARUC compiled the following list of insights into the benefits, challenges, and level of effort involved. The list derives from advice from PUCs interviewed for this case study, and from conversations with the E-ISAC, NGA, and the DOE.

1. Determine your commission's role and legal authority during an energy emergency. Most PUCs have an outlined role within their state's emergency operations plan or energy assurance plan. Even if your PUC does not have an official response role, other emergency response organizations may look to the PUC as the energy subject-matter experts. Exercises should reflect real emergency coordination, so your exercise role should mimic your expected role in an actual energy emergency.
2. Review lessons learned from previous GridEx iterations (I, II, III, IV, V) ahead of time to set expectations for GridEx VI. Past lessons learned may also help your PUC determine realistic objectives to test during GridEx VI.
3. About 10 to 12 months before the exercise start date, begin reaching out to your state's energy office, emergency management agency, governor's office, national guard, fusion center, and/or utilities (regulated and non-regulated) to propose a coordinated exercise experience. To ensure an organized and directed exercise experience, the earlier you begin preparing the better. Note that participation in GridEx VI may satisfy existing state requirements to conduct emergency response exercises. For PUCs planning to observe, reach out to likely players within your state to ask if they are playing and if you could observe.
4. To highlight interdependencies and allow for a more beneficial exercise experience, consider reaching out to industry sectors that typically are not included in energy sector exercises (e.g., water, telecommunications, local law enforcement, information sharing organizations, and non-regulated utilities). To provide a holistic picture of your state's response capabilities, aim to work with more than one utility.
5. Take advantage of the opportunity to customize the exercise to your state's energy infrastructure. To guide your customization efforts, use template documents within NARUC's Cybersecurity Tabletop Exercise Guide.[28]
6. Review incident response plans and crisis communication plans before participating in GridEx to identify thresholds for escalation. Revisit the plans afterward to address any inefficiencies and ultimately make the response plans more robust.
7. Proactively identify a process to document exercise findings and construct an improvement plan post-

27 NERC GridEx website, https://www.nerc.com/pa/CI/ESISAC/Pages/GridEx.aspx.

28 NARUC, *Cybersecurity Tabletop Exercise Guide,* https://www.naruc.org/cpi-1/critical-infrastructure-cybersecurity-and-resilience/cybersecurity/cybersecurity-manual/.

exercise. Determine whether this information may be sensitive and, if so, decide how that information will be protected. Note that enhancing response capabilities cannot be accomplished overnight. It is an iterative process that requires regular attention and coordination to make a genuine difference.

8. Document your preparation and play activities so future PUC staff members have reference materials and will be able to pick up where you left off. Valuable institutional knowledge could be lost to personnel turnover if preparation activities are not documented.

All PUCs interviewed for this case study had a unique experience in GridEx V because the GridEx series is designed to be flexible and adaptable based on an organization's needs. PUCs participated in GridEx V at varying levels of involvement and different geographic locations across the country. Still, they faced similar challenges that required cooperation between key partners to understand how best to manage catastrophic disruptions to critical energy infrastructure. Lessons learned from these exercises have helped PUCs and their partners continually improve emergency response capabilities and influence how they protect their systems before an emergency. Their participation in GridEx V has helped build relationships and uncover effective practices that are integral to ensuring rapid, coordinated recovery of critical infrastructure assets after an attack occurs. All six PUCs will be participating in GridEx VI to continue building on their successes.

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