

EPRO[®] SECTOR

EXECUTIVE COMMITTEE

WINTER, 2018

November 26, 2018.

PJM Interconnection, PA



EXECUTIVE COMMITTEE GOAL, WINTER 2018

“Building sector and cross-sector teams and milestone plans to address high priority gaps in Black Sky resilience.”

EPRO SECTOR EXECUTIVE COMMITTEE, WINTER, 2018: Meeting Report

Executive Summary

The Challenge

We live in a time of massive change. The interconnected networks of goods and services that power our lives and our economy have brought us unprecedented abundance. Yet resilience challenges have more than kept pace.

Cyber and other malicious threats are expanding, weather patterns have been delivering 100-year storms annually, and the earthquake and tsunami that leveled most of Palu, Indonesia in 2018 reminded us: the hazard menu is growing, not shrinking.

The assets we deploy today to recover from such hazards are unparalleled, but there is a new and disturbing vulnerability in the powerful, interconnected infrastructures that support these assets. The flip side of interconnectivity is interdependency. Without carefully developed, collaborative, coordinated multi-sector plans, the consequences of a Black Sky hazard could be destructive on an unthinkable scale.

The core of the challenge: Personally and mutually taking responsibility to make critical Black Sky resilience plans and investment now, *before* catastrophe makes the need tragically obvious, when it will be too late.



PJM Headquarters. The EPRO SECTOR Executive Committee, Winter, 2018, was hosted by PJM Interconnection at its headquarters in Audubon, Pennsylvania.

Key Themes and Plans Emerging from the Meeting

The Scale and Urgency of the Challenge

Given the profound interconnectedness of today's infrastructure, resource and service sectors and the globalization of supply chains, interdependencies must be addressed as a critical element of effective resilience planning.

As EIS Council CEO **Avi Schnurr** put it,

"Our challenge is to make and implement both critical resilience plans and essential, cost-effective investment. If we wish our interdependent society to continue for the long term, that is the only choice we have. 'Resolving these issues is not a matter of choice,'" he continued, quoting Sergio Braunstein of Israel Electric Corporation. "'When it becomes a question of survival. it is simply essential.'"

Jonathan Monken of PJM characterized the challenge similarly.

"People need to understand that Black Sky restoration is not about individual homes and businesses," he said. "It is about staving off the collapse of the system."

The Developing Threat Landscape

Nation state actions are an increasing threat. **Paul Stockton** said that he was less worried about terrorism than about state actors attacking for strategic purposes.

"What we see going on in the Ukraine is coming here," he warned. "We will see coordinated kinetic attacks on our infrastructure."

Stockton also predicted that future conflicts between states will include new elements for which we are not yet prepared, such as cyber-attacks coupled with information warfare through social media to sow additional chaos, demoralize the public and hinder restoration efforts.

Black Sky-class **Black Start and Restoration Planning**

Electric subsector leaders at the meeting reiterated a fundamental resilience gap, previously highlighted at EIS Summit IX in London, and again in the focused meeting on that topic at the recent EPRO Electric Subsector meeting at TVA Headquarters. Current Black Start and restoration planning, industry leaders commented, does not reach a level sufficient to restart one of the nation's three power grids following a Black Sky hazard-induced interconnect-wide outage. This is especially true for events that will include associated, distributed damage and cascading failure of all other infrastructures.

Assembled leaders at the meeting reviewed a draft Black Start + Restoration resilience roadmap, developed from discussion and planning that took place at both of the above meetings.

As a major accomplishment of the Executive Committee meeting, electric subsector leaders jointly established a working group to build out their draft Black Sky - Black Start + Restoration Roadmap. Frank Koza of EIS Council is coordinating the working group.

As a major accomplishment of the Executive Committee meeting, a self-identified group of electric subsector operations managers and leaders jointly established a working group to carry that draft forward, and develop explicit, detailed recommendations for the subsector. Frank Koza of EIS Council accepted the role of coordinating the working group.¹

Details of both resilience gaps and associated resilience strategies were discussed, especially during focused breakout sessions. For the electric subsector, **John Norden** of ISO New England pointed out that, for a Black Sky-class event, “plans today are not resilient because they assume no damage to the system.” **Scott Aaronson** of EEI concurred, pointing out that for restoration to be effective, “you don’t have to be resilient everywhere in the grid, but you do need safe havens that are.”

Jonathan Monken of PJM gave an example of a specific, high priority “black start + restoration” capability gap, stressing the importance of a diverse fuel mix for optimal resilience, saying “just as you wouldn’t put all of your money in one stock, so you should not place all of your emergency resilience reliance on one fuel.” Amplifying this point, Dr. **Udi Ganani** of EIS Council reported on an important pilot project completed by Israel Electric Corporation (IEC) demonstrating the viability of methanol as an environmentally ideal, easily produced, long duration storable backup fuel that could operate with conventional, existing gas turbines now increasingly common in generating stations.

Resilience Investment and Regulation

Another common theme raised by speakers was the education gap between utilities and both government agencies and customers. The latter often lack a comprehensive understanding of the real risks to the system, or the true urgency of resilience – especially at Black Sky levels. While this reality arises from many factors, utilities need to find ways to do a better job of explaining risk in terms that are comprehensible to both regulatory agencies and consumers.

This gap in education results in both consumers and officials often seeing vital resilience investments as unnecessary expenses. And with regulatory commissions typically focused on mandating that resilience investment be connected to events that are highly probable and frequently encountered in the relatively short term, investment in high impact low-frequency events simply does not fit this structure

One approach that could be particularly helpful would be development of new, self-consistent, industry-wide metrics that could address the unique need for building adequate resilience to address infrequent but catastrophic events. **Tom Galloway** of NATF said that, while we are not yet close to that point, efforts are going forward to develop such metrics. This point was amplified by EIS Council participants, who referred to an ongoing initiative to develop a package of draft metrics, to be reviewed both by industry and regulatory personnel.

All-Sector Black Sky Tools

One key point of concurrence reached – both at the EPRO Electric Subsector meeting in TVA and at this EPRO Executive Committee meeting – was that the relevant resilience time

¹ For an update on the Black Start + Restoration working group, write to frank.koza@eiscouncil.org

scale for Black Sky, subcontinent-class outages ranges from many weeks to months, not hours or days.

Given this, effective all-sector coordinated resilience planning and investment that can address a large scale outage for these durations will be essential to enable infrastructure restoration and population sustainment.

- **Black Sky-class All-Sector Emergency Communication**

However, neither infrastructure restoration nor population sustainment on such scales will be possible if all relevant corporations and organizations – in all sectors – cannot easily communicate.

Scott Blevins of EIS Council reviewed the BSX Emergency Communication Requirements and Architecture as an example of an approach that could meet this need. **Tom O’Brien** of PJM stressed that Black Sky compatible resilient telecommunications must be a top priority, and within that area, voice communications is the number one capability needed. O’Brien endorsed the EIS Council BSX emergency communications project as an important effort toward this goal.

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Walter Weiss of DARPA also addressed this subject, discussing how innovations in communications technologies can increase infrastructure resilience, observing that solid situational awareness and adequate communications are essential prerequisites for decision making in a complex catastrophe.

There was also a special presentation offered by the RAFAEL aerospace corporation, summarizing the potential role for their BNET military communication system to serve as the backbone for an all sector, widely deployed emergency communication network.

- **Black Sky-class Situational Awareness and Decision Support**

While all-sector emergency communication represents the most fundamental need for a subcontinent-scale complex catastrophe, to be effective, such a system must also host additional tooling that can provide adequate situational awareness and provide at least basic decision support to allow managers to work through all-infrastructure restoration and population sustainment. In the absence of the essentially autonomous financial, resourcing, logistics and transportation networks that manage the vast spectrum of multi-sector corporate and societal supply chains and services under normal conditions, AI-enhanced decision support will be critical.

John Organek and **Joey Schnurr** of EIS Council summarized the GINOM multi-infrastructure simulation system as an example of an AI-enhanced decision support system that will be needed in a complex catastrophe. The system is designed to operate in multiple layers, they explained.

GIS situational awareness tools will provide windows into real time inter-sector supply chain operations, utilizing an integrated all-sector situational awareness system designed to provide cross-sector level status information. As a foundation, this system will utilize a rich database incorporating critical data from multiple infrastructure systems, including interdependencies and high-level operational parameters.

As another layer, AI-enhanced decision support is designed to provide insight into the logistics of a severely disrupted supply chain, providing the “emergency equivalent” of a user’s normal understanding of cross-sector supply chain logistics

Cross-Sector Coordination

Although organizations, companies and sectors are making progress in planning and, in some cases, implementing Black Sky-class resilience capabilities, delegates agreed that there is still a great deal that needs to be done to build better intra-sector and cross sector capabilities, and especially the coordination and relationships which will be essential in a Black Sky event.

Multi-sector resilience exercises can provide a powerful framework to help organizations understand capability gaps, and develop strategies to fill those gaps. The EARTH EX exercise series represents a focused, and perhaps completely unique example of such an exercise framework. EARTH EX III, 2019 is being designed to address this need, to help organizations refine decision making and resource management in a complex catastrophe. The exercise is based on real-world natural disaster events that have occurred around the world over the last three years.

The exercise will build on EARTH EX 2017, which highlighted situational awareness and communications, and EARTH 2018, which expanded into cross-sector coordination and development of core initial emergency response plans.