ABSTRACT
This Regulatory Sector Black Sky Guidebook reflects collective input from numerous regulatory agency partners, as well as operational and technical personnel. This Guidebook is meant to serve as a recommended framework for planning resilience investments and cross-sector coordination needed for long duration, multi-region power outages. This peer-reviewed document is designed as a resource for critical lifeline infrastructure owners and operators, addressing critical Black Sky resilience needs for Preparation/Mitigation, Response, Restoration and Recovery measures.

David L. Miller, Regulatory Sector Coordinator
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Role of the EPRO Regulatory Sector Black Sky Guidebook

This Guidebook is designed to provide an evolving framework for recommended guidelines to manage “Black Sky” hazards and risks that are multi-regional and of long duration.

This Guidebook will be consistently updated and reviewed using the EPRO Regulatory Sector Steering Committee process through consultation with sector professionals and managers. This Guidebook contains the latest consolidated thought on the unique challenges posed by wide area, long duration power outages regardless of cause. It provides guidelines to help individual entities strengthen their resilience measures, develop focused operational plans, and assess external support needed to address these severe hazard scenarios.

This document provides general guidance for state and federal utility regulatory bodies as an example of a resilience template addressing emerging “Black Sky” hazards. It is not meant as a one-size-fits-all structure. Rather, it is designed to provide an evolving, best practice framework to help individual regulatory agencies assess and enable resilience planning and investments and consider post-event engagement actions, that will be essential to save and sustain lives in the aftermath of extreme multi-region Black Sky events.

Sector Background
For purposes of this Guidebook version our focus will be on utility regulation with primary focus on the electric power industry. Therefore, when we discuss regulatory agencies and bodies we are primarily talking about three key types of entities. First, is the Federal Energy Regulatory Commission (FERC); second is the North American Electric Reliability Corporation (NERC) and third is the State or Territorial Public Utility Commission or similarly named entity.

The Federal Energy Regulatory Commission, (FERC), is an independent agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects. The Energy Policy Act of 2005 gave FERC additional responsibilities as outlined in their most recent Strategic Plan. As part of that responsibility, FERC:

- Regulates the transmission and wholesale sales of electricity in interstate commerce;
- Reviews certain mergers and acquisitions and corporate transactions by electricity companies;
- Regulates the transmission and sale of natural gas for resale in interstate commerce;
- Regulates the transportation of oil by pipeline in interstate commerce;
- Approves the siting and abandonment of interstate natural gas pipelines and storage facilities;
- Reviews the siting application for electric transmission projects under limited circumstances;
- Ensures the safe operation and reliability of proposed and operating LNG terminals;
- Licenses and inspects private, municipal, and state hydropower projects;
- Protects the reliability of the high voltage interstate transmission system through mandatory regulatory standards
- Monitors and investigates energy markets;
- Enforces FERC regulatory requirements through imposition of civil penalties and other means;
- Oversees environmental matters related to natural gas and hydroelectricity projects and other matters; and
- Administers accounting and financial reporting regulations and conduct of regulated companies.

**The North American Electric Reliability Corporation (NERC)** is a not-for-profit international regulatory authority whose mission is to assure the reliability and security 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. NERC is the electric reliability organization (ERO) for North America, subject to oversight by the Federal Energy Regulatory Commission (FERC) and governmental authorities in Canada. NERC’s jurisdiction includes users, owners, and operators of the bulk power system, which serves more than 334 million people.

The ERO’s key programs, which impact more than 1,900 bulk power system owners and operators, are based on four pillars of continued success:

- **Reliability** – to address events and identifiable risks, thereby improving the reliability of the bulk power system.
- **Assurance** – to provide assurance to the public, industry, and government for the reliable performance of the bulk power system.
- **Learning** – to promote learning and continuous improvement of operations and adapt to lessons learned for improved bulk power system reliability.
- **Risk-based Approach** – to focus attention, resources, and actions on issues most important to bulk power system reliability.

While **State and Territorial Public Utility Commissions or Boards** may vary significantly in the scope and nature of their authorities, those authorities may include areas such as electric, natural gas, telecommunications, water and waste-water, and transportation. The commission or board mission may best exemplified by that of the Pennsylvania Public Utility Commission:

“Mission Statement: The Pennsylvania Public Utility Commission balances the needs of consumers and utilities; ensures safe and reliable utility service at reasonable rates; protects the public interest; educates consumers to make independent and informed utility choices; furthers economic development; and fosters new technologies and competitive markets in an environmentally sound manner.”

**Sector Black Sky Environment**

As modern societies become ever more dependent on integrated, sophisticated utilities, widespread interdependencies among diverse lifeline infrastructure sectors have peaked at a time of increasing concern over emerging, severe “Black Sky” hazards. Threats of Cyber, Electro Magnetic Pulse (EMP), and Coordinated Physical Assault have all grown and are seen as viable threats. Ongoing research has also identified growing risks of natural hazards, including catastrophic earthquakes, severe terrestrial events, and space weather. Occurrence of any of these hazards could result in very large, multi-region power outages, with widely distributed damage affecting all lifeline infrastructure sectors.

While the energy and water sectors and other lifeline infrastructures invest in resilience measures addressing conventional local or regional hazards, these measures are insufficient to enable timely restoration and long-term recovery from Black Sky hazards. Properly focused, effective utility resilience
investment and planning will be essential to avoid severe societal disruption and to save and sustain lives in the extraordinary outages that these extreme events can cause.

Federal, state, territorial and local regulators play a particularly crucial role in enabling and encouraging essential Black Sky resilience, and in preparing for post-event engagement. Serving at the intersection of policy and regulation affecting critical utilities, regulators now have a particularly important opportunity for progress, at a time when industries are paying increasing attention to the needs for such enhanced resilience and planning.

This Black Sky Guidebook summarizes enabling regulatory policies and approaches that address this urgent need.

**Sector Model Overview**

As stated above, for purposes of this version of the Black Sky Playbook we are discussing regulators in the context of the responsibilities of the FERC, NERC, and State and Territorial Public Utility Commissions. However, it is noted that there is a broader array of regulatory authorities that influence life-line, critical infrastructures. Such entities at the federal level may include the Department of Energy, the Nuclear Regulatory Commission, the Environmental Protection Agency, the U.S. Department of Transportation and other federal authorities. At the State level, authority and regulation may include transportation, public health, emergency management, and natural resources, among others. It is recognized that local authorities and regulators may also play a role in ensuring effective response and recovery from Black Sky events, as well as for the resilience of critical infrastructures within their communities.
Sector Black Sky Strategic Mission Statement

The Black Sky Mission of the Regulatory Sector is to: foster a regulatory framework which provides for the protection and mitigation of critical infrastructures from catastrophic disaster; enable timely, effective disaster response; and provide for the speedy restoration and long-term recovery of critical infrastructure, minimizing the loss of life and property.

Regulators must seek to define a resilience framework and metrics that strengthen critical infrastructures and build effective response and recovery capacities and capabilities. These capacities and capabilities must be part of an ongoing preparedness and mitigation effort established in effective strategic and operational plans, and regularly reviewed and tested through a rigorous exercise regimen.

In the severely disrupted, multi-region, long duration power outages associated with Black Sky hazards, the most critical goals for societal health and continuity will be to enable systematic, timely and well-prioritized power grid restoration, while simultaneously enabling the largest possible numbers of people to “shelter in place” and avoid long-term evacuation during that multi-week or longer restoration.

While many tasks must go forward to enable these goals, among the most critical will be properly focused resilience investment and planning by the energy sector (i.e., the electricity and the oil and natural gas subsectors), and the water sector, especially to address those measures that resolve sector-specific vulnerabilities, and critical cross-sector interdependencies.

This represents the core area where public utility commissions have a unique opportunity to foster progress.

Proper development of Black Sky-critical investments and plans can only flourish if they are well-founded in regulatory policies designed to enable and encourage them. Public Utility Commissions (PUCs) are frequently called upon to make decisions on cost recovery and proposed infrastructure projects for water / wastewater, for natural gas gathering fields, storage facilities and pipelines, and for electricity distribution systems. This gives them unique policy-setting opportunities to utilize Black Sky-compatible resilience as a key factor, as they consider encouraging or authorizing both sector-specific projects, and investments that address cross-sector interdependencies.

Development of such Black Sky-compatible regulatory policies shapes the central goal of this Regulatory Sector Black Sky Guidebook.

Sector Black Sky Strategic Mission Priorities Matrix

<table>
<thead>
<tr>
<th>Phase</th>
<th>Priority</th>
<th>Mission</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mitigation</td>
<td></td>
<td>Provide a framework and metrics that demonstrate critical infrastructure resilience and a reduction in the loss of life and property that may result from a catastrophic disaster.</td>
</tr>
<tr>
<td>Preparedness</td>
<td></td>
<td>Require a rigorous system and regimen of operational and systems planning, training and exercise.</td>
</tr>
<tr>
<td>Response</td>
<td></td>
<td>Provide a regulatory framework that provides for a timely and effective response to, and stabilization of critical infrastructures during times of catastrophic disaster.</td>
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</tbody>
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Black Sky Assumptions

Black Sky Hazards are those emerging, extreme, malicious and natural hazards taking place at a level that could cause catastrophic impacts and damages over a wide geographical area. While primarily referring to the impacts on the electric infrastructure and long-term outages, the term has come to include severe impacts to all critical, life-sustaining infrastructures. Black Sky events are considered to be low probability events. However, when occurring, the severity of the impacts is almost immeasurable.

With all modern infrastructures now fully, or near-fully, dependent on electricity, a Black Sky power outage would shut down water, waste-water, food, communication, health care, pharmaceuticals, transportation and most other infrastructures on a subcontinental scale. An initiating hazard for such an event could happen at any time. All such hazards have happened previously, either on smaller scales or on large scales but before modern megacity development. We need only look at disasters occurring around the world, within the last decade, to understand the devastating impacts that a Black Sky event could have, including threats to national security.

Electric subsector experts project that “black start” or grid restart from a full outage of one of three grid interconnections would take “weeks, at best,” a timeline far longer than lifeline infrastructure operation could continue without an operating grid. Without those resources and services that keep modern cities and their residents alive, millions could die, and the United States as we know it, would never be the same.

The Regulatory Sector, while not being a disaster response or recovery agency in the truest sense, does contribute to an environment that provides for the strengthening and protection of critical infrastructure prior to a disaster. It requires that proper plans and operational procedures be put in place and tested to ensure an efficient and effective response and stabilization of the disaster while allowing for timely restoration and recovery of critical services.

Regulators must position themselves to have total situational awareness of the impacts to those critical infrastructures they regulate as well as the dependencies and inter-dependencies of other critical infrastructures that may be outside their immediate purview.

Regulators must apply informed decision-making when determining the need to enforce or waive regulation in striking the proper balance of expediency, social welfare and public safety.

<table>
<thead>
<tr>
<th>Restoration</th>
<th>Provide a framework that provides for the timely and effective restoration of critical lifeline infrastructures to minimize the loss of life and damage to property</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery</td>
<td>Provide a regulatory framework that allows for effective and efficient long-term recovery from the effects of catastrophic disaster and that encourages sound mitigation efforts against future Black Sky events.</td>
</tr>
</tbody>
</table>
Recommended Regulatory Sector Black Sky Policies / Black Sky Decisions

Overview

Regulatory responsibilities for resilience start well before the actual event occurs, through the
development of lifeline infrastructure and cross-sector resilience project approval criteria, and in the
context of regulatory / utility investment discussions informed by such criteria. Along with financial,
environmental, and other considerations, regulators should give equal consideration to Black Sky
resiliency as a key aspect of decision-making policies.

I. Electric Subsector Regulatory Policies
II. Electric / Oil and Natural Gas (ONG) Cross-Subsector Regulatory Policies
III. Water Sector Regulatory Policies
IV. Water / Electric Cross-Sector Regulatory Policies

Electric Subsector Regulatory Policies

State and federal regulatory policies today include evolving, increasingly mature guidance for resilience
measures that have proven vital for recovery from “Gray Sky” hazards, such as hurricanes, ice storms or
floods. As concerns grow over emerging “Black Sky” hazards that can result in long duration, multi-
region power outages, expanded planning is becoming essential. The electric sector, along with the
highly interdependent Oil and Natural Gas (ONG) sector, is increasingly turning their attention to the
focused, expanded resilience investment and planning that will be essential to address this emerging
hazard class.

Given the inherently vast footprint of such hazards, it is not practical – and it is not necessary – to adopt
measures that could protect and prepare the entire power grid for such hazards. Rather, the
fundamental strategies for such severe scenarios provide for protection of a core set of grid assets –
typically associated with Black Start generators and their associated cranking path generation stations –
and “building out” from this core to complete a restoration process which will likely take weeks, or
longer.

Such investment and planning can only be effective – and can only progress from planning to
implementation – if it is well coordinated with expanded, Black Sky-oriented regulatory policy
adaptations.

1. Black Sky Restoration Prioritization

In the aftermath of a severe, Black Sky event, the primary “service” provided by affected electric
utilities will be the restoration process, and the prioritization of that process for different customers.

Unlike for more conventional hazards, outages for these scenarios will typically be associated with
damage to grid components over very large areas, and will not be limited primarily to power lines,
as has usually been the case following storm damage. Finding and then repairing damage in
generation stations, control centers, transmission and distribution substations, and in other facilities
distributed across multiple regions, in the highly disrupted environment that will result from such
outages, will require weeks or longer, far more time than for more conventional outages.

In this situation, priorities for the restoration process will be very different from more conventional
restoration scenarios. Since efficient restoration will require extensive cross-sector collaboration
and coordination with emergency management agencies, mass care NGOs and other stakeholders, commonality of prioritization policy will be important.

Review and development of appropriate, common strategies for prioritization policy for Black Sky restoration will require coordination between the energy sector and the regulatory sector, but also between state and federal regulatory bodies.

2. **Develop Black Sky Restoration Prioritization Policies**

This will be a particularly important subject for cross-coordination between the electric sector and its government and NGO partners, with a special need for involvement and policy setting by regulatory bodies.

Examples of a subset of the facilities, installations and utilities for which these prioritization policies should be established include the following:

- Black Start cranking path generating stations
- Water and wastewater utilities
- Nuclear power plants
- Natural gas pipeline facilities associated with the delivery of fuel to black start and other electric generation
- Critical transportation arteries
- Emergency communications
- Department of Defense facilities
- Emergency management agencies
- Other lifeline infrastructure facilities, including medical care, fire protection, security, food and medicine production and storage.
- Retail residential loads.

As an example of one likely difference in restoration prioritization for Black Sky events, residential loads will likely be low on the priority list compared to water and wastewater utilities, natural gas pipeline facilities and other assets that will play an important role in successful, timely restoration.

3. **Resilience Investment Policy**

To ensure power restoration is practical and feasible following a Black Sky event, increasing the focused resilience investment many electric utilities have already begun represents one of the most crucial requirements for our society. Regulatory policy can and should play a key role in encouraging this process and ensuring measures taken are adequate and cost effective.

3.1 **Electromagnetic protection of select assets against Electro-Magnetic Pulse (EMP) and Severe Space Weather**

While investments in cyber protection, site physical security, flood mitigation and many other measures have increased over the years, protection against the most recent of the emerging Black Sky hazards, Electro-Magnetic Pulse (EMP), and Severe Space Weather / Geo-Magnetic Disturbance (GMD) has lagged behind. Hardening of selected critical electric utility facilities is essential to the ability of the electric grid to recover from an EMP or GMD event. Fundamental
strategies include, for example, protecting a subset of a power grid segment’s Black Start system as a “Protected Enclave,” to function as a starting point for power restoration, with other black start and cranking path assets systematically evaluated, repaired, and then added to the restored, operating generation system.\(^1\)

In addition, policies should be established that encourage cost-effective design practices that facilitate future incorporation of EMP and GMD hardening into selected new facilities, particularly those that could play an important role in “protected enclaves,” such as black start or associated cranking path assets, or control centers.

Regulatory bodies will play a key role in both allowing and encouraging the expanding efforts now underway by many power utilities to invest and develop plans to address these needs.

### 3.2 Adaptations for a Black Sky Compatible Black Start System

U.S. power companies have developed an excellent black start system, with designated generating stations and associated cranking path power plants designed with the capability of restarting the power grid, even when no outside power is available to assist the restart.

However, these existing black start capabilities were developed to address risks associated with conventional hazards. With gas pipeline / electric utility interdependencies, limitations in generator onsite tankage for emergency fuel and a number of other Black Sky-unique issues, black start assets, as configured today, would likely not be capable of functioning normally in an extended, multi-region power outage.\(^2\)

Regulatory bodies have a unique and important capability to encourage development of focused expansions of existing black start regulatory policy, and by giving special consideration to appropriate investment plans and rate recovery requests.

As one unique example, nuclear power plants – which typically have more than a year of “fuel” in place, onsite – could, with appropriate guidance from regulatory bodies, become particularly advantageous to Black Sky recovery, especially as ongoing EPRI efforts to improve controllability are formulated and implemented. By supplementing these already well-hardened assets by basic measures for EMP and GMD protection, these generating plants could become even more important for hazard-independent, Black Sky restoration.

### 3.3 Incentivize Development of Selected Distribution Substations:

Encourage establishment of new distribution substations that uniquely increase power grid resilience.

One of the primary Black Sky hazards, Coordinated Physical Assault, has become a particularly serious concern as the nation’s three power grids or “interconnects” have become increasingly

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complex. With grid vulnerability analysis efforts led by the Federal Energy Regulatory Commission (FERC) and others showing that malicious attacks on a selected handful of substations could seriously threaten a grid-wide shut down, building carefully sited new distribution system substations represents a particularly valuable step toward enhanced Black Sky power grid resilience which would, synergistically, also improve resilience to more conventional “Gray Sky” hazards.

Utility commissions should work with the power sector to find cost effective ways to encourage construction of such substations, based on grid vulnerability assessments and other feasibility considerations.

4. Adapting Regulatory Policy for Emergency Waivers

In some cases, regulatory waivers will be essential during Black Sky response, restoration and recovery operations. Federal and State regulators such as the EPA and State government environmental regulators, U.S. and State Departments of Transportation, Federal and State Emergency Management Agencies, the U.S. Department of Energy and others may have regulatory waiver authority to assist in timely response, restoration and recovery operations.

**Electric / Oil and Natural Gas (ONG) Cross-Subsector Regulatory Policies**

1. **Environmental Policies**: Consider environmental policy adjustments to enable key Black Sky resilience measures

   Expanded environmental waivers for restoration-critical installations: Utility commissions should engage with sector personnel to examine the tradeoffs between improved Black Sky sector resilience for restoration-critical black start installations (through expanded storage and other infrastructure investments) and environmental regulations relating to these critical installations. Such installations may be evaluated in two categories:

   1.1 **Normal Use**: Waivers needed for construction and ongoing use

   1.1.1 **Dual Fuel Storage**: Expanded use of onsite secondary fuel storage at dual fuel, black start generation and black start cranking path facilities. (See sec. 2.2.4 below)

   1.2 **Recovery Use**: Waivers needed for construction and use only for periodic maintenance and Black Sky outage recovery.

   1.2.1 **Dual-Fuel Pipeline Compressors**: Expanded use of dual-fuel gas pipeline compressors, to ensure natural gas will flow to generating stations during Black Sky restoration and recovery. States and the Federal government could incentivize the use of dual drive compressors by providing for regulatory relief for such emergency operations. Section 61002 of the Fixing America’s Surface Transportation Act” or the “FAST Act” exempts electric generating units from compliance with environmental laws and regulations when they are operating under an emergency directive issued by the Secretary of Energy. A similar approach with a simplified
approval or preapproval process should be adopted for the gas-driven operation of compressors in defined emergencies.

1.2.2 Fuel Switching:
Ensuring that dual fuel generators are compliant with existing emissions standards is important for improving air quality during normal periods of operation. However, during black sky events when power generation is essential for saving and sustaining lives, dual fuel generators should be able to operate on secondary fuel beyond the periods for which they are typically permitted – indeed, as long as necessary until the flow of natural gas to them is restored.

A recent study sponsored by FERC and the Eastern Interconnect Planning Collaborative (EIPC) found that across much of the Mid Atlantic and Northeast regions, states have not yet modified their air permits to include explicit provisions to allow exceedances of the annual oil burn limit in the event of an emergency declared by a state or federal authority. But other states are beginning to adopt such exceptions. The State of Florida, for example, issues emergency orders that allows dual-fuel generators to continue to burn secondary fuels in an emergency, even if doing so violates their air permits. That waiver authority constitutes an emerging best practice that ought to be considered for adoption by states on a nationwide basis.

At the federal level, Section 61002 of the Fast Act exempts electric generating units from compliance with environmental laws and regulations when they are operating under an emergency directive issued by the Secretary of Energy. As the EPA, DOE and other Federal agencies move to implement this new provision of law, they should explicitly include measures to facilitate fuel switching during emergencies and provide for expedited regulatory approval of generators that would otherwise exceed state and federal emission standards.

By providing this legal framework well in advance of an actual Black Sky event, regulatory bodies will provide the context utilities need to properly plan and build resilience capability that will be available, when needed, in a long duration power outage.

2. Resilience Investment Policies: Encourage targeted, cost-effective resilience investments

One of the primary examples of Oil and Natural Gas (ONG) and Electric Subsector interdependencies involves the flow of gas to power grid generators during a major blackout.

Emergency generators at gas pipeline compressor stations have very limited emergency fuel storage and run time. As a result, when the electricity that normally keeps gas pipeline compressors operating shuts off, gas pipeline flows to power grid generators slow or end, as the compressor stations begin to shut down. To avert this problem, regulatory policy should recognize and encourage two “Fuel Security” approaches:

- **Expanded Natural Gas Storage for Generating Stations**: Expanded underground gas storage near electric generators, where feasible, and above ground storage of Liquid Natural Gas (LNG) onsite at generating stations.
- **Use of “Dual Fuel Generation”:** Generating stations designed to allow use of either natural gas or, in an emergency (when natural gas may not be available), a “secondary” fuel (typically diesel fuel), to fire their generators, along with adequate storage of that secondary fuel.

2.1 **Facilitate Expansion in Natural Gas Storage**

Where sufficient market incentives do not exist to spur the construction of gas storage facilities that would benefit grid resilience, new cost recovery mechanisms should be developed to assess those resilience benefits (as opposed to day-to-day reliability of fuel supplies) and support construction of facilities that have special value for ensuring the flow of fuel to power plants that serve as black start resources or serve critical loads.

2.2 **Dual Fuel Generation**

2.2.1 **Preplanned Emergency Waivers for Secondary Fuel Use**

State Public Utility Commissions and federal agencies (including the Environmental Protection Agency, DOE and others) could also partner with the power industry to consider emergency waiver authorities and triggers for secondary fuel use, to allow more effective resilience planning and investment. At the federal level, existing authorities to be examined and potentially utilized in this assessment should include those provided for in the Stafford Act.

2.2.2 **Cost Recovery for Dual Fuel Generators:**

Expand market rules and regulations to allow cost recovery for dual-fuel generators. In part due to the cost of seeking emission permits and installing necessary pollution control equipment, new dual-fuel generators and their fuel systems are more expensive than their gas-only counterparts and they are also more expensive to maintain. Regulators and other stakeholders in power resilience should partner to examine how financial inducements might be created to encourage the construction of dual-fuel generators.

2.2.3 **Incentivize Generator Fuel Switching Capability:**

Create special incentives to provide fuel-switching capabilities for generators that support black start operations

In January 2016, the “FERC-NERC-Regional Entity Joint Review of Restoration and Recovery Plans” recommended that studies be made of possible strategies for replacing lost coal-fired black start resources, and of factors to be included in replacing them (including geographical diversity and fuel switching capabilities). As those studies go forward, they should develop targeted incentives and cost recovery mechanisms for dual fuel generators serving as black start resources.

2.2.4 **Expand Onsite Storage of Secondary Fuels:**

Even the widest possible distribution of fuel-switching capabilities will be of little resilience value when gas flows are interrupted unless generating stations have the secondary fuel they
need to operate. On-site storage of secondary fuel offers the greatest value for resilience in black sky events.

Zoning boards, environmental regulators and other officials should work with stakeholders in power resilience to include resilience considerations in assessing specific tank construction proposals. When practical, future gas generators might be strategically sited near major pre-existing fuel storage facilities and terminals. In addition, regulatory measures to assure maintenance of adequate storage levels of secondary fuels for critical dual fuel generators should be made a priority.

2.3 Facilitate expansion in natural gas storage

Where sufficient market incentives do not exist to spur the construction of gas storage facilities that would benefit grid resilience, new cost recovery mechanisms should be developed to assess those resilience benefits (as opposed to day-to-day reliability of fuel supplies) and support construction of facilities that have special value for ensuring the flow of fuel to power plants that serve as black start resources or serve critical loads.

2.4 Ensure Gas Pipelines Supply Electric Generating Stations During Black Sky Restoration

2.4.1 Avoid Fuel Interruptions to Power Grid Generators: Ensure Pipeline Flows to Generators are Prioritized in Black Sky Outages

Note: Regulatory “Curtailment Policies” provide for curtailing gas deliveries to industrial customers, including power grid generators, to prioritize delivery to residential customers when a power outage or other factors reduce pipeline gas flows. During a severe, long duration power outage, this prevents power grid generating stations from producing electricity, resulting in shutdowns of gas pipeline compressors that further reduce gas flows, causing a “vicious cycle” that quickly becomes a serious societal problem.

2.4.1.1 Emergency Waivers to Avert Curtailments

Authorize emergency waivers to avert curtailments to power generators. Many state governors already have the authority to declare an energy emergency when they determine that the health, safety, or welfare of their citizens is imminently threatened by gas supply shortages. These emergency authorities should be revised to provide that when an especially severe event occurs, including those that would fall into the category of Black Sky events, governors can temporarily revise state curtailment policies and state environmental rule and make preservation of gas service to power generators a top priority.

2.4.1.2 Encourage Firm vs Interruptible Gas Contracts for Generators:

Create market rules and regulatory mechanisms to recover the additional costs of firm versus interruptible contracts.

Many state utility regulators who approve regulated utility cost recovery are sensitive to the additional cost that accompanies firm pipeline transportation. However, such firm contracts can greatly reduce the likelihood of gas curtailments in Black Sky hazards. Regulators should work with generation companies to develop options to provide for the additional funding firm contracts require.
2.5 **Gas-Fired Compressors on Gas Pipelines**

The interstate natural gas pipeline network uses more than 1,200 compressor stations to maintain continuous gas flow to generating stations and other customers. Such stations historically used almost exclusively gas-fired compressors, which use little electricity, and therefore can operate for long durations on minimal stored quantities of fuel for their emergency generators in a Black Sky power outage. Increasingly, these Black Sky-robust compressors are being replaced by electric motor-driven compressors, which operate for much shorter times during such outages.

2.5.1 **Incentivize Use of Dual Fuel Pipeline Compressors:**

A growing number of vendors produce compressors that can operate using electricity as their primary, low emission source of power, or -- in a blackout -- use offtake gas as a backup system. Such "dual-drive" or older back-up compressors provide an especially useful means to both maintain air quality and provide for resilient operations in Black Sky events.

2.5.2 **Reexamine Regulatory Incentives for Electric vs Gas-Fired Pipeline Compressors:** Reconsider regulatory incentives driving the transition to electric-powered gas transmission pipeline compressors.

In Pennsylvania and other states where replacement of gas-fired compressors by electric units is accelerating, noise and air quality regulations provide incentives for gas companies to shift to electric powered compressors, despite the additional risk that electric-powered system components create if blackouts occur.

Some states may wish to reconsider the value of such regulations relative to the potential vulnerabilities they will create for grid resilience, and facilitate permitting of gas-powered compressors. It may be necessary to have emergency criteria where back-up compressors can be permitted and used in an emergency.

2.6 **Encourage Vital Information Sharing During a Severe Power Outage: Address Anti-Trust Laws and Regulations that Hinder Information Sharing**

Restoration and recovery operations in a Black Sky hazard scenario will be complex, and information sharing will be vital to allow lifeline infrastructure utilities to pool their resources, address critical issues and optimize restoration. Regulators and lawmakers should address the challenges associated with anti-trust laws that have a negative effect on such information sharing between companies, especially in the fuel industry.

As one effective approach, regulators can create temporary solutions that can be enacted during large-scale outages and disasters.

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**Note:** Further information on Oil and Natural Gas regulation and waivers is contained in the “Oil and Natural Gas: Industry Preparedness Handbook,” October 2013, American Petroleum Institute
WATER SUBSECTOR REGULATORY POLICIES


One of the primary goals for effective recovery from any Black Sky hazard is to allow the maximum numbers of people to “shelter in place” during an extended restoration period. Sustained water and wastewater service, at least at designated, minimum “Black Sky” service levels, is one of the most essential preconditions to prevent uncontrolled and disastrous mass migration.

While the water and wastewater sectors are now working to develop plans for reduced, sustainable Black Sky service levels for severe outages, these efforts can only continue, and be implemented, if their efforts are complemented by support from state and federal government emergency management agencies, and facilitated and permitted by preplanned emergency waivers from state and federal regulatory bodies.

Without advance planning for such regulatory waivers, utilities will be unable to plan, invest or maintain the special equipment and operational plans that must be put in place, well before a severe hazard strikes.

1.1 Air Quality Standards and Emergency Generators

Current environmental regulations restrict the amount of time that emergency generators can be operated at many facilities, including hospitals and especially water and wastewater treatment facilities. However, in preparing for Black Sky emergencies, it is important to test emergency backup generators under full load for at least several hours at a time on a routine basis (monthly) to ensure they can function properly during emergencies.

In addition, such generators will typically need to operate continuously during the weeks (or longer) anticipated for Black Sky hazard power restoration operations, a capability not currently contemplated by environmental regulations. In order for water and wastewater utilities to invest and plan for continuous use of emergency generators for sustained service during Black Sky recovery operations, a preplanned waiver process will be essential, along with requisite impact in utility rates.

Limited environmental quality waivers should be developed for emergency generator operation, to recognize the needs for ongoing maintenance use, as well as preplanned continuous use in severe, extended power outages

1.2 Encourage expanded emergency fuel storage

While it is estimated that 75% of water and wastewater facilities have installed emergency power generators, onsite emergency diesel fuel generally does not exceed supplies adequate for 48 to 72 hours. In a Black Sky event, where electric power outages are expected to last weeks or longer, backup fuel will be depleted quickly, and fuel resupply will be extremely challenging, and deliveries infrequent.

Regulatory bodies should develop policies that permit and encourage expansion of these emergency fuel reserves, either onsite at water utilities, or stored in accessible locations where it can also be shared with local emergency management and other disaster responders.
1.3 Encourage Adequate Emergency Generator Procurement

Water and wastewater utilities, in coordination with regulatory commissions, should examine their existing backup power capability. For those utilities that do not currently have sufficient emergency generation to allow for sustained operation at Black Sky service levels that are designated for that utility, regulatory commissions should develop policies that allow for cost recovery to acquire, install and maintain the minimum additional generator inventory.

As an intermediate step, infrastructure investment in the facility to install electrical connections and manual transfer switches will allow for connection of “trucked-in” emergency generators during severe hazards. This solution is not ideal, since availability of such units is anticipated to be very limited. However, this also represents an essential step toward later acquisition and installation of dedicated emergency generators.

1.4 Encourage development of resilient wastewater energy reclaiming systems

Opportunities exist for some wastewater utilities that use aerated sludge water purification processes to self-power, reclaiming energy through the use of combined heat and power (CHP) units, fueled by captured methane from the wastewater treatment process. Such a process is not only environmentally friendly and reduces energy costs for the wastewater utility, but can also be a powerful driver for system resilience if the additional investment in electrical infrastructure is made to allow the utility to function as a power island or microgrid.

2. Resilient Water and Wastewater Treatment Planning: Cost Recovery and Water Quality Waivers

Sustained water and wastewater service will be critical to save and sustain lives during the weeks or longer that will be required for recovery from Black Sky events. Continuing service for such durations – even with the requisite support from state and federal emergency management agencies – will only be possible if utilities, in coordination with utility commissions, develop the capability and plans needed to operate at minimal, prearranged Black Sky service levels. Depending on the decisions utilities and regulators jointly make, these service levels will involve water quality reductions, and wastewater treatment compromises. Investing and planning for emergency operation at these levels requires development of regulatory policy that both allows and encourages these efforts.

2.3 Black Sky service level determination

Preparation for resilient, sustained operability under Black Sky conditions will require coordinated utility and regulatory decisions on the preplanned service levels.

For example, optimally, water quality under those conditions will retain requirements for potability, while treatment chemical and energy requirements will typically be reduced by waiving other requirements, such as clarity and odor. Similarly, water pressure levels will likely be reduced below accepted, “nominal” set points to minimize energy requirements from emergency generation. Emergency power limitations may also require geographic service reductions, with service being reduced or shut down in some zones (coordinated with government officials for preplanned relocation options) to maintain at least minimal service in other zones.
These and related Black Sky service levels, along with corresponding decision needed for wastewater treatment, will require regulatory body policy decisions and corresponding rule adaptations, based on coordinated review with the utilities involved.

2.4 Onsite chemical storage requirements

At least as pressing as the need for adequate onsite emergency fuel storage, adequate availability of chemicals needed to treat water and wastewater will be essential. While these chemicals are routinely resupplied at these facilities under normal conditions, availability and delivery will be drastically reduced in severely disrupted, Black Sky scenarios.

Utility commissions, in coordination with utilities, should examine options for expanded onsite storage of the subset of treatment chemicals that correspond to designated, Black Sky treatment levels, to develop corresponding new regulatory policy for such chemical storage.

2.5 Emergency fuel and chemical transportation requirements

Delivery of fuel and water treatment chemicals is often a challenge for utilities and their regulators, due to hazardous materials and other transportation regulations. While such regulations are of course necessary to limit risks and protect public safety, under Black Sky conditions, the continued functioning of lifeline infrastructures will become a crucial requirement for saving and staining lives. Shut down of such systems, particularly in large cities, would represent a health and safety catastrophe. However, advance planning for required transportation of these chemicals – whether by utilities or by government emergency management agencies – can only take place if such transportation requirements are embodied and recognized in prearranged regulatory policy adaptations.

Utility commissions and other regulatory bodies should develop policies for transportation of essential chemicals under Black Sky conditions, as an essential framework for use by other government agencies and utilities in their planning for sustained water and wastewater system operation in Black Sky scenarios.

**Electric / Water Cross-Subsector Regulatory Policies**

**Power Restoration Priority for Water Utilities**

While there are numerous areas that are relevant to the electric / water cross-sector interdependencies, the most important subject relevant to regulatory policy is in restoration prioritization.

Water and wastewater utilities are often located in low population density regions. With restoration to the maximum number of households functioning as a key, important parameter in restoration priorities for conventional hazards, this often means that water utilities are not treated as embedded, high priority customers for early restoration.

For Black Sky hazards, with water and wastewater utilities struggling to sustain minimal service to allow an affected population to “shelter in place,” this prioritization should be changed. Regulatory bodies should work with the power and water sectors to explore developing appropriate, revised prioritization policies for electricity restoration that recognize the criticality of the water sector in Black Sky scenarios.
Sector Black Sky Situational Awareness Overview

In order to work effectively and efficiently prior to, during and after a catastrophic disaster, regulators must establish an ongoing dialogue between regulatory bodies both horizontally and vertically. In addition, communications must be maintained between regulators and the entities and stakeholders that come under their purview.

As a Black Sky event develops, regulators will be seeking situational awareness from those they regulate and will be providing that information to federal, state and local governmental and private entities charged with Black Sky response, restoration and recovery activities.

Information that regulators may seek includes the nature and level of impacts to affected areas and estimated timelines for response, stabilization and restoration of critical operations and services. Effective situational awareness may allow regulators the ability to anticipate the need for regulatory clarification or waiver necessary to facilitate a timely and effective response, restoration and recovery.

Priority Information Requirements Matrix

<table>
<thead>
<tr>
<th>Information</th>
<th>Source</th>
<th>Priority</th>
<th>Confidence Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated scope &amp; impact of electrical outages &amp; damages</td>
<td>Electric energy providers at all levels</td>
<td>1*</td>
<td>**</td>
</tr>
<tr>
<td>Estimated scope &amp; impact of communications outages &amp; damages</td>
<td>Communications service providers at all levels</td>
<td>1*</td>
<td>**</td>
</tr>
<tr>
<td>Estimated scope &amp; impact to water and wastewater utilities</td>
<td>Water &amp; wastewater service providers</td>
<td>1*</td>
<td>**</td>
</tr>
<tr>
<td>Need for regulatory clarification &amp; waivers necessary for timely &amp; effective response, stabilization, restoration &amp; recovery</td>
<td>All affected utilities and other local, state and federal governmental officials</td>
<td>1*</td>
<td>**</td>
</tr>
</tbody>
</table>

*Note: Each of the information requirements listed above may be of the highest priority during a Black Sky disaster. This prioritization will be at least somewhat dependent on the nature and scope of the disaster.

**There must be a high confidence level in the information received if regulators are to effectively set priorities and aid in the effective response, stabilization, restoration and recovery of affected areas.
Sector Initial Actions

Initial actions begin with the activation of operations plans in response to the disaster. Regulators may be the first to receive information from affected utilities, depending on the nature and scope of the event. Plans and procedures must be in place to establish internal and external communications with internal leadership and staff, as well as inter-agency communications with emergency management officials and other key entities.

Regulators must have pre-determined the triggers for response and activation of operations plans that include policies and procedures for notification, reporting, activation of emergency facilities, staffing, etc.

In turn, the regulatory body may need to establish a physical presence at an activated Emergency Operations Center (EOC).

Sector Initial Actions Matrix

<table>
<thead>
<tr>
<th>Priority</th>
<th>Initial Action</th>
<th>Desired/Required Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Notification and activation of key leadership and staff</td>
<td>Activation of operations plans and reporting requirements to aid in the determination of the nature and scope of the event.</td>
</tr>
<tr>
<td>2</td>
<td>Establish communications with utilities and inter-agency operations such as Emergency Management</td>
<td>Determine the impact and effects of the disaster and provide operational information to those responsible for the coordination and facilitation of the disaster response</td>
</tr>
<tr>
<td>3</td>
<td>Provide for a physical presence with a knowledgeable person or staff with decision-making authority to the Emergency Operations Center (EOC).</td>
<td>Provide ongoing situational awareness and communications to and with key operations officials and determine the need for regulatory clarification or waiver</td>
</tr>
</tbody>
</table>
Sector Specialized Resource Requirements Overview

**Black Sky Resilience Information Resources for Regulatory Bodies**

*Existing National Scale Coordination Bodies as Information Resources for State and Federal Regulators*

As state and federal regulators evaluate policy options to encourage improved lifeline utility resilience to Black Sky hazards, a growing set of national scale utility resilience coordination efforts and processes are available to them as important information resources. The examples shown below span resources and coordination efforts hosted by NGOs, federal agencies and utility associations. While they each reflect varying levels of engagement in addressing the unique resilience needs of severe multi-region, long duration power outages, they represent important elements of the planning foundation upon which Black Sky resilience can most effectively be built.

**Electric Infrastructure Protection (EPRO) Resource Family**

The Electric Infrastructure Protection (EPRO) Resource Family includes both information and coordination resources focused on the unique challenges of Black Sky hazards. The EPRO Handbook Project is providing a growing compendium of best practices in this area, with EPRO I addressing cross-sector recovery planning and EMP-specific resilience measures, and EPRO II examining the utility investments, cross-sector support needs and regulatory initiatives that will be most highly leveraging for the water and wastewater sector, and the oil and natural gas subsector (ONG), and to address electric / ONG cross-subsector interdependencies. The EPRO Executive Steering Committee and the subsidiary sector-specific steering committees provide an expanding forum for sector by sector and cross-sector deliberations on the resilience and planning needs to address severe outages, framed by evolving Black Sky Playbook and Playbook documents for each sector. The EPRO Black Sky Event Simulation Project provides in depth exercise resources to help evaluate and build this overall process.

**Federal Energy Regulatory Commission (FERC) Gas-Electric Harmonization Forum**

Taking advantage of its dual regulatory role for both the ONG and electric subsectors, the FERC has convened a Gas-Electric Harmonization Forum to help “ensure that outages and reliability problems are not the result of the lack of coordination between the electricity and gas industries.”

**North American Electric Reliability Corporation (NERC) Cross Sector Interdependency and Resilience Studies**

The North American Electric Reliability Corporation (NERC), which develops and enforces reliability standards for the bulk power system (including generators, high voltage transmission systems, and other grid components other than power distribution systems) is also increasingly focused on advancing initiatives to strengthen cross-sector resilience, and has produced a series of pioneering studies on cross-sector interdependencies and resilience options.\(^3\)

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\(^3\) For more information, or to download current editions of EPRO Handbook volumes or Black Sky Playbooks or Playbooks, visit http://www.eiscouncil.org/EPro

The American Gas Association’s (AGA) Downstream Natural Gas Information Sharing and Analysis Center (DNG-ISAC)

The DNG-ISAC is designed to strengthen the resilience of gas supplies to power generators and other key customers. DNG-ISAC collaborates with the Electricity Sector ISAC (ES-ISAC) on physical and cyber-related intelligence and incident information sharing important for such resilience.

The American Petroleum Institute, Oil and Natural Gas Industry Preparedness Handbook, October 2013

This handbook contains an appendix of Potential Waivers that may be considered and requested during times of disaster to include those from the EPA, USDOT, IRS, USCG, and other federal requirements.

Electric Subsector Resources

- Electricity Subsector Coordinating Council (ESCC)
  The ESCC provides for cross-industry collaboration, including resilience issues. Collaboration is also growing on a regional basis.
- Independent System Operators (ISO) and Regional Transmission Organizations (RTOs)
  These organizations across the United States are strengthening gas-electric planning and operational coordination mechanisms.

Regulators may also want to access disaster recovery guides and information published by State Emergency Management Agencies and FEMA’s Disaster Assistance: A Guide to Recovery Programs; FEMA-229, September 2005.

Regulatory Sector Black Sky Resilience Considerations Overview

Over the past year EIS has worked to satisfy a request by the Federal Energy Regulatory Commission (FERC) and the National Association of Regulatory Utilities Commissioners (NARUC) to establish a Resilience Framework, Metrics and Matrix tool for use by regulators and critical infrastructure owners and operators in making decisions regarding resilience investment. The basis for this tool can be found in the following key documents:

1. Presidential Police Directives 21 (PPD-21), February 2013
2. Presidential Executive Order 13636, February 12, 2013

Through the application of this tool, regulators will be able to work with utilities under their purview to institute and measure resilience investment and effectiveness.

This methodology is valid in designing investment strategies and metrics for all critical infrastructure satisfying agreed upon goals and objectives for sustaining the Nation. This methodology is also applicable when working in coordination with all critical infrastructures within a specified geographic
area. A coordinated, cross-sector analysis provides for a resilience strategy that is holistic in approach and is more than a sum of its various parts.

Those priorities, goals and objectives, are based on knowledge and understanding using assumptions borne of the values of the organization and its leadership. As stated in the Sandia Labs report, this framework allows for metrics that:

- **Are useful**: Metrics developed under this framework must be useful for decision-making (by humans, computational analysis, or both). Decisions of interest include system planning decisions, real-time operations decisions, and policy decisions.
- **Provide a mechanism for comparison**: Applying the same metric to different systems should result in valuable information. Furthermore, the same metric must be able to differentiate between the resilience of a system that has not been enhanced and one that has (either through infrastructure or operations enhancements).
- **Are usable in operations and planning contexts**: The same metric should be able to assist decisions for both planning and operations.
- **Can be extended**: The metrics selected must be scalable in time and geography. The metrics should remain valid as technology progresses and more complex analytic methods become feasible.
- **Are quantitative**: The framework must allow the development of metrics that can be used both qualitatively and quantitatively.
- **Reflect uncertainty**: It’s critical that metrics are populated using methods that will quantify the uncertainty of the result. Specifically, decisions being made based on a resilience metric value must be well informed by the certainty of that value.
- **Support a risk-based approach**: The metrics should reflect a specific threat or set of threats, the system vulnerability, and potential consequences to PEOPLE* (beyond the immediate system effects). *(Emphasis added).
- **Consider recovery time**: Resilience metrics should reflect the consequences over time, and therefore must consider the recovery period either directly or indirectly.

Two fundamental concepts of this risk-based framework are:

- **Resilience** is defined with respect to disturbance(s) or threat(s), and
- **Consequences** relate to the social effects of system performance in addition to system performance alone.*

We would offer a third concept:

- **Dependence & Inter-dependence** between systems and critical infrastructure sectors is necessary if we are to achieve true national resilience. The resilience of one system does not directly translate to community, regional, or national resilience.
Metrics Can Serve Both Operational & Strategic Decision Making:

The RAND Corporation, in its report, “Measuring the Resilience of Energy Distribution Systems – Henry H. Willies & Kathleen Loa, 2015” provided complementary data, insight and specificity to the SANDIA Labs report. Perhaps the most relevant of their conclusions was:

“There is no single set of metrics that supports all decision-making needs; rather, each purpose may need a unique set of metrics. But across levels of decision making, the metrics ought to be organized within a consistent measurement framework.”

“From an operational perspective, a logic model explains how activities, budgets, and people (i.e., inputs) ultimately contribute to desired outcomes. From a strategic perspective, a logic model explains which inputs are needed to support strategy. From either perspective a hierarchy of metrics exists to connect inputs to outcomes and improve understanding about how to achieve outcomes more effectively and efficiently.”

In the end, the performance of [energy] systems depends on how the systems generate the outcomes that society is seeking to achieve. Resilience of [energy] systems can be measure by many outcomes, such as reduced damage from disasters, increased economic activity, or reduced deaths and injuries from disasters.”

Source: Rand Corporation: Measuring the Resilience of Energy Distribution Systems
Resilience Metrics & Investment Examples:

The Rand Corporation report offers pages of examples of energy resilience metrics for electricity systems at the facility / system level, at the system / regional level, and at the region / national level. Their research also cites metrics for oil and natural gas systems at the system / regional level and at the region / national level.

Below are examples of resilience metrics and investments captured by the EIS Council and include those investments needed in the:

- EPRO Resource Family
- EarthEx Exercise Program
- Black Sky/Black Start Protection Initiative (BSPI),
- Black Sky Emergency Communications and Coordination System (BSX),
- Certified Power Recovery (CPR) Engineering Team Project

Conclusions & Recommendations:

We concur with the recommendations outlined in the Sandia Labs report:

1. A framework for energy resilience metrics has been created such that:
   a. Energy resilience metrics quantify the expected consequence due to events that have low probability but potentially high consequence. Consequences focus on social welfare, extending beyond systems impacts.
   b. The resilience metrics rely on the performance of the system, as opposed to attributes of that system.
   c. The resilience metrics incorporate the uncertainty associated with limited information about the system and threat.
   d. Resilience metrics quantify performance given uncertainty, providing insights into risk management and cost/benefit processes for planning, operations, and policy building
2. A resilience analysis process has been created that explains how to use resilience metrics.
3. The process is flexible enough for use by different stakeholders and infrastructures.
4. Stakeholder goals should drive the selection of metrics used for an analysis within the framework provided.
5. Continued research is essential:
   a. More research is needed to improve quantification of human/societal consequences based on reduced system performance in a disruption. Key areas for R&D investment include multi-category uncertainty quantification, modeling and simulation of disruption, recovery and repair, and adaptive system operation algorithms.
   b. Developing a library of suggested performance indicators and recommended methods for translating those system outputs to common consequence measures is a necessary national research and development pursuit.
   c. Data availability will be a challenge in the early stages of adopting these methods, so some effort is likely needed with respect to data collections and establishing associated best practices.
6. **Outreach and collaboration are necessary to define the types of decisions that will use resilience metrics, as well as the metrics’ units of consequence, selection of threats, and quantification of uncertainty.**

7. A stakeholder group should be created for the refinement and standardization of metrics for electricity, petroleum, and natural gas sectors for the validation of this resilience metric framework. **Specific areas that should be addressed include:**
   a. Differentiate reliability metrics from resilience metrics with input from state, federal, and regional regulatory authorities and other stakeholders.
   b. Determine federal, state, and local government roles.
   c. Work toward stakeholder buy-in and coordination: federal and state regulators, utilities, asset owners, and other key stakeholders.
   d. Conduct an expanded case study using data from one or more major utilities (in coordination with that utility).

**It is expected that this resilience tool will be ready for publication and broad release early spring of 2018.**
Appendix A
Relevant Authorities and Waivers:
Emergency managers, infrastructure owners and operators, and regulators should all be aware of authorities and laws that help supply chains support disaster response, restoration, and recovery. Legal counsel can advise on properly applying and complying with all laws, local, state and federal. Managers, operators, and regulators should consider prioritizing power restoration, medical supplies, and/or physical assistance to individuals with disabilities and access and functional needs throughout the supply chain resilience planning process. Below is a brief compendium of laws and authorities that may come into play during a Black Sky event.

U.S. Department of Transportation
The U.S. Department of Transportation website (www.dot.gov/emergency) provides information and guidance related to transportation permits, waivers, and other regulations and authorities that apply during emergency. Additionally, the Federal Motor Carrier Safety Administration (FMCSA) provides a website (www.fmcsa.dot.gov/emergency) and a toll-free hotline number (1-877-831-2250) for anyone seeking inquiries pertaining to FMCSA regulations during a declared disaster.

Oversize/Overweight Permits
Section 1511 of the Moving Ahead for Progress in the 21st Century Act (MAP-21) amending 23 U.S.C. § 127, extends the states’ authority to issue special permits to vehicles with divisible loads that are delivering relief supplies during emergency and disaster responses. States may issue special permits during an emergency to overweight vehicles and loads that can easily be dismantled or divided if all of the following conditions are met:
- The President has declared an emergency or a major disaster under the Stafford Act
- The permits are issued in accordance with state law
- The permits are issued exclusively to vehicles and loads that are delivering relief supplies

Hazardous Materials Permits
The Pipeline and Hazardous Materials Safety Administration (PHMSA) may issue special permits authorizing a variance of specified hazardous materials transportation safety regulations. There are three types of special permits:
- Transport differently than otherwise required in the Hazardous Materials Regulation (HMR)
- Transport a hazardous material in a different manner than required in the HMR
- Authorize the manufacture and sale of packaging that does not meet the design specification or performance requirements in the HMR

Truck/Weigh Station Bypass
Each individual state has the authority to allow certain vehicles to bypass the truck/weigh stations based on the configurations of known vehicles during emergency and disaster response.

Motor Carrier Safety Regulation Waivers
In accordance with 49 Code of Federal Regulations (CFR) 390.23, when the President, a state Governor, or a local government official issues a declaration of emergency (as defined in 49 CFR 390.5), waivers from many of the Federal Motor Carrier Safety Regulations (FMCSRs) occur automatically. Presidential and state declarations are effective for up to 30 days, and local declarations are effective for up to five days. The FMCSA Field Administrator or Regional Field Administrator has authority to extend the waivers beyond the initial 30 days and to place additional restrictions on the waivers.
The waivers apply to any commercial motor vehicle responding from anywhere in the United States to provide direct relief to the emergency. Emergency declarations temporarily lift most safety regulations, including hours of service, from interstate motor carrier drivers and operators providing emergency relief. Regulatory parts from 390-399 of 49 CFR are available for temporarily lifting as the result of any emergency declaration.

**Toll Waivers**

Each individual state of toll authority can grant waivers for tolls on a case-by-case basis during emergency and disaster assistance.

**Jones Act Waivers**

The Department of Homeland Security (DHS) can grant waivers of the Merchant Marine Act of 1920 (Jones Act), 46 U.S.C. § 55102, requiring that all goods transported by water between U.S. points be carried on U.S.-flag, coastwise-qualified ships. DHS considers waivers of the Jones Act on a case-by-case basis when necessary in the interest of national defense and only following a determination by the Maritime Administration (MARAD) of the non-availability of qualified U.S.-flag ships to meet the stated national defense requirements.

**Federal Railroad Administration (FRA) Emergency Relief Docket (ERD)**

The FRA Administrator may designate incidents as an emergency, which allows railroads to submit emergency request for regulatory waivers to the ERD. The Railroad Safety Board may give expedited review and grant a temporary waiver for the requests.

**The Stafford Act**

The Robert T. Stafford Disaster Relief and Emergency Assistance Act permits consideration of private sector requests for assistance. A private sector Critical Infrastructure and Key Resource (CIKR) owner and operator may receive direct or indirect assistance from Federal Government sources when the need meets the following four criteria:

- Exceeds capabilities of the private sector and relevant local, state, tribal, territorial, and insular area governments
- Relates to immediate threat to life and property
- Is critical to disaster response or community safety
- Relates to essential Federal recovery measures

In certain circumstances, Federal law requires appropriate authorities to include private sector representatives in incident management planning, operations, and exercises. When not required, it encourages such participation whenever practical. The Federal Government may direct private sector response resources in some cases in which contractual relationships exist.

**The Defense Production Act (DPA)**

The DPA is another authority that can support owners and operators of private sector critical infrastructure. While primarily for Federal procurement, the DPA priorities and allocations authority can also directly assist a private sector critical infrastructure owner or operator when the request is necessary of appropriate to support national defense. The DPA broadly defines national defense to include emergency preparedness activities to:

- Prepare for or minimize the effects of a hazard upon the civilian population
• Deal with the immediate emergency conditions, that the hazard creates
• Effectuate emergency repairs to, or the emergency restoration of, vital utilities and facilities that the hazard destroyed or damaged.

The use of this authority does not require a declaration of emergency. The process starts with a request from a private sector entity for a priority rating. DPA requests can go to different organizations in various ways, but they should go to the Federal Coordinating Officer (FCO) at the Joint Field Office (JFO) during Presidentially declared disasters. The FCO will determine to support the request and initiate coordination accordingly. Refer requests not tied to a disaster to the FEMA DPA Program Division, through the FEMA Regional Headquarters, to FEMA Headquarters.

In addition to the above cited authorities the Oil and Natural Gas Industry in their "Industry Preparedness Handbook"\(^5\) has identified the following potential waivers to be requested during an (disaster/emergency) incident.

The oil and natural gas industry operate under a myriad of regulations to ensure safe operations, environmental quality and fair market competition. The industry has a deep commitment to complying with all regulations all of the time regardless of external conditions. However, during the response to an incident affecting system integrity, some regulations can impede the quick restoration of services when access to specific resources is limited or workers and equipment are needed from other areas. Governments understand this paradox and the value of quickly restoring critical services when events affect their communities. Waivers, where government temporarily suspends regulations so that companies can continue operations that will help alleviate the emergency and restore normal operating conditions, are the solution to this problem. The following identifies many of the statutes and regulations, related issues and waivers that can be requested during an incident to speed recovery and a return to compliance.

### Environmental Protection Agency (EPA)

#### RFG Requirements

- **Issue:** Reformulated Gasoline (RFG) is a cleaner burning gasoline blend required in areas that are not meeting certain air quality standards. During times of emergency, it is imperative that distributors have the flexibility to get any available fuel into the affected area in any way possible regardless of whether or not it is RFG.
- **Waiver Needed:** 40 CFR 80.78(a)(7), prohibits persons from combining any reformulated gasoline blendstock or oxygenate blending with any other gasoline, blendstock, or oxygenate.

#### ULSD Requirements

- **Issue:** Ultra Low Sulfur Diesel (ULSD) is a cleaner fuel, with a 15 parts per million (ppm) sulfur specification, required by EPA for vehicles and equipment. During times of emergency, it is imperative that distributors have the flexibility to get any available fuel into the affected area in any way possible, regardless of sulfur content.

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\(^5\) *Oil and Natural Gas Industry Preparedness Handbook*, Ver 2.0, September 30, 2013, Produced by the American Petroleum Institute
Waiver Needed: 40 CFR 80.510 and 80.520, which set ULSD standards. This waiver would allow the use of high sulfur heating oil in model 2006 and older vehicles, generators and as home heating oil during the emergency.

Vapor Recovery Regulations
- **Issue:** Fuel terminal loading and unloading systems and tank trucks that transport fuels are required to use specified vapor recovery equipment which can differ from state to state. In the case of an emergency, it is imperative that fuel can get from jurisdiction to jurisdiction by any transport means available. The states include these regulations in their state implementation plans (SIPs) which are approved and enforced by the EPA.
- **Waiver Needed:** 40 CFR Part 60, Subpart XX and Part 63 Subparts R, Y, and BBBB, which set the standards for loading applicable to Bulk Gasoline Terminals, Pipeline Breakout Stations and Marine Tank Vessel Loading Operations, respectively.

Tank Roof Landing Emissions
- **Issue:** During an emergency when more fuel may be needed to pass through a facility’s tanks faster than normal operations, the emptying and filling of tanks may result in higher air emissions due to the tank roof landing emissions in floating roof tanks.
- **Waiver Required:** Air emission regulations are enforceable by EPA and air emissions for specific facilities are limited by their air permits. If EPA provides a waiver (or no-action assurance) during an emergency, each state may also waive the permit limits for an appropriate time during and following an emergency.

U.S. Department of Transportation (USDOT)

General Administrative Requirements
- **Issue:** The DOT Federal Motor Carrier Safety Administration (FMCSA) sets general standards and requirements that apply to vehicle labeling, record keeping, etc. They also require transporters to follow all applicable state and federal requirements. Waiving this section could expedite shipments of fuel to recover areas and allow for other federal and state waivers to be effective.
- **Waiver Needed:** 49 CFR 390, which provides the general basis for federal motor carrier safety regulations.
- **Issue:** The DOT Pipeline & Hazardous Materials Safety Administration sets requirements on operator qualification training for certain hazardous liquid and gas pipelines transportation functions or “covered tasks” that meet the components of the “four-part test”. This set of regulations is commonly referred to as Operator Qualification, and an example of a covered task is manual closure of valves. Due to the diversity of hazardous liquid and gas pipeline infrastructure across the Nation, operators train to satisfy the requirements as they apply specifically to their company’s equipment and infrastructure. These requirements, which may be appropriate under regular operating circumstances, hinder the effort for mutual aid from other hazardous liquid and gas pipeline companies in time-sensitive circumstances.
- **Waiver needed:** 49 CFR Part 192 and 195, subpart N lists the requirements of Operator Qualification, including “covered tasks” and “four-part test” in § 192.80 and § 195.505.
Driver Qualification Regulations

- **Issue:** The FMCSA has certain rules requiring a driver’s physical fitness, fluency in English language, level of fatigue, the thorough inspection of cargo, ensuring lighting and cargo standards are met and maintenance requirements, which may be appropriate under regular operating circumstances, but hinder the effort to get as many loads into the disaster area as possible in a short amount of time.
- **Waiver Needed:** 49 CFR Parts 391-3, and 396, which set driver standards, load standards, inspection standards, etc.

Hours of Service Regulations

- **Issue:** The FMCSA sets requirements on how many hours a truck driver can drive or be on duty in a given day and week. There are also certain rest time requirements between on duty periods. These requirements, which may be appropriate under regular operating circumstances, hinder the effort to get as many loads into the disaster area as possible in a short amount of time.
- **Waiver Needed:** 49 CFR Part 395, which sets hours of service regulations.

Vehicles Not Meeting HazMat Specifications

- **Issue:** USDOT’s Pipeline and Hazardous Materials Safety Administration (PHMSA) sets strict specifications on which vehicles can carry gasoline and other hazardous materials, and how they need to do it (i.e. shipping papers, markings, placarding, etc.). To get the needed quantities of fuel into the disaster area as quickly as possible, more vehicles are needed as long as they are fit to carry gasoline and diesel fuel, even if they do not meet the strict specifications.
- **Waivers Needed:** 49 CFR Parts 173.242 and 172 Subparts C,D,F, and I, which govern vehicle specifications and other shipping standards for tank trucks. These waivers will also affect 49 CFR Parts 106, 107 and 171-180.

Jones Act

- **Issue:** The Merchant Marine Act, also called the Jones Act, requires that only U.S. built and flagged vessels carry goods from U.S. ports to other U.S. ports. During times of emergency it is imperative that disaster relief items, including fuel, get to the disaster area as quickly as possible regardless of country of origin. More vessels mean that more disaster relief supplies arrive faster. Coastwise waivers can be granted in two ways: (1) waivers shall be granted automatically on request of the Secretary of Defense to the extent considered necessary in the interest of national defense; and (2) when the “head of an agency responsible for the administration of the navigation or vessel inspection laws (in this case the Secretary of DHS) considers it necessary in the interest of national defense, if the Administrator of MARAD determines that no U.S.–flagged vessels are available for the proposed transportation. CBP has direct responsibility for enforcing the Jones Act and processes requests for waivers for the Secretary of DHS. Prior to granting the waiver, CBP must seek MARAD’s advice regarding U.S.-flagged vessel availability before the Secretary of DHS makes a decision by law (see U.S.C. § 501).
- **Waiver Needed:** 46 USC 551, which codifies the restriction on non-U.S. flagged vessels delivering from U.S. ports to U.S. ports.

Foreign Oil Spill Response Vessels
- **Issue:** The Maritime Administration entered into a Memorandum of Agreement with the U.S. Coast Guard, the Environmental Protection Agency and the State Department to expedite requests for exemptions for foreign oil spill response vessels (oil skimmers, etc.).
- **Waiver Needed:** 46 U.S.C. § 55113. This MOU essentially memorializes the process that these agencies created will continue to expedite allowances to foreign oil spill response vessels in the future.

### Anchor Handling Waiver Program
- **Issue:** Similar to the Launch Barge Program, MARAD is authorized to make determinations under 46 U.S.C § 501 allowing the use of foreign anchor handling vessels (used to position mobile offshore drilling units) if no U.S.-flag vessels are available, and if the companies that want to use foreign vessels have contracts in place to bring in replacement U.S.-flag vessels.
- **Waiver Needed:** 46 U.S.C. § 501 allowing the use of foreign anchor handling vessels (used to position mobile offshore drilling units) if no U.S.-flag vessels are available.

### Internal Revenue Service (IRS)
#### Diesel Fuel Penalty
- **Issue:** The IRS imposes 24.4 cents per gallon tax on diesel fuel sold for on road use, while dyed diesel fuel used for farming purposes, home heating use, and etc. are not ordinarily subject to the tax. Typically, if a diesel fuel that was not subject to this excise tax was converted to use for on road purposes, the IRS would require that use to be reported and the tax paid accordingly. In the case of emergency, the goal is to get as much transportation fuel into the market as possible to make up for supply shortages, and as such, this reporting and tax requirement becomes an impediment to bringing that fuel into the transportation mix.
- **Waiver Needed:** Requirements under Publication 510, which governs excise taxes, of the Internal Revenue Code.

### Other Federal Government Assistance Options
#### Vessel Movement Control
- **Issue:** The Coast Guard has authority to control vessel traffic in areas subject to the jurisdiction of the United States which are determined to be hazardous or under other hazardous circumstances through enactment of safety and security zones. Coordination efforts with the U.S. Coast Guard and Department of Homeland Security (DHS) to provide exclusive access to ports in the disaster area to those bringing in fuel and other necessary supplies in an effort to expedite barge movement.
- **Waiver Needed:** Captain of the Port order waiver under Ports and Waterways Safety Act (33 U.S.C. 1221 et. seq.).
Fuel loans and distribution assistance from the Department of Defense's (DOD's) Defense Logistics Agency (DLA) and DHS's Federal Emergency Management Administration (FEMA).

Fuel loans from the Department of Energy (DOE).

State Specific Waivers Needed to Transport Fuel Interstate

Reid Vapor Pressure (RVP) Requirements

- **Issue:** Many states allow a variance, up to 1 lb. RVP, from the most recent version of ASTM D4814 for gasoline blended with ethanol. NIST Handbook 130 also provides for this variance.
- **Waiver Needed:** States that do not allow for an RVP variance may waive the applicable state law of regulation to allow fuel from states that do allow the variance to be used interchangeably across state lines during an emergency.

Biofuel Blending Requirements

- **Issue:** Some states require a minimum amount of biofuels to be blended into all gasoline and/or diesel sold within the state.
- **Waiver Needed:** States with minimum biofuel blending requirements may waive the applicable law or regulation to allow fuel that does not contain the specified volume of biofuels to be carried across state lines and sold in the state during an emergency.

Stage I Vapor Recovery Requirements

- **Issue:** Fuel terminal loading and unloading systems and tank trucks that transport fuels are required to use specified vapor recovery equipment, which can differ from state to state. In the case of emergency, it is imperative that fuel can get from jurisdiction to jurisdiction by any transport means available. The states include these regulations in their state implementation plans (SIPs) which are approved and enforced by EPA.
- **Waiver Required:** SIPs are enforceable by the EPA and during an emergency. If EPA provides a waiver (or no action assurance) during the emergency, each state requiring Stage I Vapor Recovery may waive the applicable law or regulation to allow trucks and terminals without vapor recovery equipment to operate and move fuel from the terminal to intrastate or interstate destinations.

Weight Limits

- **Issue:** All states set weight restrictions (maximum weight allowable) for trucks that travel on their roadways. Because federal law allows each state to set their own weight requirements, not all states set the limits at the same weight. Additionally, these state specific weight limits typically require fuel tankers to be filled at levels below their capacity in most, if not all states.
- **Waiver Needed:** States may waive their typical weight limits and set temporary limits for trucks carrying emergency relief supplies (including fuel) to allow rapid movement of the largest amount of fuel that can be moved safely intrastate and across state lines. A typical waiver may allow trucks from 92,000 to 100,000 lbs.
Distributor License
- **Issue:** Many states require a carrier to pay a fee and obtain a Distributor’s License to transport fuel within the state.
- **Waiver Needed:** States may waive the applicable fees and license requirements to ensure that all drivers, trucks and resources within the state, or brought across state lines to provide support are available to contribute to the disaster relief effort.

Hours of Service
- **Issue:** Some states have driver Hours of Service requirements that are more restrictive than the USDOT.
- **Waiver Needed:** States with hours of service regulations that are more restrictive than the federal government may waive those requirements to get as many loads into the disaster area as possible in a short amount of time.

Retail Gasoline Label Requirements
- **Issue:** States that have specific biofuel blending requirements may require labels that say things like “contains 10% ethanol,” while some fuel transported interstate may not have exactly 10%, but rather, “up to 10% ethanol.”
- **Waiver Needed:** States with content specific labeling requirements may waive those requirements to allow fuels that may not be blended with the exact volume depicted on the dispenser to be sold in the state during the emergency.

Importer/Exporter Licenses
- **Issue:** State revenue departments require fuel importers and exporters to pay a fee and obtain a license from the state to move fuel across state lines. Without these licenses the fuel merchant cannot legally buy gasoline from one state and move it to another.
- **Waiver Needed:** Each individual state within the disaster region may allow fuel to be bought and sold within or outside their state by any merchant, whether or not they have paid the proper fee and obtained an importer/exporter license, regardless of where the fuel is purchased and where it will be delivered. States who have allowed this in the past have taken different approaches, with some expediting licenses during the emergency and others waiving the requirement entirely or required the merchant to remit taxes to the state despite not being properly licensed and registered.

IRP/IFTA
- **Issue:** The International Registration Plan (IRP) is an agreement among states of the U.S., the District of Columbia and provinces of Canada providing for payment of commercial motor carrier registration fees. To operate in multiple states or provinces, motor carriers must register in their base jurisdiction (state or province). The International Fuel Tax Agreement (IFTA) is an agreement among states to report fuel taxes by interstate motor carriers.
- **Waiver Needed:** The tax structures, which act as interstate fuel taxes, may be waived in agreement with all states that are affected by the emergency or that are participating in the emergency relief effort to ensure that fuel can move freely from one state to another without being bogged down with tax bureaucracy.