UNLEASHING THE GRID

ENERGY DOMINANCE FOR NATIONAL DEFENSE

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ASSOCIATION OF DEFENSE COMMUNITIES | CONVERGE STRATEGIES

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SUMMARY

The United States sits at an energy crossroads that will define the security and economic future of our country for decades. Central to this challenge is establishing and maintaining energy dominance through targeted and comprehensive investment in domestic energy resources and the infrastructure required to support national defense. Energy provides an essential component of every Department of Defense (DoD) mission, and this dependency will only increase in the future. Achieving energy dominance for national defense requires having the resources needed to execute critical missions regardless of adverse conditions. Strengthening grid reliability and security fortifies our energy supply against adversarial attempts to disrupt or delay missions through targeted attacks on infrastructure, essential systems, and supply chains. Ensuring the secure delivery of electricity supports deterrence through resilience by denying adversaries the benefits of attacks. Aligning national defense and electricity system expansion requires a substantial shift in the way critical infrastructure in the U.S. is planned, constructed, and operated.

This paper will focus on electric transmission, consistent with the Trump Administration's focus on grid reliability and security to support energy dominance. The connections between national defense and transmission are outlined in the Transmission Expansion for National Defense (TREND) report[1] published in 2024, which identifies three key concepts linking mission assurance to a resilient transmission system:

- **The electric grid is an extension of the weapons system platform.** No mission is executed in isolation, and the energy needed to power facilities, equipment, and assets on military installations depends on the availability and survivability of the bulk-power system. Energy assurance extends from the point of consumption to the point of electricity generation. The infrastructure that supports it should be prioritized accordingly.
- **Defense communities are essential to mission capability.** Mission assurance is not limited to the availability of personnel and resources inside the fence line. It encompasses the civilian-owned infrastructure surrounding the installation. DoD dependencies on systems that reside outside the fence line (e.g., water, wastewater, telecommunications, transportation, natural gas, and fuel delivery) require energy solutions that take a holistic approach as opposed to treating missions as a single "ratepayer."
- **Energy assurance risks to DoD are regional.** Outages at the electric distribution level are more common, but regional outages pose a much greater risk to mission assurance. The shared dependency of multiple DoD installations (and the missions they support) on a limited number of bulk-power system assets can compromise energy assurance at a scale that undermines national defense.

The primary audience for this report is defense stakeholders – defense industries, defense communities, military installations, and federal and state agencies. This paper presents a framework for defense stakeholders to understand grid risk in their regions and explores the national defense opportunities presented by transmission infrastructure expansion.

This paper is structured to answer a series of questions identified during consultations with defense and energy stakeholders.

- **Section 2: Why is transmission important to national defense?** Electricity underpins national defense. Military installations, defense communities, and defense manufacturing rely almost entirely on the grid. Energy demand from artificial intelligence and from the cyber and space domains are only increasing this reliance. At the same time, the grid is undergoing a period of unprecedented change because of surging industrial demand, extreme events, and changes in the generation fleet. A strong electricity transmission backbone assures abundant energy for national defense.
- **Section 3: What ability does DoD have to influence grid resilience?** Energy resilience and security are at the core of defense energy policy.

1 Converge Strategies and Association of Defense Communities, Transmission Expansion for National Defense, April 2024

DoD is required to achieve up to 99.9999% energy uptime for critical missions and has focused extensively on "inside the fence line" backup power systems and microgrids. Onsite resilience strategies are necessary but not sufficient given the potential for long-duration power outages and the reliance of military installations on interdependent civilian infrastructure. DoD is increasingly engaging with utility and community partners on readiness strategies, and there are significant opportunities for increased cooperation on defense critical electric infrastructure and bulk-power system resilience.

- **Section 4: What should transmission planning for national defense accomplish?** The objective of expanding transmission to support national defense is to increase the warfighting and homeland defense capabilities of the military through energy resilience and energy security. Transmission expansion should prioritize energy assurance to critical DoD missions, incorporate DoD energy loads into planning, identify and efficiently connect growing missions and facilities, and provide cost-effective reliability.
- **Section 5: How can defense stakeholders assess the need for transmission expansion?** Significant portions of the country are at grave risk of not being able to meet their projected electricity requirements in the coming years. Defense stakeholders can build a high-level understanding of grid risk and transmission opportunities in their regions using public data related to bulk-power system reliability, projected electricity demand growth, the impacts of extreme events, changes in the electricity mix, and recent studies of potential transmission expansion.
- **Section 6: What are the regulatory processes and policy authorities that govern transmission?** Transmission expansion is influenced by regulatory and policy proceedings at the state, regional, and federal levels. There are multiple venues in which policy makers and defense stakeholders can work to integrate national defense more intentionally into grid planning.

1. INTRODUCTION

"It is the policy of the United States…to protect the United States's economic and national security and military preparedness by ensuring that an abundant supply of energy is readily accessible in every State and territory of the Nation."

- Executive Order on Unleashing American Energy[2]

On January 20, 2025, President Donald Trump signed a series of Executive Orders (E.O.s) that established energy policies to support national security and military preparedness.

- The *E.O. on Declaring a National Energy Emergency* directs federal agencies to support "a reliable, diversified, and affordable supply to drive our Nation's…defense industries, and to sustain the basics of modern life and military preparedness" in response to hostile state and non-state foreign actors who "have targeted our domestic energy infrastructure."[3]
- The *E.O. on Unleashing American Energy* seeks to expedite energy projects deemed essential for national security.[4]

Both E.O.s emphasize the need not only to produce and generate energy, but also to deliver energy reliably from coast to coast.

- The *E.O. on Declaring a National Energy Emergency* cites insufficient electricity transmission as an extraordinary threat to national security and directs federal agencies to assess the Department of Defense's ability to acquire and transport the energy, electricity, or fuels needed to protect the homeland.
- The *E.O. on Unleashing American Energy* directs the Administration to prepare recommendations for Congress to facilitate "the permitting and construction of interstate energy transportation and other critical infrastructure."[5]

On February 5, 2025, U.S. Department of Energy (DOE) Secretary Chris Wright issued his first Secretarial Order, *Unleashing the Golden Era of American Energy Dominance*. The Secretarial Order states that "[f]ortifying America's electric grid is critical to the reliable and secure delivery of electricity." The Secretarial Order also states that DOE will "identify and exercise all lawful authorities to strengthen the nation's grid, including the backbone of the grid, our transmission system."[6]

The Trump administration's emphasis on expanding energy infrastructure for national security and national defense is consistent with the findings of the 2024 TREND initiative, supported by the Association of Defense Communities (ADC). The TREND report identified the electric grid as the cornerstone of national defense, and that the unique capabilities of the bulk-power system are an essential extension of military missions and weapons platforms. A portfolio of solutions, such as energy efficiency, storage, demand-side management, and power generation, can support bulk-power system reliability and resilience in a manner that meets national security needs.[7] This report focuses primarily on the electric transmission system because of its unique technical capabilities and operational characteristics.[8] Transmission can support military energy resilience across broad regions and in specific locations, while also reliably and cost-effectively delivering a diverse national supply of energy. The Trump administration has set a goal of achieving energy dominance, defined as securing energy, ensuring markets for energy exports, accessing new energy natural resources, and providing tools for policymakers to assist allies and deter adversaries.[9] As stated in the DOE Secretarial Order, a strong national transmission backbone must play an important role in achieving these goals.

If not adequately planned and secured, the transmission system may be a vulnerability for the reliable and secure delivery of electricity in the face of

2 White House, *Unleashing American Energy*, January 2025
3 White House, *Declaring a National Energy Emergency*, January 2025
4 White House, *Unleashing American Energy*, January 2025
5 White House, *Unleashing American Energy*, January 2025
6 DOE, *Unleashing the Golden Era of American Energy Dominance*, February 2025
7 NERC, *Interregional Transfer Capability Study Report Summary*, 2024
8 The electric transmission system typically refers to the extra-high voltage backbone network of transmission circuits, substations, and infrastructure at 100 kilovolts and higher
9 Project 2025, *Mandate for Leadership: The Conservative Promise*, 2023

natural or man-made events. Widespread transmission system disruptions can cause long-duration outages that simultaneously impact military installations, defense communities, and defense industries across entire regions. Such regional outages pose serious risks to military preparedness because they undermine mission assurance across multiple installations, and because they may last longer than DoD planning horizons for backup power.

Reliable electricity is central to national defense, but the bulk-power system is currently undergoing dramatic changes and upheaval. Electricity demand from strategically important industries such as data centers and domestic manufacturing is surging, even as the generation resources and equipment needed to accommodate their growth are in critically short supply.[10] Extreme events, cyber attacks, and physical attacks by violent extremist organizations threaten the electricity grid.[11] Our energy supply is changing as uneconomic and inefficient power plants retire and next generation plants come online. Rapid changes in our electricity system could negatively impact national security without intentional planning.

During this period of flux and investment, it is crucial that national defense concerns remain at the forefront. Yet, there are currently no standard (or even common) channels or processes for incorporating military requirements or perspectives into civilian electricity planning. As discussed in the TREND report and other publications, expanding the grid will create an opportunity to align bulk-power system planning with national defense priorities.[12] The practice of integrating defense into electric grid planning and regulatory processes, however, is relatively new. DoD has begun to build out its in-house capacity to engage in grid proceedings, but fundamental questions about where and how DoD should prioritize its engagement remain.

The primary audience for this report is defense stakeholders – representatives of the defense industrial base (DIB),[13] state military affairs agencies, staff from federal agencies such as DoD and the Department of Homeland Security, and defense communities that support military installations and are critical to mission assurance. This paper presents an initial framework for defense stakeholders to understand grid risk in their regions and explores the national defense opportunities presented by energy infrastructure expansion. This paper also serves as a resource for defense stakeholders to better understand and engage in policy processes that shape electric transmission infrastructure investment. Existing stakeholder venues where decisions about critical electric infrastructure investments are being made need to create onramps to integrate the defense perspective into these processes. The intent of this paper is also to raise awareness among the electricity sector and transmission stakeholders about opportunities to proactively consider national defense.

A planned publication will use the questions presented in Section 5 and Section 6 to characterize the landscape for grid reliability, transmission planning, and national defense in specific states. Defense stakeholders can use a similar methodology for characterizing additional states or regions.

10 DOE, *The Supply Chain Crisis Facing the Nation's Electric Grid*, December 2022

11 SAFE, *Grid in Peril*, September 2023

12 Converge Strategies and Association of Defense Communities, *Transmission Expansion for National Defense*, April 2024; SAFE, *Wired for Defense: The National Security Imperative of Transmission Expansion*, November 2024

13 The DIB is the network of facilities and organizations that provide defense-related materials, products, and services to the U.S. Government. See Congressional Research Service, *The U.S. Defense Industrial Base: Background and Issues for Congress*, September 2024

2. WHY IS TRANSMISSION IMPORTANT TO NATIONAL DEFENSE?

"The threats the United States faces are the most serious and most challenging the nation has encountered since 1945 and include the potential for near-term major war."

- Commission on the National Defense Strategy[14]

This stark statement builds on similar assessments of the global security landscape from the DoD and the intelligence community.[15] Each of these assessments also echoes the Trump Administration's E.O.s and stresses that future conflict with peer competitors such as the People's Republic of China or Russia would involve attacks on critical infrastructure in the U.S., with the goal of disrupting the U.S. military's ability to deploy. This section reviews the role that transmission plays in defense, as both the national security landscape and the electricity system rapidly evolve.

2.1. Missions Require Electricity

As summarized in the TREND report and other recent publications, the U.S. will need to invest in the reliability and resilience of its power system in order to deter and prepare for potential conflict. The electricity demand of domestic national defense missions is projected to increase, and transmission will be key to enabling that growth. Electricity underpins national defense energy demand in multiple ways:

- **Mission assurance.** Our globally networked forces depend on the seamless operation of domestic military installations – which, in turn, rely almost entirely on the civilian electric grid. Electricity supply disruptions here at home can cause critical missions to fail around the world and constrain DoD's ability to provide defense support to civil authorities (DSCA) during disasters. DoD is also adding new, energy-intensive mission sets that will increase its domestic energy demand and increase its reliance on the electricity grid.
- **Evolving warfare.** The nature of warfare is rapidly changing, as witnessed in the recent conflict in Ukraine, and the military is evolving to keep pace.[16] The U.S. Space Force was established in 2019 in recognition that the space and cyber domains are national security imperatives, and artificial intelligence (AI) is projected to reshape the face of global competition and conflict.[17] Cyber, space, AI, and other new missions are adding large new DoD energy loads to the U.S. electricity system, which will require intentional and streamlined planning to accommodate.
- **Defense manufacturing.** Defense manufacturing is critical to sustaining resilient defense supply chains and to economic deterrence.[18] The Commission on the National Defense Strategy found that the U.S. defense industrial base is "unable to meet the equipment, technology, and munitions needs of the United States and its allies and partners." In each of the major wars of the last century, electricity shortages were a major constraint on defense production. The DIB, like military installations, is heavily dependent on electricity from the grid and vulnerable to power disruptions.[19]

2.2. There Is Growing Competition for Electricity Supply

The mission of DoD is to provide the military forces needed to deter war and to protect the security of the United States.[20] The U.S. military is considered the most powerful in the world, based on its diverse capabilities, highly trained personnel, advanced technology, global reach, and large budget. Sustaining these advantages requires vast amounts of energy. DoD spends more than $16 billion on electricity and

14 RAND, *Commission on the National Defense Strategy*, July 2024
15 Director of National Intelligence, *Annual Threat Assessment of the U.S. Intelligence Community*, February 2024; DoD, *2022 National Defense Strategy of The United States of America*, October 2022
16 Walsh, T.A. & Huber, A.L., *A Symphony of Capabilities How the Joint Warfighting Concept Guides Service Force Design and Development*, Joint Forces Quarterly, 4th Quarter 2023
17 Schmidt, E. *AI, Great Power Competition, and National Security*, Daedalus, May 2022.; DoD, *Space-based threats and U.S. countermeasures from the DoD*, April 2023
18 DoD, *National Defense Industrial Strategy*, November 2023.
19 DHS, *Defense Industrial Base Sector-Specific Plan: An Annex to the National Infrastructure Protection Plan*, May 2010
20 DoD, *About*, January 2025

fuels each year.[21] One third of this – close to $5 billion – is for the electricity and fuels required to power domestic military installations. DoD has been the largest electricity customer in the U.S. for decades and consumes close to 1% of the country's kilowatt-hours. Following two decades of flat or low growth, however, national electricity demand is projected to increase by an unprecedented 16% over the next five years (see Section 5.2).[22] This load growth has complex implications for DoD and for military readiness that transmission expansion would help address:

- **Reliable electricity supply.** The forecasted jump in electricity demand will require a large and rapid build out of new electricity infrastructure. If not carefully coordinated, the addition of large new loads may contribute to grid reliability issues. Since the military's critical missions rely on the civilian power grid, looming grid reliability issues may pose mission assurance challenges that DoD has yet to incorporate into operational risk assessments.[23]
- **Buying power.** At the national level, DoD may continue to be the country's largest single electricity consumer. At the regional level, however, DoD may be rapidly displaced by other large industrial customers. This could create new dynamics that disadvantage DoD in key defense regions where there are heavy concentrations of military installations and DIB facilities. As private sector demand expands, DoD will need to adjust to ensure its perspectives and needs are taken into account and prioritized.
- **Resource competition.** Large loads like data centers cannot tolerate power interruptions without incurring significant financial loss and other potential damages, similar to critical military missions. Unlike the military, however, large companies are willing to pay a premium for enhanced reliability from their utility partners. As load growth creates scarcity, DoD may find itself less able to compete with private sector entities for energy.

3. WHAT ABILITY DOES DOD HAVE TO INFLUENCE GRID RESILIENCE?

As discussed above, the Trump Administration's Executive and Secretarial Orders focus on supporting military preparedness with strengthened electric infrastructure to support energy dominance. This federal focus on the electricity grid implicates new roles for DoD and for defense stakeholders within electricity planning and policy processes.

This section provides an overview of DoD's policies related to energy resilience and highlights the opportunities and limitations of the department's current authorities related to grid resilience and transmission. In practice, DoD has focused historically on energy resilience within its installations ("inside the fence line"). The Department, however, has authorities and policies to engage with the electricity system in ways that align with the *E.O. on Declaring a Grid Emergency's* focus on transporting the electricity needed to protect the homeland and conduct operations abroad.

21 DoD, *FY23 Annual Energy Performance, Resilience, and Readiness (AEPRR) Report*, July 2024
22 GridStrategies, *Strategic Industries Surging: Driving US Power Demand*, December 2024
23 Stockton P.N. & Paczkowski, J.P. *Strengthening Mission Assurance Against Emerging Threats: Critical Gaps and Opportunities for Progress*, Joint Forces Quarterly, 2019

3.1. Resilience and Security Are Central to DoD Energy Policy

There has been a consistent focus on military energy resilience over the last several presidential administrations. During the first Trump Administration, Congress and DoD elevated energy resilience to be a central national defense priority. The FY18 National Defense Authorization Act (NDAA) codified resilience and security as the energy policy priorities of the DoD (see Text Box 1).[24]

DoD Energy Resilience and Security Definitions

Under the general energy policy of the DoD, the "Secretary of Defense shall ensure the readiness of the armed forces for their military missions by pursuing energy security and energy resilience."[25]

Energy resilience means the ability to avoid, prepare for, minimize, adapt to, and recover from anticipated and unanticipated energy disruptions in order to ensure energy availability and reliability sufficient to provide for mission assurance and readiness, including mission essential operations related to readiness, and to execute or rapidly reestablish mission essential requirements.[26]

Energy security means having assured access to reliable supplies of energy and the ability to protect and deliver sufficient energy to meet mission essential requirements.[27]

In 2016 and 2018, DoD established requirements that military installations develop energy resilience plans, and each of the military departments created policies in 2016-2020 requiring critical missions to operate independently from the grid for 7-14 days.[28] In 2020, Congress passed a law requiring that critical defense missions attain a minimum level of 99.9% energy uptime,[29] translating to an average grid outage of less than two times per year for fewer than five hours in total. DoD subsequently issued guidance in 2021 specifying that certain missions will have uptime requirements of 99.999% and even 99.9999%,[30] which would require less than six minutes of downtime per year. Current DoD strategy to address these uptime requirements is almost exclusively limited to "inside the fence line" solutions, yet those solutions still leave installations vulnerable to regional outages that can impact the deployment of military forces, and long-duration outages that undermine the health and safety of troops, civilians, and families. An integrated approach that bolsters the bulk-power system through transmission investment augmented by local energy resources carries the greatest potential to achieve the reliability sought by DoD.

3.2. DoD Has the Authority to Engage Outside the Fence Line

To meet its energy resilience requirements, DoD has focused extensively on efforts "inside the fence line" of installations, deploying technologies such as emergency backup generators, uninterruptible power supplies, microgrids, and hardened electricity distribution lines.[31]

Threats to domestic energy infrastructure have highlighted DoD's vulnerability to civilian critical infrastructure.[32] DoD has an increasingly clear stake in power grid resilience, and the Department is beginning to include considerations "beyond the fence line" in its infrastructure resilience strategy. In December 2024, DoD issued a new policy that requires planning with state and local governments to ensure resilience of the civilian infrastructure that supports mission essential functions.[33] DoD has also helped fund transmission lines that support installation resilience through the Defense Community Infrastructure Program (DCIP).[34]

DoD's energy policies, however, are less specific

24 10 U.S.C. § 2911(a)
25 10 U.S.C. § 2911(a)
26 10 U.S.C. § 101(f)(6)
27 10 U.S.C. § 101(f)(7)
28 Air Force. *Air Force Policy Directive 90-17*, May 2020; Army, *Army Directive 2020-03 (Installation Energy and Water Resilience Policy*, March 2020; Navy, *Installation Energy Resilience Strategy*, February 2020
29 *10 U.S.C. § 2920(a)(1-2)*
30 DoD. *Metrics and Standards for Energy Resilience at Military Installations*, February 2020
31 ADC, *Beyond the Fence Line: Strengthening Military Capabilities Through Energy Resilience Partnerships*, November 2018
32 ADC, *Transmission Expansion for National Defense*, April 2024
33 DoD, *DoD Instruction 4715.28: Military Installation Resilience*, December 2024
34 DoD, *Defense Community Infrastructure Program*, January 2025

about grid resilience than they are about installation resilience, and DoD practice is less well established. DoD's 99.9% uptime policy, for example, requires that the standards also apply to "contracts for energy and utility services," but the methods for complying with this part of the code are not specified.

In 2019, the Defense Science Board Task Force on DoD Dependencies on Critical Infrastructure was created to explore DoD's vulnerabilities to the civilian electricity, water, transportation, and communications systems. In September 2024, the Task Force concluded:

> *"DoD leadership must take seriously—and give priority to—their roles and responsibilities to ensure the resiliency of civilian infrastructure on which it is so critically dependent…While this does not mean that DoD must pay for all that needs to be done, it does mean that DoD must become a highly committed and visible partner with the civilian owner/operators, both directly and through key government agencies, to help them bolster their resilience. Doing so will erode adversary confidence in the homeland attack pillar of their doctrine and contribute to deterring war altogether."*

Responsibility for grid resilience within DoD lies with the Assistant Secretary of Defense for Energy, Installations, and the Environment (ASD(EI&E)), who, by DoD policy, "manages energy-related risks to support mitigation of commercial electric grid challenges for DoD infrastructure and missions."[35] The Assistant Secretary of Defense for Homeland Defense and Hemispheric Affairs (ASD(HD&HA)) is responsible for promoting collaboration between DoD and private sector entities on "the resilience of commercial energy infrastructure upon which DoD relies to reduce mission risk."[36]

DoD senior leadership has already provided clear guidance to use appropriate regulatory processes to engage on resilience matters. In 2024, the ASD(EI&E) issued a new guidance directing the regulatory law offices of the military departments to monitor and intervene in utility proceedings in which DoD resilience objectives may be affected.[37] Building on the intention of this guidance, defense stakeholders can similarly engage in grid planning processes in which DoD has equities.

3.3. Defense Critical Electric Infrastructure: A Stalled Priority

DoD has also engaged with DOE on defense critical electric infrastructure (DCEI). Congress amended the Federal Power Act in 2015 to define DCEI as "any electric infrastructure that serves a critical defense facility but is not owned or operated by the owner or operator of such a facility." DOE and DoD designated critical defense facilities (CDFs) in 2019, and DOE informed the utilities that serve the CDFs of their designation.[38] DoD and DOE signed a memorandum of understanding (MOU) in September 2020, on collaborating in support of DCEI.[39] A significant focus of the MOU was on engaging in planning processes for civilian electricity infrastructure. DOE also announced plans to roll out a DCEI Program in 2020.[40] The DOE Electricity Advisory Committee (EAC) drafted a set of recommendations for DOE on strengthening the resilience of DCEI in 2022.[41]

Although the groundwork for a DCEI program was laid in the first Trump Administration, it did not receive significant programmatic focus under the Biden Administration. Many of the EAC recommendations have not been implemented, and DoD and DOE have not yet operationalized the partnership laid out in the MOU. The recent Presidential declaration of an energy emergency presents a renewed opportunity for DoD and DOE to focus on DCEI as a centerpiece of engagements with federal, state, and utility partners on bulk-power system resilience.

35 DoD, *DoD Directive 4180.01: DoD Energy Policy*, August 2018
36 DoD, *DoD Directive 4180.01: DoD Energy Policy*, August 2018
37 DoD, *Guidance for Regulated Electric Utility Engagement*, February 2024
38 Electricity Advisory Committee, *Strengthening the Resilience of Defense Critical Electric Infrastructure Recommendations for the U.S. Department of Energy*, March 2022
39 DoD and DOE, Memorandum of Understanding, September 2020
40 DOE, Defense Critical Electric Infrastructure, October 2020
41 Electricity Advisory Committee, *Strengthening the Resilience of Defense Critical Electric Infrastructure Recommendations for the U.S. Department of Energy*, March 2022

4. WHAT SHOULD TRANSMISSION PLANNING FOR NATIONAL DEFENSE ACCOMPLISH?

4.1. Defense Principles for Transmission Expansion

At the highest level, the objective of expanding transmission to support national defense is to increase the warfighting and homeland defense capabilities of the military through energy resilience and energy security. DoD has not, however, articulated specific infrastructure performance or energy delivery requirements for the electric grid that would enable transmission owners and operators to work toward more specific mission-enabling outcomes through infrastructure planning and system operation.

DoD has military installations in all 50 states, the District of Columbia, and territories. Any improvement in transmission system reliability and resilience therefore supports national defense. This broad benefit is appropriate when considering the need for a national transmission backbone, but it is difficult to translate into nuanced guidance for specific geographies. This section lays out national defense principles that could be used to guide and inform transmission and grid resilience decision-making and planning. These principles are drawn primarily from the objectives of the E.O.s described in Section 1, the DoD energy policies detailed in Section 3, and interviews with defense stakeholders. These principles do not constitute formal DoD policies or positions. They are intended as reasonable proxies for how defense priorities might be considered in electricity policy venues, regulatory proceedings, and planning exercises that influence transmission expansion.

Principle 1. Prioritize Energy Assurance to Critical DoD Missions

- DoD policy is to enhance military capability by diversifying and expanding its energy supplies and sources.[42]
- Critical national defense missions must achieve between 99.9% and 99.9999% energy availability by law and policy.
- Transmission policymaking should formally incorporate these requirements, and mechanisms should be developed in transmission planning processes to consider the value of transmission in supporting critical DoD missions.

Principle 2. Incorporate DoD Energy Load into Capacity Planning and Allocation

- Existing DoD load should be explicitly considered in local, regional, and interregional transmission and bulk-power system planning relating to, for example, generation reserve margins and transfer minimums.
- Grid planning should take into account the size of DoD loads and the specific operational requirements of defense missions. Importantly, this includes ensuring there is sufficient grid capacity to supply critical mission loads that may otherwise be backed up "inside the fence line." This will require DoD to properly and efficiently communicate this information to electricity system stakeholders at the appropriate levels of classification.
- Grid planning requirements and standards should recognize the criticality of defense loads and prioritize the availability and uptime of these loads in planning and operational activities.

Principle 3. Identify and Efficiently Connect Missions and Facilities

- DoD's energy demands are shifting as it invests in new missions and capabilities in both existing and new locations.
- Each of the military services has its own modernization and force design strategies, such as the Air Force's Future Operating Concept and the Marine Corps' Force Design 2030, that outline planned transformations in capabilities and technologies.[43] Given the pace of technological change, the Army is adopting an approach of continuous transformation on three different timescales: 18-24 months, two to seven years, and seven to 15 years, with work done in each period affecting and informing the others.[44]

42 DoD, *DoD Directive 4180.01: DoD Energy Policy*, August 2018
43 Air Force, *Future Operating Concept Executive Summary*, March 2023; U.S. Marine Corps, *Force Design 2030*, March 2020
44 Rainey, J.E., *Continuous Transformation*, Military Review, September-October 2024

- Transmission planners should understand, accurately represent, and prepare for transformations in DoD force design so that demand from civilian data centers and other large loads do not "crowd out" national defense, and that new DoD missions are protected from electricity supply shortfalls.

Principle 4. Provide Cost-Effective Reliability

- In the race for new capacity, DoD (and taxpayers) must be able to access diverse low-cost resources. To secure energy for national defense, DoD must take the additional step of considering the most cost-effective acquisition path to accomplish mission requirements.
- Transmission expansion provides a cost-effective avenue to increase reliability and increase supply diversity for DoD loads.[45]
- Planning, permitting, and construction for cost-effective transmission that supports national defense should be accelerated.

4.2. Scope and Focus

These principles could be applied to a range of grid resilience topics and proceedings. This paper considers these principles primarily in the context of expanding the electricity bulk-power system. Transmission can significantly contribute to national defense in other ways that are beyond the scope of this paper and that are covered in other recent reports. Expanded electric transmission infrastructure can support DoD needs in the following ways:

- **Local reliability.** Robust local transmission (and distribution) infrastructure can play an important role in enhancing reliability of specific bases and missions. This paper focuses more on large-scale transmission infrastructure designed to transmit power across or between large regions of the country. The extra-high voltage transmission system can serve growing national defense requirements, mitigate the worst impacts of natural disasters, and improve protections against cyber and physical attacks.
- **Restoration.** DoD's energy resilience definition emphasizes action at different stages of energy disruptions: before (preparing), during (adapting), and after (recovering). The transmission system can support DoD energy resilience at each of these stages. Bulk-power system restoration processes ("blackstart"),[46] directly support the recovery stage. This paper focuses primarily on building transmission capabilities that help DoD prepare for and adapt to energy disruptions.
- **Hardening.** There are opportunities to ensure that the transmission system is better able to withstand damage from extreme weather, natural disasters, man-made attacks, and other hazards. These measures include, but are not limited to, enhanced wind and ice ratings, weatherization techniques, undergrounding or moving infrastructure indoors, enhanced physical security measures, flood or tidal barriers, or other physical protections for transmission infrastructure that serves critical defense missions. This paper focuses primarily on transmission expansion that supports reliability, redundancy, and supply diversity.
- **Grid-enhancing technologies (GETs) and reconductoring.** By increasing the capacity of pre-existing transmission infrastructure, GETs and reconductoring offer pathways to enhance our current grid much faster and at a fraction of the cost of building new lines. New technologies ranging from dynamic line ratings, to power flow controls, to topology optimization offer energy efficiency solutions to improve utilization and strengthen resilience.[47] Reconductoring with advanced conductors – replacing old conductors with new versions that have a higher electrical current capacity – reduces the risk of sagging and decreases line losses.[48] While this paper concentrates more on regional and interregional transmission buildout for national defense, GETs and reconductoring can be strategically implemented to strengthen transmission lines serving critical defense missions.

45 DOE, *The National Transmission Planning Study*, October 2024
46 National Association of State Energy Officials, *The Black Box of Blackstart: Electricity Reliability and Interdependency Considerations for State Energy Offices*, January 2022
47 The Brattle Group, *Building a Better Grid: How Grid-Enhancing Technologies Complement Transmission Buildouts*, April 2023
48 INL, *Advanced Conductor Scan Report*, December 2023

5. HOW CAN DEFENSE STAKEHOLDERS ASSESS THE NEED FOR TRANSMISSION EXPANSION?

Near-term forecasts project that electricity supply and demand in the U.S. are dangerously misaligned. There is insufficient generation infrastructure to supply projected electricity demand in many parts of the country, and this problem is compounded by the rapidity of cross-sector critical infrastructure electrification. Significant portions of the country are at grave risk of not being able to meet their projected electricity requirements in the coming years, posing clear risks for national defense.

Defense stakeholders have well-established processes for risk assessment to identify and mitigate threats to mission execution. The Defense Threat Reduction Agency and each of the military departments have established methodologies to assess the risks to specific missions. These methodologies do not, however, have a specific crosswalk to risks posed to military missions by the U.S. electricity system.

This section provides a series of questions that defense stakeholders can use to orient themselves to current trends and to the drivers of risk within their domestic areas of operation. Defense stakeholders cannot effectively know or address their own risks without understanding the risks to the grid that supports them.

The intent is to provide an introduction to key topics, rather than a comprehensive overview of electricity risk assessment processes and metrics. Defense stakeholders can use this section to assemble indicators related to grid resilience, build a high-level profile of relevant grid trends in their region, benchmark their regions against others, and identify potential opportunities to reduce mission assurance risk with transmission.

This section builds on other efforts from organizations such as the National Association of Regulatory Utility Commissioners (NARUC) and the RAND Corporation that use standard questions and indicators to characterize the defense energy resilience landscape.[49]

This section is distinct from other efforts in that it focuses on the bulk-power system, rather than at the state or local level. The indicators are intended to be accessible to leaders from outside the energy industry, allowing them to inform risk-based decisions related to infrastructure prioritization without needing to engage in overly technical analysis. This section also limits the number of questions and indicators to enable broad snapshots, rather than in-depth research efforts.

Each of the five subsections follows a similar structure:

- **BLUF (bottom line up front):** Key takeaways about the topic and how it relates to transmission expansion.
- **Background:** Details about the topic such as key trends, key players, related processes, and relevant resources.
- **Defense considerations:** Summary of intersection points with defense policies and requirements (or lack thereof).
- **Potential pathways:** Examples of next steps related to the topic that defense or electricity industry stakeholders could take. These pathways are intended as examples rather than a comprehensive set of recommendations.
- **Indicator(s):** Suggestions of indicators that defense stakeholders can collect to build a fuller picture of grid resilience and transmission opportunities in their region.

5.1. What Is the Outlook for Electricity Reliability, and What Does It Mean for DoD?

BLUF: Large parts of the country are at risk of electricity shortfalls that can affect DoD stakeholders. Transmission expansion, particularly interregional transmission expansion, can enhance reliability in areas of elevated risk.

Background: Reliability is the ability of the bulk-power system to meet energy demand at all times, and to withstand sudden disturbances.[50] The North American Electric Reliability Corporation (NERC) assesses the reliability of the bulk power system in both the near-

49 NARUC, *Defense Energy Resilience Engagement Framework for Utility Regulators*, September 2024; RAND, *Extreme Weather and Climate Hazard Impacts on Energy and Water Utilities: Implications for Department of the Air Force Installation Climate Resilience Planning*, March 2024

50 NERC, *Reliability Terminology*, August 2013

term and long-term, taking into account the adequacy of both transmission and generation.

- NERC Long-Term Reliability Assessment (LTRA).[51] The NERC LTRA aggregates data from across the country to develop an annual 10-year reliability forecast. The 2024 forecast concludes that significant portions of the country are at elevated risk of electricity shortfalls to meet future peak electricity demand under normal conditions. The Midwestern Independent System Operator (MISO) area, which extends from Minnesota to Louisiana, is at high risk of electricity shortfalls under normal conditions in the future. Figure 1 below shows the risk of electricity shortfalls for different areas of the country.
- Winter and Summer Reliability Assessments. NERC also formally assesses system reliability twice each year in the winter and summer. NERC's 2024-2025 Winter Reliability Assessment and 2024 Summer Reliability Assessment found that large parts of the U.S. are under elevated risk of energy shortfalls under more extreme conditions during both seasons.[52]

Defense considerations: Reliability assessments can inform DoD decision-making around energy assurance risk mitigation priorities. They provide a starting point for aligning risk metrics inside and outside the fence line of DoD installations to guide infrastructure planning and investment. As discussed in Section 3.1, DoD has energy uptime requirements of at least 99.9% for critical missions.

Potential pathways: In NERC assessment areas with elevated or high risks, DoD and other stakeholders should seek to understand the missions, critical loads, and DCEI assets that can be effectively supported by transmission investment. Defense stakeholders should also determine the aggregate energy loads of their installations, surrounding defense communities, and DIB supply chain facilities within each assessment area to understand the relative risk to missions. Knowing this load information, combined with the context of what missions are being executed using that energy, will not only allow DoD to know how much electricity they need, but it will also inform their risk assessments and aid in the development of new requirements that will directly address the energy needs for specific missions.

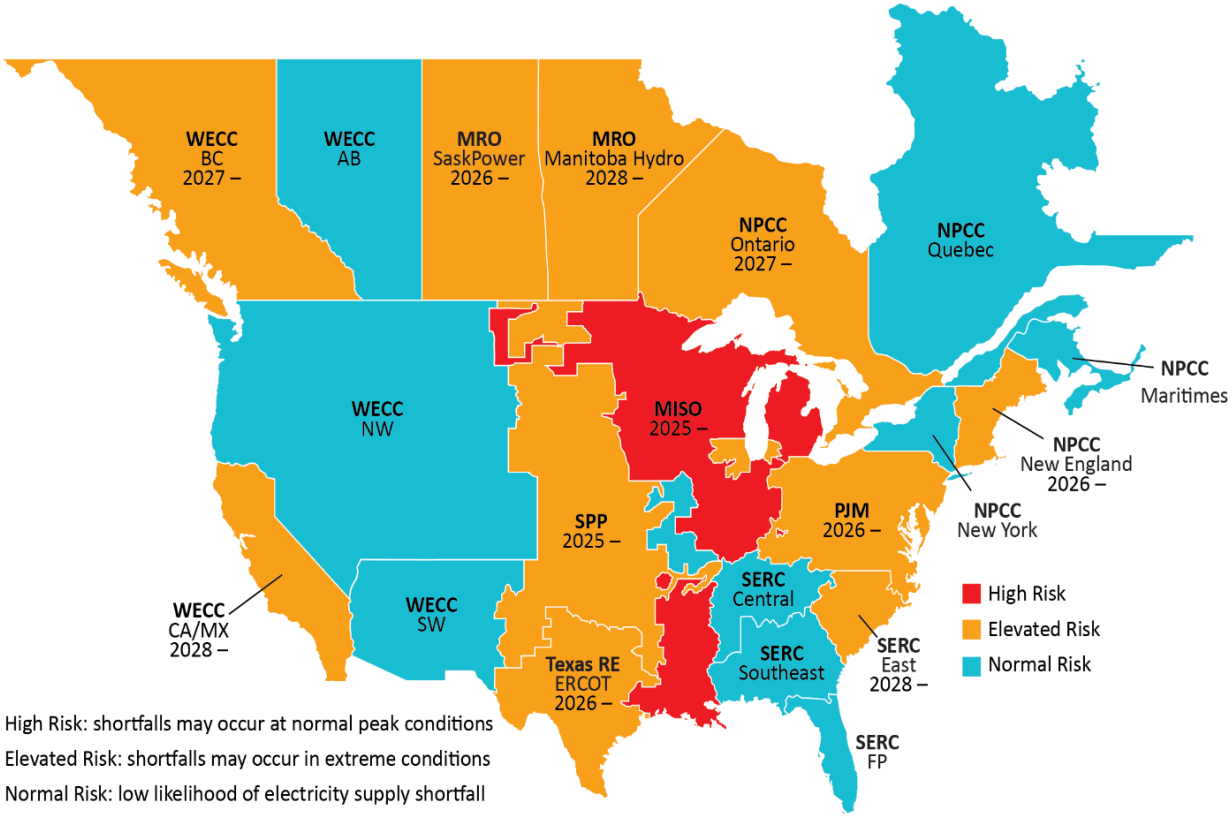

Figure 1. NERC Risk Area Summary 2025-2029

51 NERC, *2024 Long-Term Reliability Assessment*, December 2024
52 NERC, *2024-2025 Winter Reliability Assessment*, November 2024; NERC. *2024 Summer Reliability Assessment*, May 2024

Indicators:

- Defense stakeholders should familiarize themselves with NERC reliability metrics for their regions to improve their understanding of how the electric grid can impact mission assurance and begin to consider where DoD might prioritize its focus on transmission investments.
- NERC reliability assessments are not granular enough to be actionable at the level of an individual DoD installation, but they are a useful starting point when exploring how electricity industry metrics connect to DoD energy resilience requirements.

5.2. How Much Is Electricity Demand Growing in the Region (and How Fast)?

BLUF: Electricity demand is growing rapidly in almost all parts of the country and may pose risk to grid reliability. The growth of large energy consumers can also compromise the availability of generation capacity to meet DoD requirements. Transmission expansion can unlock new supply to support growing load.

Background: Although electricity demand has been stable in recent decades, it is projected that 128 gigawatts (GW) of new load will be added to the grid by 2029. The forecast for average annual peak demand growth over the next five years is now an unprecedented 3%, up from a forecast of only 0.6% in 2022. The magnitude of this projected electricity growth varies by region, with the Northwest, Southeast, Mid-Atlantic, and Texas expected to exceed the national average. These growth projections are driven by data centers and other new loads that are expected across the country.[53]

- **Data centers.** The increase in projected electricity demand is driven in significant part by the rapid expansion of data centers, which power the Internet, AI, cryptocurrency mining, and other applications. In the western U.S., for example, data centers accounted for nearly 80% of large electricity load requests.[54] Data centers are not only increasing in number but also in size, with demand levels rising from several megawatts to over 500 megawatts (MW) or even 1,000 MW,[55] comparable to the energy needs of a small city. U.S. data center demand is forecasted to grow nearly 10% annually, from 17 GW in 2022 to 35 GW by 2030.[56]
- **Other demand growth drivers.** Data centers are not the only emerging load demanding increasingly more energy from tomorrow's grid. Manufacturing, including semiconductors, automotive components, and advanced materials; mineral mining; hydrogen fuel production; and agriculture (e.g., grow houses) are all driving significant increases in demand. Electric vehicles and home electrification (e.g., heat pumps) are also emerging as significant drivers of demand in many states.[57]

Defense considerations: As overall national load grows, increasingly strained generation assets and limited regional transmission can undermine DoD energy assurance, especially if DoD fails to advocate for the allocation of potentially scarce capacity resources to support national defense priorities. DoD's own load is growing with the addition of new missions, expansion of existing missions, and the increasing energy intensity of critical support facilities and equipment. Demand growth may pose reliability risks but should be put into context. Large load additions in regions without sufficient transmission connectivity are of greater concern than the same demand increase in a large region with sufficient transmission and generation resources. As discussed in Section 2.2, the emergence of large new customers will also reshape the competitive environment for electricity resources in key defense regions. Electricity prices may increase, and large industry customers may be willing to pay a premium for resilient service that exceeds the price that DoD is willing to pay or that uses an acquisition model that may be unavailable to DoD. Defense stakeholders should not wait until the middle of an outage event to discover their inferior relative position for priority electricity supply, particularly during extreme contingency events.

53 GridStrategies, *Strategic Industries Surging: Driving US Power Demand*, December 2024
54 WECC, *An Assessment of Large Load Interconnection Risks in the Western Interconnection*, February 2025
55 EPRI, *Utility Experiences and Trends Regarding Data Centers: 2024 Survey*, September 2024
56 McKinsey & Company, *Investing in the Rising Data Center Economy*, January 2023
57 Energy Systems Integration Group, *Grid Planning for Building Electrification*, October, 2024; Energy Systems Integration Group, *Charging Ahead: Grid Planning for Vehicle Electrification*, January 2024

Potential pathways: Additional planning is needed to prioritize large energy loads and align current and future capacity resources. This can include expanded information sharing between electricity balancing authorities, grid operators, and NERC assessment areas with DoD stakeholders to ensure ongoing coordination to meet the national defense energy assurance.

Indicators:

- Defense stakeholders should engage utilities and grid operators to review the scale and pace of demand growth within their region through the lens of potential resource shortfalls or increased competition for scarce energy resources.
- Utility Integrated Resource Plans (IRP) and similar documents provide load forecasts for specific utility territories (Section 6.6). Projected load growth is so rapid compared to the pace of regulated utility planning, however, that these sources are often out of date. Defense stakeholders may also consult recent state-sponsored and independent studies on load growth.[58]

5.3. How Might Extreme Events Impact the Bulk-power System?

BLUF: Extreme events are getting more frequent and intense. Transmission can support bulk-power system resilience and recovery during and after extreme events at a level that meets DoD needs.

Background: The frequency and intensity of extreme events and disasters has increased rapidly over the last several decades. Since 1980, more than 400 weather disasters have each exceeded $1 billion in damage, with 7% of those occurring in 2024.[59] Figure 2 shows the locations, details, and dates of each of the disasters in 2024.

Severe and long-lasting extreme events, caused by heat, cold, wildfires, and hurricanes pose major concerns for grid operators. Extreme events can affect every aspect of the electricity system, with impacts ranging from decreased generation availability and damaged grid components, to electricity demand spikes and long-duration power outages.[60]

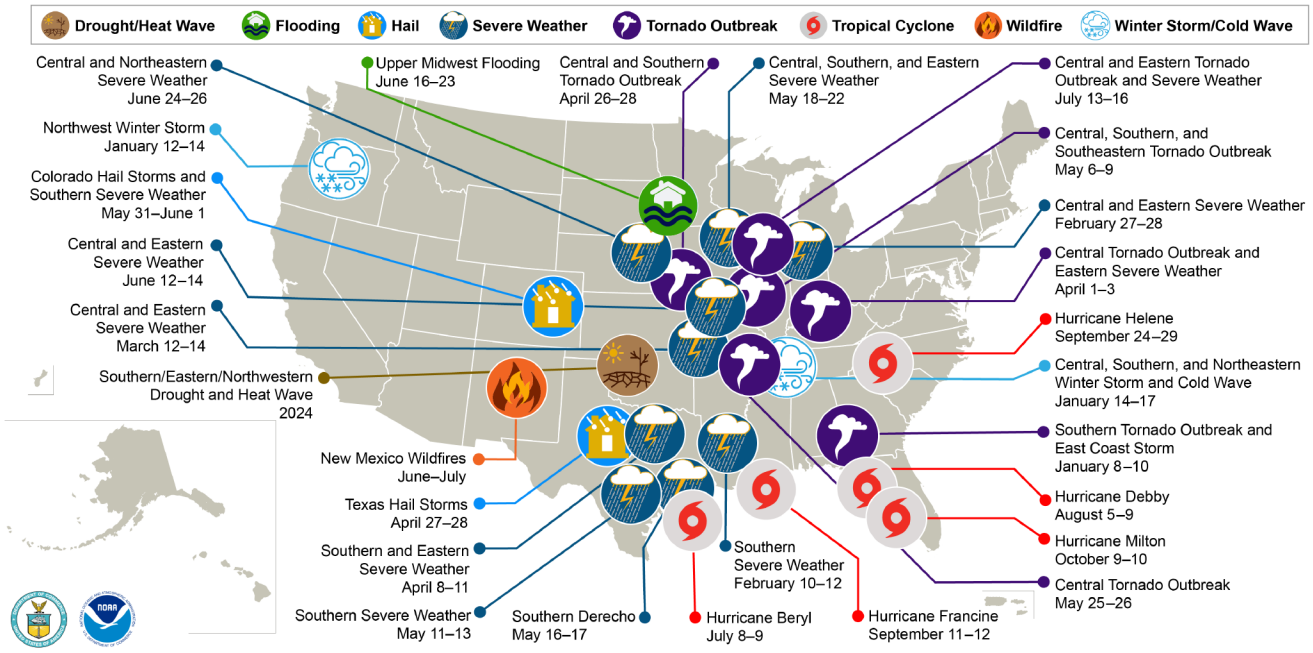

Figure 2. Billion-Dollar Extreme Events and Disasters in the U.S. in 2024

58 JLARC, *Data Centers in Virginia*, December 2024; GridStrategies, *Strategic Industries Surging: Driving US Power Demand*, December 2024
59 National Oceanic and Atmospheric Administration, *Billion-Dollar Weather and Climate Disasters*, January 2025
60 EPRI, *A Starting Point for Physical Climate Risk Assessment and Mitigation: Future Resilience and Adaptation Planning*, April 2022

Defense considerations: The efficacy of DoD energy readiness strategies is largely dependent on their relative vulnerability to large-scale hazards. Integrated infrastructure planning between DoD stakeholders and energy service providers is needed to support mission assurance in the face of increasingly frequent and severe events. DoD tracks power outages at its facilities annually and has assessed the exposure of its critical missions to weather and other environmental hazards at hundreds of installations around the world.[61] Areas prone to extreme events can benefit from increased emphasis on hardened and more resilient energy infrastructure, and increased transmission capacity.

Potential pathways: Defense stakeholders should continue to analyze recent trends in severe weather and their impacts on military installations. Adapting DoD analysis tools to assess transmission risks by analyzing the type, frequency, and severity (as a function of service outages) of major energy disruption events can help the defense stakeholders understand their energy vulnerabilities and act as a guide for future infrastructure planning and investment. Defense stakeholders may also consider more actively engaging in transmission planning activities to articulate the need for expanded and hardened infrastructure, emphasizing that assured power is also critical to DoD's support for state and local disaster response through DSCA and the National Guard.

Indicators:

- Defense stakeholders should use both backward- and forward-looking resources to augment their own analysis with perspectives on power grid risk.
- NERC publishes after action reports (AARs) following major outage events to summarize system impacts and consequences.[62] Defense stakeholders can review AARs to gain an understanding of the ways that electricity system vulnerabilities have been exposed by specific types of events, and how those vulnerabilities might impact missions.
- For forward-looking forecasts, the NERC seasonal reliability assessments provide useful information about the potential impacts of near-term extreme heat or extreme cold events. The Electric Power Research Institute provides additional details on utility approaches to assessing the impacts of mid- and longer-term extreme events.[63]

5.4. How Is the Electricity Supply Mix Evolving?

BLUF: Older fossil fuel and nuclear plants are retiring while resources such as batteries, wind, and solar energy are growing rapidly. The result is a stark change in the operational characteristics and inherent attributes from these resources. Careful consideration of how newer resources are deployed to meet or serve mission assurance needs is crucial moving forward. Transmission expansion can provide access to new generators and balance resource diversity across regions.

Background: The U.S. electricity industry is in the midst of a dramatic transition, driven by policies and economics.

- **Retirements and renewables.** Many older fossil fuel and nuclear power plants are retiring, with close to 80 GW expected to go offline within the next 10 years.[64] At the same time, batteries and weather-dependent resources such as wind and solar energy are rapidly expanding. The U.S. Energy Information Administration (EIA) projects that renewable energy will supply a quarter of national electricity generation in 2025 and 27% in 2026.[65] Increasing the amount of variable generation while meeting rising demand requires careful planning to maintain a balance between supply and demand. Unlike traditional thermal generators – which provide "system strength" through large rotating turbines – wind, solar, and battery systems are connected to the grid via power electronics (i.e., inverters). Inverter-based resources can offer the same reliability services

61 DoD, *DoD Installation Exposure to Climate Change at Home and Abroad*, April 2021; DoD, *Annual Energy Management and Resilience Report (AEMRR) Fiscal Year 2021*, October, 2022

62 FERC, NERC, and Regional Entity Staff, *Inquiry into Bulk-Power System Operations During December 2022 Winter Storm Elliott*, October 2023; FERC, NERC, and Regional Entity Staff, *The February 2021 Cold Weather Outages*, November, 2021 in Texas and the South Central United States

63 EPRI, *Developing Local Climate Change Information: Steps and Illustrative Analysis*, December 2023

64 NERC, *2024 Long-Term Reliability Assessment*, December 2024

65 EIA, *Short Term Energy Outlook*, January 2025

as conventional power plants, but they must be appropriately integrated into the bulk-power system to ensure stability and reliability.[66]

- **Interconnection delays.** The pace of the energy transition is complicated by the grid interconnection process, in which new generation and storage facilities face long waits before they can plug in.[67] In PJM, for example, the average wait for generators to receive an interconnection agreement is nearly 4 years.[68] Such interconnections increasingly depend upon the construction of new transmission infrastructure since the current grid is not robust enough to accommodate the flood of new supply and demand.[69] These delays create uncertainty around the timing and amount of new generation coming online.

Defense considerations: The projected increase in supply from resources such as solar and wind energy is consistent with DoD's policy priority to ensure a diverse fuel supply.[70] The weather-dependent nature of renewables, however, can cut both ways in terms of reliability. The addition of 24 GW of new solar PV leading up to the summer of 2024, for example, supported reliability across the country.[71] Decreases in wind, hydropower, and sunlight (e.g., from wildfire haze) can create the risks of "energy drought" and of regional supply shortfalls.[72] Transmission networks that enable the transfer of electricity across regions with different weather patterns can mitigate this risk while realizing the full potential of energy dominance.

Potential pathways: A more detailed assessment is needed to determine the performance capabilities of transmission and generation asset types as a function of DoD requirements across all event stages. This will help determine which assets (or combinations of assets) can best support mission assurance. New electricity service requirements can help optimize the resource mix within NERC assessment areas to support defense energy resilience.

Indicators:

- Defense stakeholders should review generation trends, such as installed renewable energy and storage capacity, planned (or mandated) capacity additions, and projected power plant retirements. In addition to short- and long-term electricity forecasts, the EIA publishes energy profiles for each state that contain electricity generation statistics and trends.[73] Trade associations and market research organizations also publish growth forecasts for individual technologies.
- Defense stakeholders should familiarize themselves with state policies related to power generation. As of January 2025, 24 states have enacted 100% clean energy goals,[74] and 15 other states have clean energy portfolio standards with lower targets.[75]

5.5. What Are the Transmission Opportunities that Could Support National Defense?

BLUF: Transmission opportunities have been analyzed across the country. Proposed transmission corridors and lines – and transmission gaps – should be mapped against national defense needs and mission assurance risks.

Background: Transmission can mitigate many of the reliability risks, and the associated risks to defense missions, discussed in the sections above. The transmission opportunity is not equal across all parts of the country, however, as a result of issues such as existing grid architecture, geography, economics, and public opinion. There are different types and scales of transmission that are fit for different needs and

66 NERC, *An Introduction to Inverter-Based Resources on the Bulk Power System*, June 2023; PJM, *Energy Transition in PJM: Resource Retirements, Replacements & Risks*, February 2024
67 Lawrence Berkeley National Laboratory, *Queued Up: Characteristics of Power Plants Seeking Transmission Interconnection*, January 2024
68 Lawrence Berkeley National Laboratory, *Queued Up: 2024 Edition -Characteristics of Power Plants Seeking Transmission Interconnection As of the End of 2023*, April 2024
69 FERC, *Order No. 1920 (Page 781, Line 1108)*, May 2024
70 DoD, *DoD Directive 4180.01: DoD Energy Policy*, August 2018
71 NERC, *2024 Summer Reliability Assessment Infographic*, 2024
72 NERC, *2024 Long-Term Reliability Assessment*, December 2024
73 EIA, *U.S. States: State Profiles and Energy Estimates*, January 2024
74 Clean Energy States Alliance, *Table of 100% Clean Energy States*, January 2025
75 DSIRE, *Summary Maps*, January 2025

purposes,[76] and each may be considered in different federal or state venues (Section 6). Recent national transmission assessments have been conducted by NERC and DOE.

- **Interregional opportunities.** NERC completed an interregional transfer study in 2024, as required by Congress. The study identified locations where improving the amount of electricity that can move between regions would enhance grid reliability.[77] NERC's analysis identified 35 GW of additional transfer capability that would enhance resilience during periods of extreme grid conditions. The largest share of this capacity (14 GW) would benefit Texas,[78] while the remaining 21 GW would benefit regions across the rest of the country.[79] As described in Section 6.3, there currently is no national process for formally considering or planning interregional transfers.
- **Future transmission needs.** In 2023, DOE published the *National Transmission Needs Study*, identifying current and anticipated transmission needs by region based on existing analyses and new modeling. The transmission needs were characterized according to whether they would improve reliability and resilience, alleviate congestion, address capacity transfer limits between regions, and/or deliver cost-effective generation. The study also considers both interregional, as well as regional, transmission needs. The study concluded that almost every region in the country needs transmission for the purposes of reliability and resilience.[80]
- **Transmission corridors.** The Federal Power Act authorizes the Secretary of Energy to designate any geographic area as a National Interest Electric Transmission Corridor (NIETC) if the development of new transmission would advance important national interests. In 2024, DOE announced it was moving forward with three NIETCs, following an initial process, during which 10 potential NIETCs were identified.[81] The intent of NIETCs is to support transmission projects within the corridors with expedited consideration, incentives, and other measures.

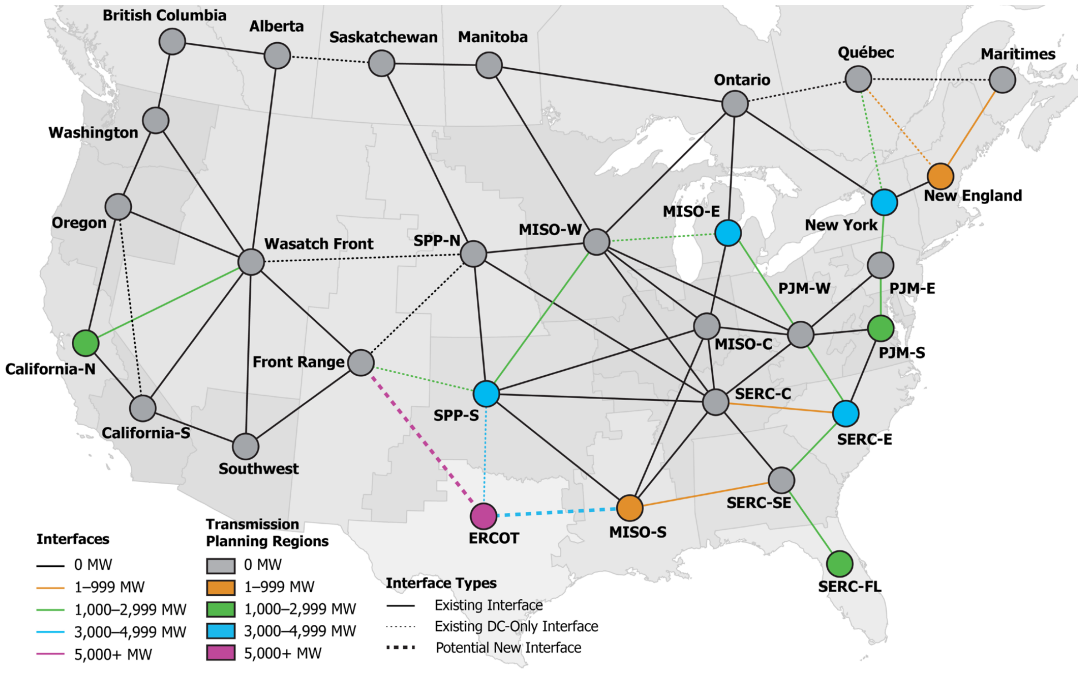

Figure 3. Interregional Transfer Capability Enhancements Identified by NERC

76 Niskanen Center, *Contextualizing electric transmission permitting: data from 2010 to 2020*, March 2024
77 NERC, *Interregional Transfer Capability Study (ITCS): Strengthening Reliability Through the Energy Transformation*, November 2024
78 Texas is an electrical island that is not connected to the other two (western and eastern) interconnected grids in the continental U.S.
79 NERC, *Interregional Transfer Capability Study Report Summary*, November 2024
80 DOE, *National Transmission Needs Study*, October 2023; DOE, *National Transmission Needs Study: Supplemental Material*, October 2023
81 DOE, *Initiation of Phase 2 of National Interest Electric Transmission Corridor (NIETC) Designation Process: Preliminary List of Potential NIETCs -Issued Pursuant to Section 216(a) of the Federal Power Act*, May 2024; DOE, *National Interest Electric Transmission Corridor Designation Process*, December 2024

- **Regional and local transmission opportunities.** In addition to the national studies, there are also a wide range of transmission planning exercises conducted at the state and regional levels. Examples include plans from regional transmission organizations (RTOs) such as the PJM *Regional Transmission Expansion Plan*,[82] and state-level analyses such as the *Colorado Transmission Capacity Expansion Study*.[83] Transmission assets identified in these types of studies provide greater connectivity between system operators, transmission providers, and even distribution utilities and end-use customers. While these studies primarily focus on immediate reliability needs, they can also be adapted to consider national defense requirements.

Defense considerations: Defense stakeholders have a wealth of information and data related to transmission needs, potential transmission corridors, and specific transmission lines that are planned or underway. To date, however, transmission planning processes have not been aligned with national defense considerations or energy requirements. The law authorizing NIETCs, for example, includes national defense and homeland security as criteria for designation, but the corridors did not explicitly consider DoD installations or missions, defense communities, or the DIB. The absence of considering defense principles such as those described in Section 4 during transmission planning represents a missed opportunity for national security.

Potential pathways: Stakeholder processes that impact transmission planning and investment at the federal, regional, utility, and/or state levels can include structured engagement with defense stakeholders to incorporate their energy requirements into planning.

Indicators:

- Defense stakeholders should review the data contained within federal assessments that relate to their region: the magnitude of the interregional transfer identified by NERC, the opportunities to enhance resilience with transmission detailed by DOE, and the proposed locations of NIETCs as they relate to defense installations.
- Defense stakeholders can also review transmission analyses published by RTOs, utilities, states, and other organizations[84] to develop a more granular understanding of transmission that is needed, planned, or underway. This information may be more difficult to collect than the federal indicators.

82 PJM, *RETP 2023: Regional Transmission Expansion Plan*, March 2024

83 Colorado Electric Transmission Authority, *Transmission Capacity Expansion Study for Colorado*, December 2024

84 The DoD Office of Local Defense Community Cooperation's (OLDCC) Installation Readiness Program funds resilience assessments of the regions surrounding military installations. A growing number of these studies have identified transmission lines that could support military missions. See OLDCC *Installation Readiness Program*.

6. WHAT ARE THE REGULATORY PROCESSES AND POLICY AUTHORITIES THAT GOVERN TRANSMISSION?

Secretary Wright's Secretarial Order instructs DOE to identify and exercise *"all lawful authorities"* to strengthen the nation's grid and the transmission system. Transmission development is governed by a complex mix of regulation and policy at the federal, regional, state, and local levels. The defense principles outlined in Section 4 need to be effectively and openly communicated to electricity system stakeholders and decision makers at each of these levels. Detailed profiles of the major planning and review processes that are relevant to transmission and national defense will be updated on the website www.UnleashtheGrid.org. This section provides short summaries of processes that are managed by defense agencies (e.g., DoD provides review or approval), and/or processes where defense stakeholders (including DoD) might provide comments and input. Text Box 2 contains a high-level description of how transmission regulatory responsibilities vary by jurisdiction.

- The Federal Power Act (FPA) splits jurisdiction for transmission between state and federal government. The federal approach to transmission planning hinges on regional organizations of transmission providers.
- The Federal Energy Regulatory Commission (FERC) is responsible for ensuring that rates and charges for the transmission of electric energy are just and reasonable and not unduly discriminatory.
- State regulators are principally responsible for the siting and permitting of transmission infrastructure.
- Both states and FERC exercise authority over certain transmission planning processes, each regulating from within their own respective sphere of authority. States where utilities remain vertically integrated often regulate transmission planning through Integrated Resource Planning (IRP) processes.
- States with non-vertically integrated utilities may have separate transmission planning proceedings[85] or exercise a planning function through rate case or infrastructure siting proceedings.

85 For example, the New York Public Service Commission (NY PSC) recently initiated a proceeding to "proactively identify and develop future grid infrastructure needs." NY PSC, *Commission Announces New Proactive Grid Planning Proceeding to Prepare New York's Electric Grid for Building and Vehicle Electrification*, August 2024

6.1 Federal Transmission Permitting

Transmission that traverses federal land will trigger federal permitting. The level of federal permitting required for infrastructure developed on federal land can vary widely depending on the type and scope of the project. Large-scale infrastructure projects may require multiple permits from various federal agencies, including the Bureau of Land Management, U.S. Forest Service, Army Corps of Engineers, the Environmental Protection Agency, and/or FERC. Under the FPA, DOE is authorized to coordinate the federal authorizations and environmental reviews required to site transmission. This process was formalized in a May 2023 inter-agency MOU,[86] which allowed the DOE to establish the Coordinated Interagency Transmission Authorization and Permits (CITAP) Program.[87] The CITAP Program aims to streamline the permitting process for interstate transmission projects by facilitating interagency coordination and providing a single point of contact for project proponents. DoD will have the opportunity to review all proposed transmission projects in the CITAP Program early in the process to identify and manage any military mission conflicts. DoD may also be asked to function as a co-lead agency if proposed transmission projects cross DoD-administered land. DoD's early notification and coordination may also create opportunities to encourage transmission development that supports defense objectives.

6.2 National Interest Electric Transmission Corridors (NIETC)

As discussed in Section 5.5, the FPA authorizes DOE to designate NIETCs to facilitate the development of high-voltage transmission lines that are in the national interest. In determining whether to designate a NIETC, DOE may consider whether the energy independence or energy security of the United States would be served by the designation, and whether the designation would enhance national defense and homeland security. The most recent NIETC designations did not consider national defense, but future NIETC efforts could identify transmission corridors that have national defense benefits.

6.3 Interregional Transmission Planning

There are significant opportunities for interregional transmission (Section 5.5). The redundancy and geographic diversity afforded by interregional transmission can provide defense installations access to a wide variety of power sources. In addition, interregional transmission can provide a lifeline during extreme events and attacks, allowing system operators to reroute power around affected areas and restore power more quickly. Interregional transmission planning is conducted today on an ad hoc, project-by-project basis. There are no requirements that utilities or transmission owners conduct interregional transmission plans. As a result, these projects are infrequently developed. NERC filed the ITCS report with FERC in November 2024, and FERC has requested comments on the study. No later than February 2026, FERC is required to submit a report to Congress on its conclusions, including any recommendations for statutory changes.

6.4 Regional Transmission Planning

Regional transmission planning is the process of developing a transmission plan that spans across the service territories of multiple transmission providers within a region. The goal is to identify transmission projects that offer significant regional benefits to many grid users, not just one customer or one utility. FERC Order 1000 established a framework requiring transmission providers to participate in regional planning. FERC Order 1920 built upon this framework by requiring the development of long-term, scenario-based regional plans that identify transmission needs based on a variety of factors most likely to influence those needs.

Transmission providers are required to engage states about how regional benefits are calculated and costs are allocated. Most transmission providers have initiated this engagement process, and defense stakeholders can engage state entities and communicate national defense objectives and requirements prior to utilities submitting their compliance filings.

86 DOE et al, *Memorandum of Understanding Regarding Facilitating Federal Authorizations for Electric Transmission Facilities*, May 2023
87 DOE, *Coordinated Interagency Transmission Authorization and Permits (CITAP) Program*, February 2025

6.5 Local Transmission Planning

Order 1920 also updates FERC rules concerning local transmission planning processes,[88] as those processes are ultimately incorporated into long-term regional planning processes. Order 1920 requires that transmission providers host at least three public stakeholder meetings per regional transmission planning cycle as they develop their local transmission plans that will ultimately be incorporated into the regional plans. The meetings must focus on each transmission provider's local planning process. These meetings must be held before each provider's local plan can be incorporated into the region's planning models. Defense stakeholders can participate in and inform these stakeholder processes.

6.6 Integrated Resource Plan

A majority of states require their electric utilities to file an Integrated Resource Plan (IRP) every two to four years.[89] An IRP is a long-term (20-30 year) plan that electric utilities develop to meet their customers' electricity needs while considering factors such as cost, reliability, and environmental impact. It is typically reviewed by state public utility commissions or other regulatory bodies. The IRP process involves forecasting electricity demand, evaluating resource options, and developing a plan to meet future needs in a cost-effective and reliable manner. IRPs are increasingly including more detailed analysis of transmission to increase system reliability.[90] Combining generation, transmission, and distribution planning into the IRP is an emerging best practice called "Integrated System Planning."[91] Regulators are also asking their utilities to evaluate whether new regional transmission planning processes offer opportunities to capture more value for customers than a "go it alone" strategy. In most cases, the IRP process is public and allows for comment, including from defense stakeholders. Effective engagement typically involves independent plan analysis, which can be done and submitted for the public record. However, in many jurisdictions simply outlining the needs of defense installations and the need for grid upgrades would be an incremental improvement over current practice. IRP testimony and documentation can usually be submitted confidentially if required for information security purposes.

88 Local transmission planning processes, in the context of FERC regulation, mean processes run by individual transmission providers to plan facilities located solely within their respective retail distribution service territories or footprints.

89 LBNL, *Best Practices in Integrated Resource Planning: A Guide for Planners Developing the Electricity Resource Mix of the Future*, December 2024

90 Salt River Project, *2023 Integrated System Plan*, 2023; HECO, *Integrated Grid Plan*, May 2023

91 ESIG, *Integrated System Planning Forum*, November 2024

6.7 Formula Rate Proceeding or Rate Case

The purpose of formula rate proceedings or rate cases are to determine the rates that a utility or transmission owner can charge its customers based on the "cost of service" (as derived from the costs of building, operating, and maintaining transmission facilities). The goal of rate proceedings is to ensure that the rates charged are just and reasonable. Generally speaking, FERC rate proceedings focus on the accounting treatment of utility investments, and do not evaluate a utility's decisions to invest in specific transmission infrastructure. State retail rate proceedings may also be relevant, depending on the jurisdiction, but to the extent that these rate cases may examine the prudence of specific proposed utility investments, they generally do so in a backwards looking manner, evaluating only whether the expenditures already made were justified. Defense stakeholders may intervene in rate cases but would typically not do so to advocate for transmission expansion or national defense objectives.[92]

6.8 Local Permitting

The acquisition of right-of-way and jurisdictional permitting are typically the last phases before transmission project construction can begin. Permitting processes vary according to state law. State agencies are generally the primary regulator responsible for authorizing the routing of new transmission infrastructure, but local jurisdictions, such as city and county governments, can also play a significant role.[93] Permitting transmission projects often occurs at the conclusion of the planning phase, lacking adequate community engagement and subsequently creating resistance to development. Proactive collaboration between state and local leaders and utility companies to establish long-term infrastructure plans has been shown to be an effective practice. Defense stakeholders can be a central voice in routing and state and local permitting discussions.

7. CONCLUSIONS AND NEXT STEPS

A reliable, diversified, and affordable energy supply is necessary to drive U.S. defense industries and to sustain military preparedness. Fortifying America's electric grid is critical to the reliable and secure delivery of electricity. This report focuses on strengthening and expanding the transmission system, which is the backbone of the U.S. grid.

Transmission expansion should prioritize energy assurance to critical DoD missions, incorporate DoD energy loads into planning, identify and efficiently connect growing missions and facilities, and provide cost-effective reliability.

Defense stakeholders can use the frameworks presented in Sections 5 and 6 to understand grid risk in their regions and explore the policy processes that are relevant to transmission expansion for national defense.

A planned publication will use these frameworks to characterize the landscape for grid reliability, transmission planning, and national defense in specific states and regions. In addition, information about defense-relevant transmission proceedings will be posted on www.UnleashtheGrid.org and updated periodically.

92 The military departments are delegated authority by the General Services Administration to intervene on behalf of the federal government in state-level rate cases and other proceedings. NARUC, *Regulatory Considerations for Utility Investments in Defense Energy Resilience*, October 2021

93 National Conference of State Legislatures, *Electric Transmission Planning: Primer for State Legislatures*, December 2023, which describes the state siting processes: "[i]n 32 states, Public Utility Commissions] are the entity responsible for siting and construction of transmission facilities," while other states vest responsibility with another state agency or, in rarer cases, have a decentralized process that local jurisdictions are responsible for.

The Association of Defense Communities (ADC) builds resilient communities that support America's military. It is the connection point for leaders from communities, states, the military and industry on community-military issues by enhancing knowledge, information sharing, and best practices. With nearly 300 communities, states, regions and affiliated industry organizations, ADC represents every major defense community/state in the nation.

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Converge Strategies, LLC provides consulting services focused on the intersection of energy, resilience, and national security.

We build partnerships with civilian governments, the military, and the private sector to deploy resilient energy innovations.

We connect and align the people and organizations required to strengthen the resilience of our communities and infrastructure.

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Elevate Energy Consulting specializes in a broad range of energy consulting services to the electricity sector: grid reliability modeling and studies, renewables integration, transmission planning and operations, regulatory compliance, technical management consulting, workforce development, education, training, and research and development. With deep technical expertise and a strong knowledge of electricity regulation and policy, the Elevate team is positioned to elevate industry and serve clients across the electricity ecosystem.

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GridLab is a national 501(c)(3) non-profit organization with an office in Berkeley, CA. Together, the GridLab team and its network of 60+ power system experts provide technical expertise, resources, and education on the design, operation, and attributes of the grid.

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