Research

# To Improve Energy Security of Military Bases, Use Less Civilian Power—Not More

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## Summary


- In FY2016, the Department of Defense reported that its facilities had 701 power outages that lasted 8 hours or longer, with an average cost of $500,000 per day, raising concerns about the reliability of electricity to military bases.
- The Trump Administration is reportedly considering a policy that would force electricity purchases from struggling power plants in order to make the electricity supply to military bases more secure. This policy would be a massive intervention into the civilian energy market that would cost American consumers between $10.5 and $65.1 billion over 10 years.
- A less costly and far more effective alternative would be competitive procurement for electricity assets on military bases, rather than an implicit subsidy to civilian power plants.


## Introduction

Reportedly, the Trump Administration is considering a bailout of civilian coal and nuclear power plants in order to make the electricity supply to military bases more reliable. The idea that military bases are vulnerable due to their reliance on civilian electricity infrastructure has been a policy issue since the Bush Administration, and provisions of the Energy Policy Act of 2005 (EPAct) and other policies attempted to diversify the military's energy sources. Challenges, however, have persisted: In 2016, Department of Defense (DOD) installations suffered 701 power outages lasting more than eight hours, and 45 percent were caused by equipment failure, making it no surprise that the current administration is concerned about grid resilience.

Unfortunately, the policies reportedly under consideration by the administration are overly focused on civilian markets and would deliver little benefit at a high cost that would fall on American electricity customers. As an extreme policy, providing electricity to all of the U.S. military bases via small nuclear reactors would have comparable costs to bailing out civilian power plants. Instead of bailing out coal and nuclear power plants, the administration should employ a competitive process to procure energy sources that would strengthen the military's electricity supply. Such an approach would likely be far more cost-effective, be consistent with past legislative efforts to address electricity resilience, and better resemble conventional energy security policies relevant to military readiness.

## The Potential Pitfalls of Manipulating Civilian Markets for Military Reliability

The administration has looked at policies to promote energy security a couple of times. Last September the Department of Energy's (DOE) proposed a rule to the Federal Energy Regulatory Commission (FERC) that would have forced electricity purchases from "fuel secure" coal and nuclear power plants to keep them in business. The rationale behind the policy was that reliance on natural gas pipelines for fuel delivery creates an added vulnerability to the electricity grid. FERC quickly rejected this proposal as unnecessary, but the administration is still considering applying its emergency powers to force a similar policy to what FERC has already rejected.

The actual security benefits from such an approach are uncertain, but a leaked draft memo from the National Security Council (NSC) on the topic highlighted concerns that military bases are too reliant on vulnerable civilian power plants. The administration's solution is therefore to force civilians to purchase more power from retiring power plants (effectively a subsidy)—in other words, a massive intervention into the civilian electricity markets.

The United States has tried a similar intervention in the past. Congress passed the Merchant Marine Act of 1920 (commonly known as the Jones Act) in response to fear that the United States' intranational maritime shipping (to, e.g., Hawaii and Puerto Rico) would become reliant upon foreign merchant marines, whose parent governments could influence the prices of traded goods and thus hurt the United States. The Act established that only U.S. owned and operated vessels could handle all intranational maritime shipping—effectively a subsidy of American shipping companies in the name of national security. Nearly a century later, the United States has no fear of foreign merchants attempting to manipulate domestic prices, but the Jones Act remains, driving up prices for the residents of non-contiguous U.S. states and territories.

Such a subsidy for power plants would be similarly expensive, as explained in detail below, but what should be noted here is that no direct and imminent threat exists to domestic energy sources. In contrast, European countries such as Germany are often much more willing to tolerate interventions in their energy markets, as their reliance on Russia and other energy exporters makes them politically vulnerable to geostrategic rivals. There are no similar threats to the United States, which is projected to be a net energy exporter by 2022, and so a policy that forces Americans to pay more for electricity to satisfy a security concern seems unwarranted.

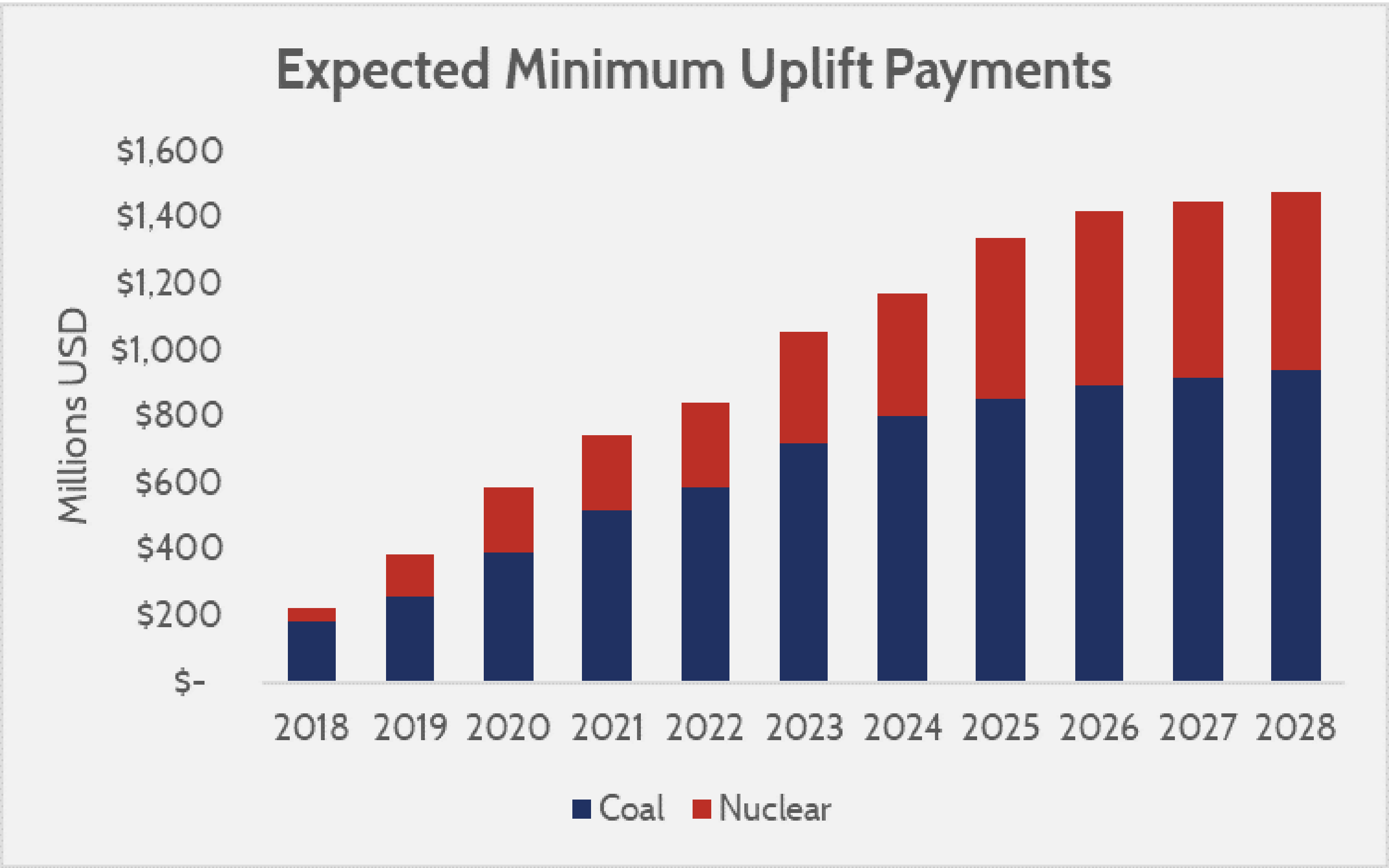
The administration's approach uses a fear of what *could* happen to justify intervening in civilian markets, when the proper approach should be to directly address the security issue: "resilient" electricity supplies for military bases. A circuitous approach to national security would carry high costs both directly and indirectly.

## The Cost of an Intervention

### *Direct Costs*

The administration could use its authority under either the Defense Production Act of 1950 or Section 202(c) of the Federal Power Act to force increased purchases from "fuel secure" power plants to preserve them. The simplest method of policy implementation would be to expand "uplift payments." As part of ensuring electricity reliability, electricity grid interconnections make determinations of how much electricity capacity should be kept in reserve, and those power plants with the reserve capacity are compensated with direct payments to make up for their low electricity sales. An obvious way to implement the administration's proposal, therefore, would be for grid operators to expand these uplift payments to power plants, which would provide expected-to-retire power plants with the minimum funds necessary to remain operational.

To determine what the potential cost of those uplift payments would be, this research uses the PJM market monitor's 2017 State of the Market Report as a source for data on power plant shortfalls. This research assumes that PJM's estimated shortfall per megawatt of capacity for coal and nuclear power plants in the first quartile of revenue (plants most likely to close) represent the required uplift payment to prevent a power plant's retirement. Extrapolating that figure to the Energy Information Administration's (EIA) projected retirements of coal and nuclear plants provides a rough estimate of what an intervention from the administration would cost directly (either to ratepayers near retiring power plants, or taxpayers if they are deemed responsible for providing the funds).




Required payments over 10 years (2019-2028) would be approximately $10.5 billion, making the bailout the third largest energy subsidy behind the Production Tax Credit and Investment Tax Credit.

This figure is likely an underestimation, however, as the shortfalls per megawatt of capacity will increase over time as their revenue declines (they would not be retiring if their revenue was increasing). The 2017 State of the Market report on PJM estimated three years' worth of shortfalls for nuclear power plants in PJM's jurisdiction, and power plants with existing shortfalls were projected to have shortfalls that reached fivefold their 2018 levels by 2020. Below are assumptions of what uplift payments would cost if they increased by 5, 10, and 25 percent annually (still a lower rate of increased shortfall than what is expected of PJM's nuclear power plants). The amount of the subsidies has a wide potential range, based on this calculation, from $10.5 to $65.1 billion—the high end of which would make this bailout the largest energy subsidy in the country and cost more than the current two largest energy subsidies (the Production and Investment Tax Credits) combined.

| Uplift Payments Required to Bail Out Coal and Nuclear Power Plants (Increasing Relative to 2017 Shortfalls) | | | | |
|---|---|---|---|---|
| *Millions* | 0% | 5% | 10% | 25% |
| 2018 | $ 225 | $ 236 | $ 247 | $ 281 |
| 2019 | $ 389 | $ 429 | $ 471 | $ 608 |
| 2020 | $ 587 | $ 679 | $ 781 | $ 1,146 |
| 2021 | $ 747 | $ 908 | $ 1,094 | $ 1,824 |
| 2022 | $ 846 | $ 1,080 | $ 1,363 | $ 2,583 |
| 2023 | $ 1,059 | $ 1,419 | $ 1,876 | $ 4,039 |
| 2024 | $ 1,173 | $ 1,651 | $ 2,286 | $ 5,594 |
| 2025 | $ 1,338 | $ 1,977 | $ 2,868 | $ 7,974 |
| 2026 | $ 1,419 | $ 2,202 | $ 3,346 | $ 10,573 |
| 2027 | $ 1,452 | $ 2,366 | $ 3,767 | $ 13,526 |
| 2028 | $ 1,481 | $ 2,533 | $ 4,226 | $ 17,242 |

| | | | | |
|---|---|---|---|---|
| 2019-28 | $ 10,492 | $ 15,244 | $ 22,078 | $ 65,110 |

### *Indirect Costs*

The above direct costs are also well below what the total economic costs of such an intervention would be, as the subsidies would undermine competition in the markets. In a competitive market, the most efficient suppliers—the ones that can produce the most at the least cost—are able to reduce their prices the most, which means the economic surplus created by efficiency is passed on to consumers. When businesses are shielded from competition, they do not have an incentive to lower prices, because their decision whether to pass on savings does not affect their market share. The Jones Act created precisely this problem, as it guaranteed intranational shipping routes to American shipping companies. As electricity is a basic energy input into virtually all economic activity in the United States, higher prices would carry multiplicative effects on the economy, as the increased electricity costs ripple out through other products and depress Americans' purchasing power.

## A Better Alternative

### *The Nature of a Strategic Generation Reserve*

An intervention into civilian energy markets is an indirect way to solve the central problem: electricity security on military bases. The administration would be better served by approaching this problem directly, perhaps with a policy modeled on the Strategic Petroleum Reserve (SPR). In fact, the leaked draft NSC memo mentioned a "Strategic Generation Reserve" (SGR) as a desired policy.

The SPR is a simple energy security policy. The federal government has reserved enough oil to replace 143 days of oil imports, or longer if rationed or restricted to military operations (in the event of a war that closes off oil supplies). The SPR has obvious military implications, but it was founded in 1975 as a response to the oil embargoes against the United States and the resulting oil crisis. The SPR helps protect the United States from the influence of foreign oil producers, yet the U.S. SPR has only been drawn upon four times, most recently to cover Libya's export shortfalls during the Libyan civil war.

The SPR works because it is separate from civilian markets. Despite the temptation to use the SPR as a force for price manipulation, politicians refrain because they know releasing reserves to depress prices in the short term creates a long-term security vulnerability. An SGR that relies upon specifying existing civilian power plants to participate would fundamentally upset civilian markets. A successful SGR would need to be modeled more like the SPR: a source of energy that is separate from civilian supplies, does not compete with civilian supplies, and is maintained to protect against a security vulnerability.

The design of an effective SGR would begin by identifying facilities that should be within its jurisdiction, determining their electricity requirements, what level of fuel reserves is most effective, and comparing that to the existing capabilities of distributed generation resources. Military bases were the specific vulnerability defined in the leaked NSC draft memo, and it makes the most sense to begin there.

Military bases typically have their own distributed electricity generation assets (e.g. generators), but for the past decade some have raised concerns that those capabilities are deficient. As part of its reporting on the requirements to expand renewable energy use under the EPAct, the DOD reports on energy usage, electricity outages, and other data in its Annual Energy Management and Resilience report (AEMR). Last year's AEMR, which was reporting for FY2016, noted that there were 701 total utility outages lasting more than eight hours during FY2016 (versus 127 reported in FY2015), and the cost per day of outage increased from FY2015's $179,000 per day to $500,000 per day in FY2016. Of the 701 outages, 45 percent occurred due to equipment failures, including from civilian sources. The high cost associated with an outage at a DOD facility makes sense, considering the high value of DOD assets. The high value of DOD assets also has implications on an SGR design, as it is a more worthwhile strategy to secure high value assets than to secure electricity supply to everything.

### *The Cost of an SGR*

The size of an SGR would depend upon the needs of military bases, but it is estimated that DOD installations use about 30 billion kilowatt hours of electricity annually, making up about 53 percent of the DOD's total energy consumption. Total energy expenditures by the DOD in FY2016 were $12.4 billion, but $8.7 billion of that was for operations while $3.5 billion was to heat and cool installation buildings. Note that these figures include overseas installations that would be unaffected by a bailout of domestic power plants. The DOD operates a total of 513 military bases around the world, of which 294 are considered "active." These figures and the cost estimate of a bailout above indicate that a cost-effective SGR should cost less than $10.5 billion, produce at least 30 billion kilowatt hours of electricity annually, and be able to be deployed to at least 294 sites, and ideally 513 or more.

As a hypothetical example of an SGR, the DOD could employ the judicious use of "small modular reactors" (SMR)—a type of miniature nuclear reactor that is effectively immune from meltdowns and currently under license review by the Nuclear Regulatory Commission. If the DOD built enough SMRs to provide 30 billion kilowatt hours of electricity per year, it would cost approximately $1.95 billion (assuming NuScale's $65 per Megawatt hour cost). The SMRs would only have to be refueled every two years (or even less frequently if highly enriched uranium is used as fuel). Because the SMRs would be located on or near military installations, the security concerns that accompany nuclear power would be minimized. Employing SMRs on military bases would shore up the electricity supply of military bases while costing less than the administration's current proposal.

The idea of using SMRs to provide energy security to military bases is not new. A 2008 report from the Center for Naval Analyses (CNA) acknowledged their viability as an electricity source for military installations, but also noted that many installations had electricity requirements below the expected capacity of an SMR, making them excessive. The ironic result is that this overkill approach is within the realm of expected costs of a bailout of civilian power plants.

### *The Future of Resilience Policies*

A SMR appears to be a viable solution to the problem of energy resilience, but much would need to happen before they are installed on military bases. Some things are already in the works. The FY2017 National Defense

Authorization Act already directed the DOD to evaluate electricity resilience and potential solutions. And the EPAct established targets for increased renewable electricity usage among military bases, meaning that an effective electricity resilience policy from the administration would require legislative coordination to amend or expand statutes of the EPAct as necessary.

Any effective energy-security policy for military bases will require a competitive procurement process for procurement that allows the most effective solutions to emerge. An updated resilience policy could also allow critical civilian infrastructure that typically rely on localized back-up generation (such as hospitals and airports) to “opt-in” to an SGR, making them more resilient as well. Likely energy sources that would be of interest include electric power storage, SMRs, and “micro-reactors” that are even smaller than SMRs.

## Conclusion

Americans make sacrifices in the name of national security every day, but not everything done in the name of national security is worthwhile. Strategy, by definition, is the application of scarce resources to achieve a desired outcome, and effective national security strategy requires careful evaluation of costs and judicious application of resources. Merely using emergency powers to force bailouts of unprofitable civilian power plants does virtually nothing to improve national security while carrying high costs, but the national security argument for improved resilience of military base’s energy consumption is well established. As the above data show, directly addressing the defined national security concerns with distributed electricity generation assets provides more security at a lower cost.