ISSUE BRIEF

The Myth of "Baseload" Power in Modern Power Grids

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Introduction

Given the economic, social, and national security importance of having an affordable and reliable electricity grid, it is crucial for energy terminology to be used correctly and well understood. In particular, the Trump administration and others routinely describe certain favored electric energy resources as "baseload" to tout their importance.[1] But "baseload" is an electric-system term for load that exists at all times, before adding variable types of demand that may cause total load to be higher, such as heating and cooling.[2] Although grid operators have long relied on a limited set of resource types with particular characteristics that operate around the clock to meet this demand, the practice of describing such resources as "baseload resources" does not mean that those resources are the only, or the most cost-effective, option for supplying baseload. Nor does it mean that these resources contribute to overall grid reliability, resilience, or security, including during conditions where demand exceeds baseload, more often or consistently than others, or in the most cost-effective manner.

This brief will discuss the term "baseload" power, together with other reliability-related energy concepts that are often used interchangeably, or in various combinations, to describe the resources' role in electricity markets and regarding grid reliability. And it will discuss why, despite the rhetoric indicating that electric grid reliability is at risk because of retiring "baseload," "dispatchable," or "firm" resources, these terms have distinct meanings for reliability in a diversely resourced grid.

Part I discusses what policymakers mean when they discuss grid reliability, including what the essential components for a reliable grid are. Part II examines the term, "baseload power," and what role, if any, it should play in modern grid reliability assessments and planning. Part III examines the administration's current misuse of "baseload" to indicate superiority of one resource over another.[3] It concludes by summarizing why appending the "baseload" label to establish economic or legal preferences for certain categories of resources clashes with existing energy and capacity market structures that support grid reliability and ensure a cost effective resource mix.

I. Defining, Measuring, and Planning for Grid Reliability

When planners speak of ensuring grid reliability,[4] they mean a grid that will serve users' electricity demand, typically planning for no more than one grid outage event every ten years.[5] Grid planners, through a variety of market structures, are responsible for procuring enough energy resources that will meet demand and provide the suite of grid services that ensure reliability. Achieving perfect grid reliability, with zero outages, would be cost-prohibitive.

Planners generally assess a grid's reliability based on the collective attributes and capacity of its resources, together with its interconnections with other neighboring grids. Prior to the advent of renewable resources, grid operators typically managed fewer types of energy resources, mostly large thermal plants, with more similar operational and reliability characteristics. Thus, the cost structure of these resources, specifically how capital and operational costs varied with power generation, played an important role in determining when and how much these resources were used.

With increased penetration of renewable energy resources like solar and wind, grid operators must now manage a more diverse resource mix with more diverse operational characteristics and reliability contributions. Similarly, these resources have different cost structures, with low or zero marginal costs. Demand characteristics have changed as well, with the increase in demand-side technologies that collectively make demand more flexible, including demand response, voluntary curtailment, time-of-use rates, distributed energy resources, etc.

How these puzzle pieces fit together to create a reliable grid is accordingly more complex, and understanding how a grid's resource fleet supports reliability requires identifying essential grid services for both daily operations and reliability-challenging events like extreme weather, in addition to accurately forecasting demand. The following table contains just a few examples[6] of some key attributes planners use to evaluate the mix of energy resources comprising their fleet to ensure grid services:

Attribute	Definition	Examples	Qualifications/Limitations
Dispatchable	A resource whose power output can be controlled, i.e., turned on, off, or adjusted at the system operator's (e.g., Independent System Operator, utility) instruction.	**Synchronous generation:** Natural gas, coal, nuclear, and hydroelectric plants. **Inverter-based resources:** Front-of-meter (utility-scale) variable energy resources (e.g., wind and solar), front-of-meter battery storage **Demand-side:** Large controllable loads with interruptible contracts.	Synchronous generation resources are dispatchable conditional on being online (starting up coal or nuclear generation units can take 12 hours or more). Inverter-based resources can change their output quickly but are dispatchable based only on available power.[7]
Flexible	The ability of a resource to adjust its power output or consumption patterns to meet the dynamic needs of the grid, such as balancing supply and demand in real-time. A dispatchable resource is typically flexible to varying degrees, but a flexible resource is not necessarily dispatchable (e.g., distributed energy resources).	Same examples as above but including also distributed energy resources (e.g., smart home heating and cooling, smart electrical vehicle charging). These resources can be pooled into virtual power plants.	Market design can play a central role incentivizing flexible distributed resources to successfully participate in wholesale markets. FERC Order No. 2222 aims to address this issue.[8]
Firm	The capability for a resource or an ensemble of resources to consistently meet electrical demand 24 hours a day, 365 days a year.	**Synchronous generation** **Transformed variable renewables:** E.g., wind and solar combined with storage, demand flexibility, and enabling infrastructure (networks) facilitating the spatial balancing of variable renewable generation, allowing excess supply in one region to complement deficits in another.	Variable renewable energy resources are not inherently firm on their own. Transforming variable renewable energy into a firm resource requires a suite of enabling strategies, including energy storage, optimal blending of resources, geographic dispersion, and overbuilding.[9]

While not exhaustive, the above sample of energy resources' grid-related characteristics aims to provide insight into the complex and multifaceted challenge of valuing any particular resource's contribution to grid reliability. As is readily revealed, reliability is not a one-dimensional inquiry even given a set fleet of resources.

Planners have developed metrics that attempt to capture some of these dynamic reliability contributions so that they can ensure they have both enough resources (in terms of gigawatts),

and enough kinds of resources (in terms of their characteristics) contributing to the wide array of needed grid services that work together to provide grid reliability. A common example of such a metric is effective load carrying contribution (ELCC).[10] ELCC values are grid-specific, because the combination of energy resources influences any particular resource's contribution to reliability.[11] Importantly, because a resource's reliability value is a function of all technologies and the network, its ELCC values change as the grid changes. A low solar ELCC can increase if more energy storage capacity enters the market, if transmission is expanded, or if demand response is better integrated into wholesale markets.[12]

II. "Baseload" Is No Longer a Meaningful Resource Description When Assessing Contribution to Grid Reliability

Notably absent from the table above is the label "baseload." In energy policy circles, the term "baseload" has generally referred to a resource that operates continually.[13] But it is a label that applies to an energy generation resource because of how the grid operator actually operates the system on which the resource is located, rather than an intrinsic quality of the resource.

Historically, the term has been associated with high capital expenditure projects like coal, hydropower, and nuclear, which had low operational expenses (low variable/marginal cost of operating) because it made economic sense to run these units continually. These resources generally had high reliability characteristics, like low exposure to fuel supply chain problems and lower forced outage or maintenance rates—characteristics that have deteriorated over time with facility age and increases in correlated outage events.[14]

While in the past, having fewer but large "baseload" units was economically efficient, resources' economics have changed significantly.[15] Now, grid operators have low capital expenditure and low operational cost resources available to call on, like renewables and storage. Additionally, most regions have embraced competitive markets to incentivize sufficient capacity.

In principle, a diverse resource fleet can meet electricity demand as well as (or better than)[16] fewer large, continually operating resources—or "baseload" resources. Grid operators will dispatch, in a technology-neutral way, energy resources that most competitively can meet demand and system needs. And for long-run energy adequacy, investors will develop new resources by balancing investment costs and expected profitability. Appending the term "baseload" to any particular future resource, thus, does not reveal any information about its future reliability contribution or cost effectiveness.

III. Using the Label "Baseload" to Retain or Promote Certain Energy Resources over Others Subverts Existing Grid Planning and Resource Procurement Processes

Recently, the federal government and others have used the label "baseload" as a heuristic shortcut for certain favored resources, promising reliable, affordable, secure, dispatchable, and firm energy.[17] Reducing the complex idea of grid reliability down to the term "baseload" resources, while a convenient shortcut in nomenclature, does not reflect current planning or operational realities. As Parts I and II above discuss, "baseload" does not mean a resource will bring those attributes to their grid. A grid with a few large thermal resources can suffer from correlated outages due to weather and fuel shortages, and appending a label of "baseload" power does not make them any more valuable for grid reliability.[18]

"Baseload" does not also mean the resources will be necessarily cheaper. In fact, because renewable energy sources are not exposed to fuel cost risks and their investment costs are expected to continue declining, there are scenarios in which they—when paired with backup generation, storage, demand response, and a modernized grid—can better enable a reliable and cost-effective power system.

In other words, when grid operators assess what grid services their system requires, and how much supply they must procure to meet demand at every moment, they do not solicit "baseload" resources. They procure and dispatch resources available to serve the demand in the most economically efficient manner. Federal measures to retain "baseload" resources that the administration takes outside of these planned processes can yield significant consumer costs, with questionable reliability returns.[19] Given the high financial stakes, it is important to dispel any extra-reliability aura that appending the label "baseload" might generate and focus on accurately assessing what energy resources can yield the most reliable grid, at the lowest cost.

Endnotes

[1] *See, e.g.*, U.S. Dep't of Energy, *The Department of Energy's Resource Adequacy Report Affirms the Energy Emergency Facing the U.S. Power Grid* (July 7, 2025), https://perma.cc/V2K5-HMFT ("Baseload, dispatchable power, such as from coal, oil and gas, and nuclear, is essential in grid planning."); U.S. Dep't of the Interior, *Interior Ends Preferential Treatment for Unreliable, Subsidy-Dependent Wind and Solar Energy* (July 17, 2025), https://perma.cc/TKV2-W46B ("American Energy Dominance is driven by U.S.-based production of reliable baseload energy, not regulatory favoritism towards unreliable energy projects . . . ." (quoting Acting Assistant Secretary for Lands and Minerals Management Adam Suess)); H.B. 15, 136th Gen. Assemb., Reg. Sess. (Ohio 2025) (Ohio law that defines baseload power resources as those that run primarily on "nonrenewable" fuel sources).

[2] *See, e.g.,* PJM Resource Adequacy Planning Department, PJM Load Forecast Report (2017), https://perma.cc/A9LT-ENX6.

[3] While grid operators typically evaluate a single conventional generation facility with a higher accreditation value than a single renewable energy resource (like wind or solar), that does not mean that a fleet of renewable resources working in concert with other technologies yield a less reliable grid. *See* Part II, *infra*.

[4] *See* Adefunke Sonaike et al., *Reality Check: Dispatchability and Reliability Are Not the Same Thing*, RMI (Jan. 8, 2025), https://perma.cc/P2T5-NNL6 (discussing the distinction between resource dispatchability and grid reliability).

[5] Jennifer Danis et al., Inst. for Pol'y Integrity, Enough Energy: A Review of DOE's Resource Adequacy Methodology 3–8 (2025), https://policyintegrity.org/publications/detail/enough-energy.

[6] For a robust list of reliability-related terms, *see* Michelle Solomon & Sara Baldwin, Energy Innovation, Grid Reliability in the Clean Energy Transition: A Primer for Policymakers 39–43 (2025), https://perma.cc/KL4F-GGS9.

[7] *See* North Am. Elec. Reliability Corp., An Introduction to Inverter-Based Resources on the Bulk Power System 4 (2023), https://perma.cc/C8SR-UR8R.

[8] *Participation of Distributed Energy Res. Aggregations in Mkts. Operated by Reg'l Transmission Orgs. & Indep. Sys. Operators*, Order No. 2222, 172 FERC ¶ 61,247 (2020).

[9] Devonie Oleson, *Reframing Curtailment: Why Too Much of a Good Thing Is Still a Good Thing*, Nat'l Renewable Energy Lab'y (July 18, 2022), https://perma.cc/Y8BY-Y7NF.

[10] *See generally* Energy Sys. Integration Grp., Ensuring Efficient Reliability: New Design Principles for Capacity Accreditation (2023), https://perma.cc/2EZ5-DCAX.

[11] See PJM Interconnection, L.L.C., *ELCC Class Ratings for the 2026/2027 Base Residual Auction*, https://perma.cc/2YPV-6QXH.

[12] Computing *average* ELCC can also illustrate resource adequacy impacts from renewable resources. For example, if the entire installed resource fleet reduces the region's risk profile (e.g., eliminating a mid-day risk and thus shifting the riskiest period to the evening) but the marginal resource adequacy value of the resource is small after that shift, average ELCC values will reveal these impacts. *See* Energy Sys. Integration Grp., *supra* note 9, at 21–22.

[13] In energy parlance, this is called having a high capacity factor. *See* "Capacity factor," *Glossary*, U.S. Energy Info. Admin., https://perma.cc/BK6S-NCJ6.

[14] *See generally* Fed. Energy Regul. Comm'n & N. Am. Elec. Reliability Corp., The February 2021 Cold Weather Outages in Texas and the South Central United States (2021), https://perma.cc/N7RK-2QBD.

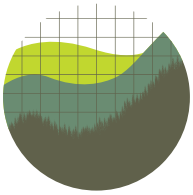
[15] For example, time adjusted coal capacity in the U.S., has decreased from 286 GW in 2015 to 175 GW in 2024. Even though coal capacity has decreased, coal units' capacity factors, a comparison of net generation with available capacity, did too (from 54% in 2015 to 43% in 2024). Thus, diminished coal capacity is used even less than before. *See* U.S. Energy Info. Admin., Electric. Power Monthly tbl.6.07.A, https://perma.cc/W92A-2BQE (last visited Aug. 26, 2025).

[16] Modernized grid infrastructure can help integrating weather-dependent renewables. Because the U.S. grid is aging, there is an opportunity to modernize at minimal additional costs. FERC Order No. 1920 is trying to facilitate just that. *See generally* Jennifer Danis et al., Inst. for Pol'y Integrity, Guide to State Participation in PJM Long-Term Scenario Development Under FERC Order No. 1920 (2024) https://policyintegrity.org/publications/detail/guide-to-state-participation-in-pjm-long-term-scenario-development-under-ferc-order-no-1920. Future interregional transmission planning frameworks can improve the effectiveness of weather dependent renewables by spatially balancing out the weather risk.

[17] *See, e.g.*, U.S. Dep't of Energy, *supra* note 1 ("Baseload, dispatchable power, such as from coal, oil and gas, and nuclear, is essential in grid planning.") (bolding added); Benjamin Storrow, *Michigan Coal Plant Tests Trump's Commitment to Fossil Energy*, Climatewire (Aug. 7, 2025), https://perma.cc/WDU2-PCKK ("'For years, American grid operators have warned decommissioning baseload power sources would jeopardize the reliability of our electric grid,' DOE spokesperson Ben Dietderich wrote in an email. 'This administration is committed to ensuring Americans have access to reliable, affordable, and secure energy that isn't dependent on whether the sun shines or the wind blows.'") (bolding added); Peter Behr, *DOE Order Keeps Michigan Coal Plant Open, Slams Wind and Solar*, E&E News (Aug. 22, 2025), https://subscriber.politicopro.com/article/eenews/2025/08/22/doe-order-keeps-michigan-coal-plant-open-slams-wind-and-solar-00519318 (quoting Energy Secretary Chris Wright saying, "This order will help ensure millions of Americans can continue to access affordable, reliable, and secure baseload power regardless of whether the wind is blowing or the sun is shining").

[18] *See, e.g.*, Fed. Energy Regul. Comm'n & N. Am. Elec. Reliability Corp., *Inquiry into Bulk-Power System Operations During December 2022 Winter Storm Elliott* (2023), https://perma.cc/Z6TM-4GTL; Fed. Energy Regul. Comm'n & N. Am. Elec. Reliability Corp., *January 2025 Arctic Events: A System Performance Review* (2025), https://perma.cc/2S4L-HM7Q.

[19] *See, e.g.*, Michael Goggin, Grid Strategies, The Cost of Federal Mandates to Retain Fossil-Burning Power Plants 1 (2025), https://perma.cc/SLA8-X9MK.



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