UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

Notice of Proposed Rulemaking	)	
Grid Reliability and Resilience Pricing	)	Docket No. RM18-1-000

INITIAL COMMENTS OF THE R STREET INSTITUTE

Pursuant to the Secretary of Energy's Notice of Proposed Rulemaking ("NOPR") for final action by the Federal Energy Regulatory Commission (the "Commission" or "FERC") issued on September 28, 2017,[1] the R Street Institute ("RSI") respectfully submits these comments in response to the NOPR's proposal to impose rules on Commission-approved regional transmission organizations (RTOs) and independent system operators (ISOs) to provide immediate cost recovery for generation resources with 90-day on-site fuel supplies. RSI also submits comments in response to Commission staff's request for commenters to address specified questions.[2]

I. GENERAL RESPONSE TO NOPR

The NOPR has some market-enhancing high-level goals (i.e., improving pricing for reliability and resiliency services), but the detailed problem statement, factual foundation and proposed policy remedies of the NOPR are inconsistent with empirical evidence and principles of wholesale electricity market design. Motivations for market reforms should never aim to adjust compensation with a pre-determined result—in this case preventing certain power plants from retiring. The rationale for markets is to let competitive forces determine resource allocations, which lowers costs and better manages risk than a pre-determined, centrally planned approach would.

The "common good" nature of discrete reliability, and perhaps resiliency, services creates a market failure that warrants market design rules for their procurement. Fuel diversity, on-site fuel supply and "baseload" power are neither market failures nor discrete reliability or resiliency services. Thus, to the extent any of these concepts benefit system reliability and resiliency, market design should provide *indirect* compensation for them, while providing *direct* compensation for discrete reliability and resiliency services associated with market failures. This ensures incentive compatibility, whereby market rules align the economic interests of market participants with the efficient and reliable performance of the electric system.

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[1] Department of Energy, *Grid Resiliency Pricing Rule,* Notice of Proposed Rulemaking, Docket No. RM17-3-000, Sept. 28, 2017, pp. 1-11.
https://www.energy.gov/sites/prod/files/2017/09/f37/Notice%20of%20Proposed%20Rulemaking%20.pdf

[2] Federal Energy Regulatory Commission, *Grid Reliability and Resilience Pricing,* Docket No. RM18-1-000, Oct. 4, 2017, p. 1. https://www.ferc.gov/media/headlines/2017/2017-3/10-04-17.pdf

The vague NOPR provides a mechanism for unprecedented expansion of cost-of-service regulation. This will profoundly undercut the competitiveness of wholesale electricity markets by retaining uneconomic resources, artificially inflating investment risk and associated capital costs, and deterring innovation and new investment. The NOPR is profoundly anti-competitive and lacks empirical support for its claim that an emergency situation justifies massive, abrupt intervention that will likely cost consumers billions without any clear benefit.[3]

As such, RSI respectfully requests that the Commission overrule or reject the NOPR and instead pursue an alternative course to price reliability and resiliency services that enhances the competitive performance of organized wholesale electricity markets.

II. RESPONSES TO STAFF QUESTIONS

RSI sees no defensible case to support the NOPR and as such, only provides comments on staff questions that relate to the "need to reform" and an additional question on alternative options. Numerous market design reforms to improve the economic efficiency of reliability and resiliency services exist. As such, the Commission may pursue alternative approaches to accomplish some of the stated goals of the NOPR.

A. Need for Reform

1. What is resilience, how is it measured, and how is it different from reliability? What levels of resilience and reliability are appropriate? How are reliability and resilience valued, or not valued, inside RTOs/ISOs? Do RTO/ISO energy and/or capacity markets properly value reliability and resilience? What resources can address reliability and resilience, and in what ways?

"Reliability" has been used in the electric industry for decades and is well-defined in industry and regulatory documentation. On the other hand, "resilience" is a more recent concept that focuses on "the ability of the system to absorb and/or quickly recover from major one-time events beyond what may be typically planned for" in bulk reliability processes.[4] The National Infrastructure Advisory Council (NIAC), North American Electric Reliability Corporation (NERC), the RTO/ISOs and other industry stakeholders have similar but varying perspectives on the definition and characteristics of "resiliency." A common theme seems to be a focus on mitigating unpredictable, high-impact events (e.g., natural

[3] As a rough cost benchmark, consider that subsidy costs to keep one or two unprofitable coal and nuclear plants open reaches hundreds of millions per year. Applying this rulemaking to merchant nuclear plants alone would cost billions per year.

[4] Paul Hibbard, et al., "Electricity Markets, Reliability and the Evolving U.S. Power System," Analysis Group, June 2017, pp. 73-74.
http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/ag_markets_reliability_final_june_2017.pdf

disasters) and the ability to rapidly recover from all disruptive events. In some cases, existing procurement processes like black start capability already codify such resiliency attributes (e.g., ability to expedite service restoration, sometimes known as “rapidity,” which contain losses) that industry considers a reliability service. Essential reliability services (ERSs) like frequency response and voltage support may also fit emerging definitions for resiliency.

A holistic conceptualization of resiliency is still in the early stages. The operationalization of resiliency in a wholesale market construct is even further behind in many ways. Given this, the Department of Energy (DOE) technical staff paper released in August recommended that “NERC should consider adding resilience components to its mission statement and develop a program to work with its member utilities to broaden their use of emerging ways to better incorporate resilience. RTOs and ISOs should further define criteria for resilience, identify how to include resilience in business practices, and examine resilience-related impacts of their resource mix.”[5] RSI suggests a much longer comment period on the subject of “resiliency pricing” to define resiliency and explore market-compatible reforms through the proper channels.

2. The proposed rule references the events of the 2014 Polar Vortex, citing the event as an example of the need for the proposed reform. Do commenters agree? Were the changes both operationally and to the RTO/ISO markets in response to these events effective in addressing issues identified during the 2014 Polar Vortex?

The NOPR mischaracterizes the 2014 Polar Vortex, where most power plant outages were not fuel-related. MISO and PJM experienced the most severe weather during this period. Gas interruptions accounted for 24% of unplanned generator outages in PJM during the Polar Vortex, with mechanical failures from cold weather causing the most outages overall.[6] In MISO, gas shortages caused even fewer outages on a percentage basis than in PJM.[7]

Of the Polar Vortex outages that were fuel-related, the expansion of on-site fuel would not have prevented some outages, nor was on-site fuel storage necessary to avoid the majority of these outages (i.e., other remedies existed). To firm up fuel supply from off-site sources would have avoided most fuel-

[5] U.S. Department of Energy, “Staff Report to the Secretary on Electricity Markets and Reliability,” August 2017, p. 126. https://energy.gov/sites/prod/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf

[6] Mike Kormos, “Polar Vortex 2014,” FERC Technical Conference, April 1, 2014, 8. https://www.ferc.gov/CalendarFiles/20140401084146-Kormos,%20PJM%20Slides.pdf

[7] Midcontinent Independent System Operator, Inc., “2013-14 MISO Cold Weather Operations Report,” November 2014, p. 24. https://www.misoenergy.org/Library/Repository/Report/Seasonal%20Market%20Assessments/2013-2014%20Cold%20Weather%20Operations%20Report.pdf

related outages. Specifically, the predominate concern was the inability of natural gas-fired plants on interruptible pipeline contracts to obtain fuel when pipelines faced heavy congestion and curtailed non-firm customers. Remedies to this include firming pipeline delivery contracts, purchasing physical call options from marketers, investing in off-site natural gas-storage (e.g., behind a chronic congestion point in a pipeline) or back-up fuel on-site. After PJM implemented Capacity Performance reforms to address these generator performance concerns, merchants used third-party marketers to firm natural gas supplies that were not fully contemplated prior to such reforms.[8] This underscores the point that fuel-neutral markets provide incentives for merchants to creatively pursue the least-cost methods to satisfy reliability needs.

Even with energy market price formation inefficiencies, the existing incentive structure played a significant role in altering merchant generation incentives after the Polar Vortex. In some cases, poor generator performance resulted from foregoing relatively inexpensive (tens or hundreds of thousands of dollars) maintenance (e.g., minor weatherization, and valve and instrumentation upgrades), while the lost energy market opportunities from inability to perform were in the hundreds of thousands to millions of dollars. This incentive, along with non-financial RTO/ISO winter preparedness efforts (e.g., dual-fuel testing), resulted in improved generator performance during comparable cold weather events after the Polar Vortex, *before* PJM implemented Capacity Performance reforms.

Further, not all outages during the Polar Vortex were necessarily problematic. Summer-peaking electric systems do not need the same level of capacity during winter months. Procuring year-round capacity at the summer reserve margin level results in over-procurement during non-summer months. It also fails to economize the seasonal cost variance in resources' abilities to provide dependable capacity. Thus, an uptick in outages during extreme winter weather events does not necessarily indicate market design problems or warrant rule changes. It does warrant close examination, which requires quality outage data.

One of the largest concerns from the Polar Vortex was the poor quality of outage reporting that limited the ability to diagnose outages outright and to specify their cause. One problem was incomplete or inaccurate reporting. In many cases, RTO/ISO staff had to call individual plant owners to determine the cause of outages. This was because the data reported in the Generator Availability Data System (eGADS) was insufficient for robust analysis. Vague outage reporting created another problem, which resulted from either overly broad or unspecific outage categories and careless reporting (e.g., selecting

[8] PJM Interconnection, LLC, "2019/2020 RPM Base Residual Auction Results," 2016, p. 28. http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2019-2020-base-residual-auction-report.ashx

the cause as "other" instead of specifying). Some RTO/ISOs improved their outage reporting systems, such as providing for greater specificity in outage code categories. Given the considerable interest in measuring and providing efficient incentives for generator performance going-forward, improving the quality of outage reporting would be of great value to future policy decisions.

3. The proposed rule also references the impacts of other extreme weather events, specifically hurricanes Irma, Harvey, Maria, and superstorm Sandy. Do commenters agree with the proposed rule's characterization of these events? For extreme events like hurricanes, earthquakes, terrorist attacks, or geomagnetic disturbances, what impact would the proposed rule have on the time required for system restoration, particularly if there is associated severe damage to the transmission or distribution system?

The NOPR mischaracterizes the effects of severe weather events by incorrectly diagnosing fuel security as the primary outage cause and over-crediting on-site fuel storage as the remedy. The largest threat to extended outages is severe damage to transmission and distribution systems. As such, unplanned generation outages, which rarely extend at broad scale for periods exceeding transmission and distribution outages, will likely not have a pronounced effect on the timeline for restoration of service.

A common cause of widespread generation outages is still important, but typically has little to do with whether power plants store fuel on- or off-site. The largest concern of widespread generation outages is unrelated to fuel security. In particular, severe weather events create more concerns with cold temperatures inducing far more extensive mechanical failures than fuel-related outages.

Fuel security is an important topic, but it is not synonymous with on-site fuel storage. Some plants with fuel stored on-site have incurred fuel-related outages. For example, many coal plants lacked fuel when cold weather caused their coal conveyor belts to break and coal piles to freeze. Cold weather also caused fuel-related outages from gelled oil, despite sufficient supplies on-site.[9] Earthquakes could also create fuel security problems through damaged fuel transportation infrastructure, but do not present a clear argument for on-site fuel storage. For example, earthquakes can take massive amounts of nuclear generation offline in a given region, irrespective of their fuel access.

For these reasons, many measures to improve fuel security have nothing to do with whether plants store fuel on-site. Efforts to improve fuel security include firming fuel delivery service (e.g., contracting for firm natural-gas pipeline capacity outright or using marketers to secure firm pipeline service the few days per year it meaningfully improves fuel access) under expected conditions.

[9] North American Electric Reliability Corporation, "Polar Vortex Review," September 2014, pp. 3, 8. http://www.nerc.com/pa/rrm/January%202014%20Polar%20Vortex%20Review/Polar_Vortex_Review_29_Sept_2014_Final.pdf

Improving fuel security under exceptionally rare conditions is also not necessarily a function of on-site fuel storage. In many cases, improving the resiliency of off-site fuel storage is just as valuable. For example, storing natural gas in more locations (underground or in liquefied form), especially behind pipeline vulnerability points, improves the fuel security of natural gas-generators in the event of a pipeline disruption by increasing available options to redirect flows.

Fuel security is both spatially and temporally dynamic, which the NOPR completely overlooks. The vulnerability of fuel delivery infrastructure varies massively by region. For example, an unplanned natural gas pipeline outage in the Northeast may cause more natural-gas plant outages than a comparable pipeline outage in the Midwest. This occurs because the pipeline network in the Midwest is far more robust and enables more fungible fuel flows in the event of a pipeline outage. Furthermore, demand and the availability of various supply resources vary immensely by season and time-of-day, which makes the value of any measure to improve generator performance a function of temporal conditions that a one-size-fits-all remedy cannot account for.

4. The proposed rule references the retirement of coal and nuclear resources and a concern from Congress about the potential further loss of valuable generation resources as a basis for action. What impact has the retirement of these resources had on reliability and resilience in RTOs/ISOs to date? What impact on reliability and resilience in RTOs/ISOs can be anticipated under current market constructs?

Currently, no bulk reliability concern exists. NERC's most recent reliability assessment concludes that the bulk power system provides an adequate level of reliability and that resilience to severe weather continues to improve.[10] Similarly, the DOE technical report found that organized wholesale electricity markets have achieved reliability with economic efficiencies.[11] Both the DOE technical report and NERC highlight that no emergency exists but suggest further evaluation to identify reliability concerns proactively.

Examining the effects of power plant retirement in isolation will always skew the results, because the reliability of a system is a function of dynamic conditions (e.g., the causes of power plant retirements tend to increase reliability services in the form of new supply, or reduce the need for such services through lower demand). A static look – the marginal implication with all other variables held

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[10] North American Electric Reliability Corporation, "State of Reliability 2017," June 2017, pp. vi-6. http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/ag_markets_reliability_final_june_2017.pdf

[11] U.S. Department of Energy, "Staff Report to the Secretary on Electricity Markets and Reliability," August 2017, p. 10. https://energy.gov/sites/prod/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf

constant – will always reveal that the loss of any resource reduces reliability and resiliency. The better question is whether the electric system still procures all reliability services sufficiently, factoring supply retirements, additions and changes in demand.

Further, impact on system reliability necessarily varies by region. It is a function of the pace and nature of fleet changes, as well as region-specific parameters (e.g., robustness of pipeline infrastructure). PJM has experienced over 20,000 gigawatts of coal retirements since 2011 while maintaining a reserve margin in excess of the requirement.[12] Regarding these coal retirements, the Brattle Group noted that PJM "passed this stress test with surprising robustness and no evident threat to reliability."[13]

ISO-NE is often cited as the system with the most challenging impacts of having less "fuel secure" generation. Yet in ISO-NE, coal and oil generators (resources with on-site fuel) were the primary drivers in declining generator dependability this decade.[14] Despite having very low levels of coal and nuclear, ISO-NE's fuel assurance concerns stem not from lack of on-site fuel *per se*, but more from the most congested fuel transport system in the contiguous United States, few dispersed off-site fuel storage opportunities (e.g., poor underground natural gas storage geology) and with high dependency on just a couple supply routes (pipelines). If ISO-NE had fuel transport systems and off-site fuel storage options with the same robustness as MISO and PJM, they would not face the same degree of challenges. This demonstrates that fuel security is very context-specific. Still, the challenges to fuel assurance in ISO-NE will be most efficiently resolved through incentive structures that determine the manner and degree in which generators procure fuel services and the dozens of other available actions to improve generator performance.

In ISO-NE, no counterfactual exists to determine what would have happened without emergency winter reliability programs. Several iterations of these winter programs, along with state policy proposals to subsidize pipeline expansions, created actual or potential out-of-market interventions that undermine the price signals necessary to encourage market participants to voluntarily improve generator performance. Merchant generators have noted the effects of these interventions to

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[12] Devin Hartman, "The Market Advantage: A Q&A with Joe Bowring," R Street Shorts No. 40, June 2017, p. 1-2. http://www.rstreet.org/wp-content/uploads/2017/06/ RSTREETSHORT40.pdf.

[13] Johannes P. Pfeifenberger, Samuel A. Newell, Kathleen Spees and Roger Lueken, "Response to U.S. Senators' Capacity Market Questions," The Brattle Group, May 5, 2016, p. 10. http://www.brattle.com/system/news/pdfs/000/001/055/original/Brattle_Open_Letter_to_GAO_-_Response_to_U.S._Senators%E2%80%99_Capacity_Market_Questions.pdf?1462477158

[14] Robert Ethier, "Meeting Natural Gas-Electric Interdependency Challenges through Market Enhancements," U.S. Department of Energy's Electricity Advisory Committee, Sept. 25, 2014, 5. https://energy.gov/sites/prod/files/2014/10/f18/08a-REthier.pdf

create artificial investment risk that deters private investment that would boost generation performance.

The impact of a changing fuel mix on resiliency is difficult to measure because of the aforementioned limitations in resiliency metrics. Thus, the future impact of changes in the generation fleet under present market design requires extensive modeling. The 2013-2014 gas-electric study prepared for the Eastern Interconnection Planning Collaborative serves as an ideal example of integrated modeling of electric and primary fuel systems.[15] This justifies further study and a longer comment period.

5. Is fuel diversity within a region or market itself important for resilience? If so, has the changing resource mix had a measurable impact on fuel diversity, or on resilience and reliability?

Fuel diversity is not a causal determinant of the reliability or resiliency of an electrical system. Whether fuel diversity correlates with an increase in reliability or resiliency in a positive, negative or statistically insignificant manner is contextually specific. For example, a system overweight on a fuel associated with strong reliability and resiliency performance may prove more reliable and resilient than a more diverse system. Conversely, a system overweight on fuels associated with inferior performance may be less reliable and resilient than a more diverse system. Interactive effects between particular fuel types make a generic metric of fuel diversity even less predictive of reliability and resiliency outcomes.

The changing resource mix has had a measurable impact on fuel diversity. An RSI study used a measure of fuel diversity similar to the Herfindahl-Hirschman Index[16] (which found that the United States had a relatively high level of fuel diversity in 2016), where the measure stood at 0.75 out of 0.91 (just 18% below the maximum value) and has increased by 13% from 2001 to 2016.[17] Fuel diversity trends vary by region. In PJM, which has experienced extensive fleet turnover, fuel diversity has increased since 2010.[18]

Fuel diversity should not be an explicit objective of Commission policy or RTO/ISO market design. To make it one would create massive opportunities for unintended consequences and likely would result in undermining the fuel-neutral principle of competitive electricity markets. In cases where

[15] For example, see the homepage for the gas-electric initiative at the Eastern Interconnection Planning Collaborative: http://www.eipconline.com/gas-electric.html

[16] The fuel diversity index equals 1 minus the sum of the squared market shares of each fuel type. This analysis used 11 fuel types at reported by the U.S. Energy Information Administration: coal, petroleum, natural gas, other gases, nuclear, hydroelectric, wind, solar, biomass, geothermal and other.

[17] Devin Hartman, "Why Risk and Reliability Matter More Than Fuel Diversity," *R Street Shorts* No. 39, May 2017, pp. 1-2. http://www.rstreet.org/wp-content/uploads/2017/05/RSTREETSHORT39.pdf

[18] Monitoring Analytics LLC, "State of the Market Report for PJM," March 2017, pp. 106-107. http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2016/2016-som-pjm-volume2.pdf

fuel diversity positively correlates with improved reliability and resiliency, fuel diversity may increase *indirectly* as the result of competitive forces in fuel-neutral markets. For example, a market with high reliance on natural gas will present stronger price signals for alternative fuels if common-mode supply restrictions affect fuel access for multiple natural-gas power plants.

Some studies have incorrectly framed fuel diversity as a precondition to reliability and resiliency, without deciphering the causal drivers of portfolio reliability and resilience. The Commission should frame fuel diversity correctly to avert the use of this catch-phrase to pursue market design reforms that compromise the fuel- and technology-neutrality of competitive markets.

B. Other

The Commission could also take alternative approaches to accomplish some of the stated goals of the NOPR—to the extent the NOPR aims to improve price signals for reliability and resiliency benefits. As noted, existing reliability services may fit the definition of at least some resiliency services. Thus, the first step to pricing resiliency efficiently is to procure associated reliability services efficiently. This begins with ensuring accurate price formation in energy markets, which the Commission and industry stakeholders began working on in 2014.[19] To this end, RSI has issued a 2017 paper that outlines eleven areas for the Commission to pursue price formation improvements in addition to pending NOPRs:[20]

1. Improved shortage pricing.
2. Adjustments to rules and practices governing economic and physical offer and bid parameters.
3. Inclusion of all active constraints in price formation.
4. Improving locational reserve products and spatial determinations.
5. Intertemporal modeling improvements to dispatch and unit commitment.
6. Enhancement of the RTO/ISO interchange.
7. Further transparency and pricing of grid operator interventions.
8. Removal of additional administrative price controls.
9. Improvement of additional uplift-cost-allocation methods.
10. Improving day-ahead settlement and scheduling intervals.
11. Pricing unpriced resources other than fast-start resources.

[19] Federal Energy Regulatory Commission, "Price Formation in Energy and Ancillary Services Markets Operated by Regional Transmission Organizations and Independent System Operators," Docket No. AD14-14-000, June 19, 2014. https://www.ferc.gov/ industries/electric/indus-act/rto/AD14-14-000.pdf.

[20] Devin Hartman, "Refreshing Price Formation Policy in Wholesale Electricity Markets," *R Street Policy Study* No. 106, August 2017, pp. 11-12. http://www.rstreet.org/wp-content/uploads/2017/08/106.pdf

Some reliability services with resiliency attributes—like black start capability—have an administrative procurement process that may benefit from a market-based approach. Others, like ERSs, lack dedicated procurement mechanisms that may result in undervaluation of the service provided. This is why the DOE technical report recommended developing fuel- and technology-neutral market mechanisms for ERSs "centered on the reliability services provided."[21] This approach expressly lets market participants decide what methods to take to provide the service, whereas the NOPR would prescribe one particular method without specifying a reliability service.

Still, pursuing market mechanisms for ERSs would be consistent with the general spirit of the NOPR to improve price signals for reliability and resiliency benefits. An immediate area to begin is shifting the pending NOPR on primary frequency response (PFR) in a market-compatible direction.[22] A market-based approach may result in PFR procurement at lower short-run cost and encourage innovative forces to drive further long-term cost reductions.[23] Exploring market approaches to voltage support would similarly address ERS procurement through an economics lens. An updated examination of ramp services may also help inform policy action, as several RTO/ISOs have pursued various approaches to acquiring ramp capability and rewarding delivered ramp service.

Pursuing the above agenda would be resource-intensive and would span at least several years. Over that time, the Commission could act on the aforementioned DOE technical report's recommendation for industry stakeholders to examine resilience in greater depth. This includes the development of metrics and market-compatible criteria for resilience. At the same time, improvements in eGADS and other outage reporting and tracking systems would provide a more informed basis for subsequent policy decisions.

I. CONCLUSION

In response to the NOPR, RSI respectfully requests the Commission consider the comments contained herein.

Respectfully submitted,

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[21] U.S. Department of Energy, "Staff Report to the Secretary on Electricity Markets and Reliability," August 2017, p. 126. https://energy.gov/sites/prod/files/2017/08/f36/Staff%20Report%20on%20Electricity%20Markets%20and%20Reliability_0.pdf

[22] Federal Energy Regulatory Commission, "Essential Reliability Services and the Evolving Bulk-Power System – Primary Frequency Response," Notice of Proposed Rulemaking, Docket No. RM16-6-000, Nov. 17, 2016, 1. https://www.ferc.gov/whatsnew/comm-meet/2016/111716/E-3.pdf.

[23] "Comments of the R Street Institute," Docket No. RM16-6-000, Feb. 1, 2017, 3-4. http://www.rstreet.org/wp-content/uploads/2017/02/PFR-Comments-FINAL.pdf.

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