Time to Double Down on Uniform Pricing in U.S. Energy Markets

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Don't it always seem to go
that you don't know what you've got
'til it's gone . . . .
—Joni Mitchell

Currently used to clear supply and demand in all short-term auction energy markets, uniform or single-clearing in the form of location-based marginal cost pricing is the most economically efficient way to deliver least-cost energy to consumers. Uniform pricing achieves this most celebrated result in economics by requiring that consumption comes from demand with the highest values and production comes from supply with the lowest cost. A recent proposal for the Federal Energy Regulatory Commission to reconsider uniform pricing is unwarranted. Any departure from uniform pricing would not lower energy prices to consumers and actually may increase them. Further, by denying the market access to a single marginal cost clearing price in a billing interval, any alternative to uniform pricing would distort merit order dispatch, distort price signals to demand, thwart effective market monitoring, and deter critically needed investment in new, cleaner generation. Rather than revisiting the long-established economic merits of uniform pricing, which continues to deliver lowest cost energy to consumers, the Commission's resources would be better spent finalizing proposals to expedite electric generator interconnections and promote comprehensive regional planning of electric transmission network buildouts.

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Introduction

To balance supply and demand for electricity in the short term—balance necessary to operate, but not otherwise achieved through longer-term bilateral contracts—regional transmission organizations and independent system operators[1] (jointly, RTO) conduct auctions that clear supply and demand in those markets at a *uniform* or *single market-clearing* price, which is the location-based marginal price (LMP).[2] LMP pays all sellers whose offers to sell clear at a location (node) during a pricing interval the uniform highest price of the last unit to clear the short-term energy auction

1. RTO electricity markets are ones in which multiple sellers sell to a single purchaser, the RTO; these are referred to as procurement auctions, as opposed to double-sided auctions in which multiple sellers sell to multiple buyers.

2. For a detailed discussion of how LMP pricing works and what it achieves in RTO and other electric power markets, see Sarb Ozkan, *An Introduction to Locational Marginal Pricing*, ENVERUS: ENVERUS BLOG (Jan. 5, 2022), https://www.enverus.com/blog/an-intro-to-locational-marginal-pricing [https://perma.cc/WQF3-LM4D].

market. "[This] pricing rule in offer-based economic dispatch results in many [electricity] generators being paid more than their offer. These result in 'inframarginal' returns . . . . [W]ithout such inframarginal returns, generators would become bankrupt, and no new investment would take place."[3]

It is now time, argues Federal Energy Regulatory Commissioner Mark Christie, for the Federal Energy Regulatory Commission (FERC) to reconsider single-clearing price.[4] That reconsideration is not needed. Uniform pricing at the LMP is working well in short-term energy auction markets. It produces better results for consumers than any alternative Commissioner Christie identifies. Moreover, FERC today has more pressing challenges before it, such as finalizing its proposed, but long overdue, rule on regional transmission planning.[5] As one commentator aptly observed in a recent article, the electric power industry today faces a challenging and expensive transition that will never get out of the starting gate "[i]f we have to revisit core principles like the single clearing price mechanism . . . ."[6]

Nearly every energy economist and engineer who has studied short-term energy pricing in RTO auction markets (most of whom Commissioner Christie dismisses as "textbook" theorists)[7] validate uniform pricing at LMP as the most efficient way to price and deliver cost savings and

3. ROSS BALDICK, SINGLE CLEARING PRICE IN ELECTRICITY MARKETS 5 (2009), https://users.ece.utexas.edu/~baldick/papers/baldick-single-price-auction.pdf [https://perma.cc/968Z-FBWY]. Professor Baldick's reference to "economic dispatch" means the operation of generation to produce energy at the lowest cost to serve consumers reliably, recognizing any operational limits of generation or transmission.

4. Mark C. Christie, *It's Time to Reconsider Single-Clearing Price Mechanism in U.S. Energy Markets*, 44 ENERGY L.J. 1, 30 (2023). The Commissioner's criticism of single-clearing price *takes aim primarily* at long-term capacity markets, *id.* at 3, 14, which do *not* use LMP. He nevertheless proceeds to conflate capacity and energy markets and urges reconsideration of both single-clearing price in capacity markets and LMP in energy markets. Forward capacity markets currently in operation are untethered from the marginal cost of generators and, as a result, habitually overstate the cost of capacity needed to ensure resource adequacy and reliability in the future (as far out as three years), based not on empirical data, but rather on assumptions, speculations, and RTO stakeholder politics. *See generally* Todd Aagaard & Andrew N. Kleit, *Too Much Is Never Enough: Constructing Electricity Market Demand*, 43 ENERGY L.J. 79 (2022) (critiquing the forward capacity markets administered by the PJM Interconnection, the New York System Operator, and ISO New England). That Commissioner Christie leverages the dysfunctionality of existing forward capacity markets to support his call for reconsidering uniform LMP pricing in RTO short-term energy auction markets offers no basis for reconsidering uniform LMP pricing in the latter.

5. Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection, 87 Fed. Reg. 26504 (proposed May 4, 2022) (to be codified at 18 C.F.R. pt. 35) (stating that among other reforms, the proposed rule would require public utility transmission providers to conduct long-term regional transmission planning on a sufficiently forward-looking basis to meet transmission needs driven by changes in resource mix and demand). Inexplicably, there has been no apparent progress on finalizing that component of the proposed rule that would require long-term regional planning.

6. Steve Huntoon, *Counterflow: Single Clearing Price*, RTO INSIDER (May 21, 2023), https://www.rtoinsider.com/32250-counterflow-single-clearing-price [https://perma.cc/MQ4D-24NC].

7. Christie, *supra* note 4, at 4 ("[A]ny serious reconsideration of single-clearing price mechanisms cannot be confined to textbook economic theory . . . .").

reliable electric power supply to consumers.[8] Professor Peter Cramton of the University of Maryland explains that by requiring that consumption comes from demand with the highest values and production comes from supply with the lowest cost, the single-clearing price auction produces "the most celebrated result in economics."[9] Those experts reject "pay-as-offered" [10] (PAO) or other departures from uniform pricing pursuant to which each offered unit of production that clears is paid its own offer price only, or possibly even less.[11]

I. Uniform Pricing at LMP Produces Economically Optimal Results Regardless of Market Imperfections or Subsidies

Why reconsider the use of LMP in RTO short-term energy auction markets? Commissioner Christie credits LMP as derived from "very granular" nodal cost data,[12] and he also credits LMP as favored by economists and engineers for supplying demand at the least cost to consumers.[13] But he argues that LMP fails in any market that is not perfectly competitive, and, in his view, RTO energy auction markets are not.[14] He contends they are not even markets but rather what he refers to as "constructs" because some suppliers receive tax credits or other subsidies that allow them to be price takers or even (in rare instances) offer into the RTO energy auctions at negative prices.[15]

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8. *See, e.g.*, BALDICK, *supra* note 3, at 1, 3, 15-18; Peter Cramton, *Forward* to BALDICK, *supra* note 3, at ii [hereinafter Cramton]; Susan Tierney, Todd Schatzki & Rana Mukerji, *Pay as Bid vs. Uniform Pricing*, PUB. UTIL. FORT. Mar. 2008, at 40; STEVEN STOFT, POWER SYSTEM ECONOMICS: DESIGNING MARKETS FOR ELECTRICITY 95-103 (2002); Alfred E. Kahn, Peter C. Cramton, Robert H. Porter & Richard D. Tabors, *Uniform Pricing or Pay-as-Bid Pricing: A Dilemma for California and Beyond*, 14 ELEC. J., July 2002, at 70, 73 (2001) [hereinafter Kahn]. The rule (or law) of one price, the very foundation of uniform pricing, was first described by William Stanley Jevons in his 1871 treatise The Theory of Political Economy. *See generally* WILLIAM STANLEY JEVONS, THE THEORY OF POLITICAL ECONOMY (R.D. Collinson Black ed., Penguin Books 1970) (1871).

9. Cramton, *supra* note 8, at ii.

10. In language that confuses *offers* to sell with *bids* to buy, this form of pricing often is referred to as "pay-as-bid."

11. Commissioner Christie disclaims endorsing PAO or any other specific departure from uniform pricing. *See* Christie, *supra* note 4, at 30. The Southeast Electric Energy Market (SEEM) that the Commissioner puts forward as an alternative to uniform pricing would set "split-the-difference" prices below what the offeror specifies and possibly below marginal (fuel) cost. *See infra* notes 39-45 and accompanying text.

12. *Id.* at 3, 14, 17, 24 n.101, 27.

13. *Id.* at 3, 15, 17, 27.

14. *Id.* at 16-19.

15. *Id.* at 4 n.10. Negative prices, in fact, are rare. For example, "[i]n 2020, negative real-time hourly prices occurred in about 4% of all hours and wholesale market nodes . . . across the United States." Joachim Seel et al., *Plentiful Electricity Turns Wholesale Prices Negative*, 4 ADVANCES APPLIED ENERGY, 2021, at 1. Negative prices have different causes. These include generation that cannot respond to demand in the short-term (e.g., nuclear and coal) or that receive production tax credits (e.g., wind), and low-marginal cost generation that is transmission constrained. *See generally id.*

A. Uniform Pricing Delivers Energy at Lowest Cost to Consumers Under Conditions of Effective Competition

Commissioner Christie's not-perfectly-competitive objection to the use of LMP in RTO energy auctions fails for several reasons. "Marginal" in LMP refers to the cost of the fuel used to generate electricity.[16] Those costs are not affected by the competitive imperfections about which he expresses concern. So long as the short-term energy market is effectively competitive, pricing at LMP delivers energy at lowest cost to consumers.

Moreover, economists generally agree, few, if any, markets are perfectly competitive, but many today are effectively so.[17] This is very much the case for electric energy markets that are *sui generis* in a number of respects: supply is capital intensive, supply and demand must always equal, the product cannot economically be stored to scale, and both supply capacity and demand are highly inelastic in the short term and even medium term. Nothing in PAO or other departures from uniform pricing at LMP changes these "imperfect" characteristics of electric energy markets.

B. Ubiquitous Political Subsidies to Many Fuel Sources Do Not Change LMP's Delivery of Lowest Cost Energy to Consumers

Politics author fuel subsidies, regardless of the form of pricing an RTO deploys in its short-term energy auction market. Professor Cramton emphasizes, "[t]he main argument against a single clearing-price auction is political, not economic."[18] He expands:

> When electricity prices are high as a result of the high cost of the marginal fuel (*e.g.*, natural gas), critics point to the disparity between the electricity clearing price [in the auction] and the marginal cost of the generators using less expensive fuel (*e.g.*,

16. Cramton, *supra* note 8, at iii; BALDICK, *supra* note 3, at 1-3. The exception is storage, for which the marginal cost is related to the opportunity cost of future purchases and sales of energy as adjusted by storage conversion efficiencies. However, even in the case of storage, the opportunity cost is still related to a marginal cost, albeit the marginal cost under future supply and demand conditions.

17. Economists and engineers who support uniform pricing in short-term auction markets generally agree that energy markets are not perfectly competitive. *See, e.g.*, Kahn, *supra* note 8, at 72-73 (arguing why "generation markets . . . are, at best, only imperfectly [competitive]"); Cramton, *supra* note 8 at ii ("No real market is perfectly competitive."). *See also* Kevin Corcoran, *Fairy Tales and Perfect Markets*, ECONLIB: ECONLOG (Mar. 7, 2023), https://www.econlib.org/fairy-tales-and-perfect-markets [https://perma.cc/7KB6-RJ7L] (stating that "in the real world, markets are never perfectly competitive"); Jason Gordon, *Perfect Competition - Explained*, BUS. PROFESSOR (last updated Mar. 27, 2023), https://thebusinessprofessor.com/en_US/economic-analysis-monetary-policy/perfect-competition-definition [https://perma.cc/GD9X-ZRNK] ("In the real world, there is no such thing like perfect competition."). The one characteristic of perfect competition on which most economists agree is that all sellers and buyers are price takers and not price setters. *See, e.g.*, *Perfect Competition: 3 Examples*, MASTERCLASS (last updated Aug. 31, 2022), https://www.masterclass.com/articles/perfect-competition-examples [https://perma.cc/9WRC-5FLC] ("The market price is equal to the cost of production, and no single firm has the power to charge more.").

18. Cramton, *supra* note 8, at iii.

> nuclear). What [those critics] fail to appreciate is that these higher profits of the low-cost generators are needed to cover the much higher fixed-costs of these resources that use less expensive fuel, such as hydro, nuclear, solar and wind.[19]

Subsidies, direct or indirect, are not unique to electricity supply. Subsidies abound in many energy markets. Commissioner Christie's view of what constitutes a "market" appears to be most offended by tax subsidies provided to incentivize investment in renewable energy—the production tax credit for wind and various biofuels and the investment tax credit for other renewable energy sources. He ignores the direct and indirect subsidies provided to nuclear and fossil fuels,[20] the Price Anderson Act limitation on nuclear liability,[21] the myriad depletion allowances and other tax deductions and write-offs afforded extractive fossil fuels,[22] and the longstanding below market leases on federal lands that have long been available to extractive fossil fuel developers.[23]

A case can be made for eliminating subsidies to promote market efficiency. But if Commissioner Christie objects to fuel subsidies, then he should agitate to have politicians remove all of them, not just those that support renewable energy. Moreover, as Commissioner Christie seems to recognize but declines to address in his article, the ability of producers and users of fossil fuels to externalize the cost of carbon and other air pollution and prevent imposition of a carbon tax is a Pigouvian indirect subsidy.[24] That subsidy is counteracted (at least in part) by the tax credits afforded forms of renewable generation that emit few if any greenhouse gasses or

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19. *Id.*

20. These include lavish federal investments in shale oil and natural gas development through fracking. *See* U.S. Dept. Energy, Off. Energy & Carbon Mgmt., *Shale Research & Development*, ENERGY.GOV (last visited Sept. 29, 2023), https://www.energy.gov/fecm/shale-research-development [https://perma.cc/G8RW-BMWQ] (documenting DOE's far-reaching investment in research and development to increase recovery and operational efficiency of U.S. onshore oil and gas resources).

21. Anthony Heyes, *Determining the Price of Price-Anderson*, REGULATION, Winter 2002-2003, at 26, 28 ("Here is a fact: Capping the liability of nuclear operators (or others engaged in the nuclear sector) for accident damages confers a subsidy on those operators [at an estimated value of $33 million per reactor per year in 2001 dollars].").

22. Clayton Coleman & Emma Dietz, *Fact Sheet/Fossil Fuel Subsidies: A Closer Look at Tax Breaks and Societal Costs (2019)*, ENV'T & ENERGY STUD. INST. (July 29, 2019), https://www.eesi.org/papers/view/fact-sheet-fossil-fuel-subsidies-a-closer-look-at-tax-breaks-and-societal-costs [https://perma.cc/MM8L-2C7S] (including Intangible Drilling Costs Deduction, 26 U.S.C. §263, $13 billion over 10 years; Percentage Depletion, 26 U.S.C. § 613, $12.9 billion over 10 years; Credit for Clean Coal Investment, I.R.C § 48A, $ 1 billion over 10 years). These are only some of the direct subsidies to fossil fuels and do not include indirect subsidies in the form of Master Limited Partnerships, Last-in-First-Out accounting, and the Foreign Tax Credit.

23. *See* Thomas Covert & Ryan Kellogg, *Ensuring Americans Receive Fair Value for U.S. Oil and Gas Resources*, ENERGY POL'Y INST. U. CHI. (July 29, 2019), https://epic.uchicago.edu/area-of-focus/ensuring-americans-receive-fair-value-for-us-oil-and-gas-resources [https://perma.cc/E9BB-5U8B] (documenting history of leases to fossil fuel companies at below market values and with lax environmental damage accountability).

24. Christie, *supra* note 4, at 25 n.105 ("Renewables advocates might argue that thermal resources such as coal and gas have also long received *implicit* subsidies by not being charged for negative externalities such as carbon emissions.").

other air pollutants. Both a carbon tax on fossil fuel combustion and a production tax credit for renewables wind and geothermal affect the variable cost of electricity production and thus determine what would be or is a seller's marginal cost offered into a uniform-price energy auction market.

II. Alternatives to Uniform Pricing Will Not Reduce Prices to Consumers, But Will Reduce Efficiency in RTO Short-Term Energy Auction Markets

A. No Alternative Delivers Electricity at Lower Cost to Consumers Than Uniform Pricing in Short-Term Energy Auction Markets

Conceding that RTO markets and energy markets more broadly are often less than perfectly competitive, does that render uniform pricing at LMP in RTO energy auction markets not the best among pricing mechanisms? Commissioner Christie puts the question this way: "in any debate on a major issue of public policy, the most important question always evokes the Henny Youngman punch line 'compared to what?'"[25] For many years, eminent economists, including the economist Commissioner Christie credits "[a]s one of history's most brilliant regulatory economists, Alfred Kahn,"[26] have analyzed Mr. Youngman's question in the context of RTO short-term energy auction markets and answered that uniform pricing is uniquely the best alternative because it efficiently satisfies market demand at the lowest cost to consumers.[27]

Professor Kahn and his co-author economists and engineers were tasked in 2000 to advise the California Power Exchange "on whether the successful sellers of power in that [short-term electric energy] market should all receive the uniform, market-clearing price . . . or, instead, their several [PAO] prices . . . ."[28] These experts answered categorically "yes" to uniform pricing and "no" to PAO pricing. In their *Electricity Journal* article, they explained that the belief PAO will lower prices to consumers is based on a "naïve expectation" that "after the market rules are changed [from uniform to PAO or other non-uniform pricing], generators will bid just as they had before. *The one absolute certainty . . . is that they will not.*"[29] The authors elaborated:

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25. *Id.* at 5.

26. *Id.* at 29.

27. Kahn, *supra* note 8, at 72.

28. *Id.* at 70. In coordination with the transmission system operations of the California Independent System Operator, the Power Exchange provided the short-term energy balancing market operations of an RTO. Professor Kahn and his co-authors note that the timing of the Power Exchange assignment proved ironic since California's restructured market at the time was performing terribly. Importantly, that terrible performance was attributable to other rules adopted in California, unrelated to uniform pricing in the Power Exchange and other RTO short-term energy balancing markets.

29. *Id.* at 72 (emphasis added).

> Knowing that unless they changed their bidding practice under the new [non-uniform] system they would receive only their avoidable costs on all their successful [offers to sell]—yielding them no contribution to their fixed or common costs, let alone profits—they obviously will universally change their practice immediately, bidding [not at their marginal cost as under uniform pricing, but] instead at what they *expect* will turn out to be the market-clearing price . . . ."[30]

If the *expectation* of the generator offering supply into the RTO energy auction market proves accurate, then PAO or other non-uniform pricing *at best* would approximate the *same* price as uniform pricing. Yet, because the offeror's expectation would be little more than a best guess, not based on known marginal production costs, it likely would prove inaccurate, resulting in inefficient dispatch. In short, there likely would be no consumer savings.

B. Uniform Pricing Facilitates Merit Order Dispatch and Economic Efficiency; Non-Uniform Pricing Would Not

The RTO pricing mechanism story does not end with this absence of consumer savings. While producing no or only negligible savings for consumers, PAO or other departures from uniform pricing likely will undermine merit order dispatch and the overall efficiency of RTO short-term energy auction markets. It will do so by distorting the information that the system operator receives and uses to coordinate merit order dispatch of generation, disadvantaging small suppliers on whom competition depends, reducing demand price responsiveness essential to mitigating generator market power, impeding effective market monitoring, disincentivizing new supply market entry, and blunting competition generally.

1. Non-Uniform Pricing Would Distort Merit Order Dispatch

Merit order dispatch is achieved when generators that clear and are dispatched have the lowest operating cost,[31] which (for all but energy storage)[32] means the lowest fuel cost. Because PAO and other departures from uniform pricing would force electricity generators to speculate where they think the market will clear, low-marginal-cost generators will be incentivized to inflate offers above their true marginal (fuel) cost to maximize fixed

30. *Id. Accord Electricity market design*, EUR. COMM'N, (last visited Sept. 29, 2023), https://energy.ec.europa.eu/topics/markets-and-consumers/market-legislation/electricity-market-design_en [https://perma.cc/T5MB-7EYF] ("In the pay-as-bid model, producers (including cheap renewables) would simply bid at the price they expect the market to clear, not at zero or at their generation costs.").

31. Kahn, *supra* note 8, at 72 (stating that when dispatching power "in merit order of generators from lowest to the highest marginal cost output to meet demand . . . power is supplied at the minimum cost at each point in time").

32. *See supra* note 16.

cost recovery and profit. These incentives will communicate to the system dispatcher offers that do not produce an efficient merit order dispatch based on fuel cost but will instead produce economic waste.

Even to try to forecast accurately where the RTO short-term energy auction market will clear in a non-uniform pricing regime will require the offering generator to survey and assess large amounts of data on market performance. This will be a time-consuming and costly enterprise that favors large generators, incumbent utilities, and the affiliates of those incumbents. Disadvantaged will be smaller or start-up generators that operate on a leaner budget but whose market entry enhances competition and reduces the market power of larger generators and incumbent utilities.[33]

2. Non-Uniform Pricing Would Distort Price Signals to Demand

Empirical evidence shows that in uniform pricing markets clearing prices are more volatile than in PAO and other non-uniform pricing markets, where price spreads are flatter but produce no single clearing price during a pricing interval.[34] This is problematic. First, it is unclear what price each unit of demand would be charged; if each is charged differently, then those charges would likely be found to be unduly discriminatory and unlawful. The same unlawful discrimination risks invalidating the payment to demand responders during a pricing interval. Second, even if PAO charges and payments to all demand were averaged during a pricing interval to prevent (possibly) unlawful discrimination, then demand would still be deprived of an accurate, single clearing price signifying when supply is scarce, to which demand economically could respond.

Further, load that does provide demand response would not be able to make the economic determination in advance that the cost of an average energy charge outweighs the value of the electricity consumption foregone. Since responsive demand is among the most effective tools in mitigating exercises of supplier market power, PAO and other non-uniform pricing will deprive RTO markets of this effective demand-side tool.

Uniform pricing, in contrast, does not discriminate in charges to demand and instead provides a single transparent clearing price to which all demand can economically respond. Commissioner Christie disagrees, arguing that price signals to retail load from uniform pricing in wholesale RTO energy auction markets are "submerged in a retail power bill consisting of numerous non-by-passable charges."[35] This may be a legitimate objection to clutter in state and local retail rate setting, but it is not applicable

33. BALDICK, *supra* note 3, at 23 ("[S]mall market participants face relatively greater costs in the assessment required to form their offers in a [PAO] market than the assessment required for offers in a single price market."). *Accord* Giulio Federico and David Rahman, *Bidding in an electricity pas-as-bid auction*, 24 J. REGUL. ECON. 175, 196 (2003) .

34. BALDICK, *supra* note 3, at 23-24.

35. Christie, *supra* note 4, at 19.

to uniform pricing in RTO wholesale energy auction markets because those wholesale prices stand alone and are not submerged.

3. Non-Uniform Pricing Would Thwart Effective Market Monitoring

All RTO markets have independent monitors that evaluate their performance over time. The monitors are charged with detecting dysfunctions, including exercises of market power, which they are charged to bring to the attention of RTOs and their regulators. Detecting dysfunction is possible in uniform pricing markets because sustained departures from marginal-cost offers are relatively easy to detect and police.[36] Not so under PAO and other departures from uniform pricing because they provide no consistent and reliable metric derived from generators offering supply at their ascertainable marginal cost of production. Instead, those departures would mire the market monitor in inconclusive inquiries into whether the PAO or other non-uniform price supply offeror did a good job in predicting the price at which the market would clear at a node during a pricing interval.

4. Non-Uniform Pricing Would Deter Needed Investment

In the long term, perhaps the most damaging consequence of departing from uniform pricing in short-term energy markets would be on investment in new, competitive low- or zero-emission sources of generation. As Professor Ross Baldick of the University of Texas, Austin explains: "By explicit design, the [uniform] pricing rule in offer-based economic dispatch results in many generators being paid more than their offer."[37] This is desirable, he explains, because the resulting inframarginal returns "contribute[] to paying down the debt or other obligation incurred by the owner to purchase the generator. . . . [W]ithout such inframarginal returns, generators would become bankrupt and no new investment would take place."[38]

C. Other Alternatives to Uniform Pricing Are Uneconomic and Suffer from Many of the Same Pitfalls as PAO

In addition to PAO, Commissioner Christie offers for consideration other alternatives to uniform pricing. In his view, "one obvious alternative . . . is simply to allow buyers and sellers to agree upon a mutually agreeable price for each transaction, just like in real markets."[39] As a model of this "real market," he puts forward the Southeast Energy Exchange Market

36. BALDICK, *supra* note 3, at 24.
37. *Id.* at 5.
38. *Id.*
39. Christie, *supra* note 4, at 23.

(SEEM), which he describes as a "fully automated *bilateral* market operating on a computer algorithm that matches willing buyers and sellers every fifteen minutes."[40] He continues, "[t]here are no transmission costs because only unused transmission capacity is used . . . . A willing buyer and a willing seller set the price for each transaction, using a '*split the difference*' pricing formula that automatically settles each transaction at the mid-point between the offer and bid. . . . Prices are localized to the buyer and seller."[41] "Price signals," he contends, "are transparent and available."[42]

The SEEM model is not a viable alternative to a uniformly priced short-term RTO energy auction market. First, bilateral trades and the uniform-price energy auction market are *not* mutually exclusive. They co-exist in varying degrees in all existing RTO. But they serve different objectives. A seller and buyer in bilateral trades negotiate potentially complicated contract terms. Negotiations can be protracted. This process can meet power supply requirements economically over time but does not lend itself to supporting the RTO's immediate need to coordinate and balance supply and demand in the short-term energy markets and dispatch in merit order. Apparently recognizing that bilateral trades and the RTO auction market serve different purposes and operate in different time frames, Commissioner Christie puts SEEM forward to fix these disconnects. But that too is no alternative pricing solution.

The SEEM model is *not* a bilateral market. It is a multilateral market in which offers and bids are *not* negotiated between a seller and buyer. Rather, it is a "black box" algorithm that connects many sellers' offers and many buyers' bids that settle,[43] as the Commissioner explains, at a "split the difference" price.[44] Neither seller nor buyer know in advance this settlement price; that price may become untethered from marginal (fuel) costs. Consequently, both the seller and buyer will have to speculate where the "split" will land, just as supply offerors would have to speculate where prices will clear in a PAO or other non-uniform pricing market.

More problematic, the dispatcher will receive no marginal cost information needed to dispatch generation in merit order. The SEEM algorithm thus perpetuates PAO and other non-uniform price distortions of merit order dispatch, disadvantages small generators, deters new market entry, and blunts the effectiveness of demand response and market monitoring.

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40. *Id.* (emphasis added).

41. *Id.* (emphasis added).

42. *Id.*

43. *Cf. supra* note 1.

44. In response to FERC's First Deficiency Letter asking for the mathematical details of the optimization problem that the algorithm solves, SEEM's lead proponent, the Southern Company on behalf of Alabama Power, demurred on the ground that explaining the software platform that implements the SEEM algorithm and solves SEEM's matching and dispatch would be a "significant undertaking and possibly an additional material . . . expense in addition to the planned cost of hiring a software vendor." Ala. Power Co., Docket Nos. ER21-1111-001, et al., SEEM Deficiency Response, at 38 (June 7, 2021). So much for transparency.

Tellingly, the SEEM allows only incumbent load-serving utilities operating in its multi-state footprint to be full SEEM Participants that set the rules and resolve disputes so they can guarantee that uncertain or speculative outcomes resolve in their favor. All other market participants are relegated to the relatively powerless status of Non-Member Participants.[45]

As another alternative to uniform pricing, Commissioner Christie suggests bifurcating the energy market, establishing different clearing prices for low-marginal cost resources such as wind and solar and another for natural gas and presumably other higher marginal-cost fossil fuels. In his view, this bifurcation could "solve" the problem identified by Professor Kahn and his co-authors that PAO would not appreciably lower prices, if at all, since "low marginal cost sellers would simply game the market by offering at or near what they think the clearing price will be anyway, so consumers really save no money."[46] Here again, bifurcation hardly seems a viable substitute for uniform pricing in RTO energy auction markets. The Commissioner offers no solution for how solar and wind generators could, should, or would offer their power under bifurcation.[47] Since those generators have close to no marginal cost, they could continue to offer in as a price taker (zero price) and never recover fixed cost or make any profit and promptly become bankrupt. Higher marginal-cost generators would then operate in a smaller fishbowl, with increased market power. Anyone who cares about efficient dispatch and economical and reliable service (not to mention reducing greenhouse gas and other polluting emissions) should question this bifurcation approach.

45. The reader might ask how FERC ever could have approved such a discriminatory market model. The answer is FERC did not. When SEEM was proposed, the Commission had only four of what should be a full slate of five commissioners. Two of those four, including Commissioner Christie, voted to approve the SEEM tariff over the objection of public interest organizations and affected states. Two Commissioners voted to reject it as discriminatory and inconsistent with various regulatory principles, including open access to the interstate transmission grid. But due to a 2018 amendment to the Federal Power Act, 16 U.S.C. § 824d(g), deadlocked votes permit tariff filings such as SEEM to take effect by operation of law without ever being found to be in the public interest or just and reasonable. *See* Allison Clements, Comm'r, FERC, Fair Rates Act Statement on Southeast EEM (SEEM) (Oct. 21, 2021), https://www.ferc.gov/news-events/news/commissioner-clements-fair-rates-act-statement-southeast-eem-seem [https://perma.cc/NR9A-VSYV]. FERC's deadlock order approving SEEM was remanded to the Commission, and its order approving the Member tariffs was remanded in part and vacated in part, in *Advanced Energy United, Inc. v. Federal Energy Regulatory Commission,* 77 F.4th 719 (D.C. Cir. 2023).

46. Christie, *supra* note 4, at 23. *See* text accompanying notes 29-30 and accompanying text.

47. Commissioner Christie's brief nod to bifurcation does not detail what he proposes to bifurcate: supply, demand, or both. Were it to be supply, then it might resemble a renewable portfolio standard common in many states. Were it to be demand, then it would be the inverse, a renewable consumption standard. However, renewables are use-it-or-lose it, and of uncertain availability. Bifurcation of supply, demand or both would inevitably result in less dispatch of renewables (and therefore greater reliance on fossil-fuel generation with higher operating costs) than in a non-bifurcated or unitary market where dispatchers are able to use essentially all available renewables whenever they are available.

Conclusion

Uniform pricing at LMP in RTO short-term energy auction markets has been and continues to be economically efficient because, under effectively competitive conditions, offers to sell and bids to buy reflect marginal valuations. Any reduction in the cost of electric energy to consumers by changing pricing in RTO energy auction markets from uniform to some other form of pricing would at best would be slight and short-lived, if achieved at all, due to the collateral damage such a change would inflict on efficient merit order dispatch, market participation by small or new entrant generators, the effectiveness of demand response in countering market power, market monitoring, and incentives to invest in future generation additions. Rather than committing limited resources to reconsidering well-functioning uniform pricing at LMP in RTO energy auction markets as Commissioner Christie recommends, FERC's resources would be better spent elsewhere.[48]

48. For example, in finalizing proposed but long overdue rules to expedite and improve regional transmission planning. Building for the Future Through Electric Regional Transmission Planning and Cost Allocation and Generator Interconnection, 87 Fed. Reg. 26504 (proposed May 4, 2022) (to be codified at 18 C.F.R. pt. 35). *See supra* note 5.