UNITED STATES OF AMERICA
BEFORE THE
FEDERAL ENERGY REGULATORY COMMISSION

PJM INTERCONNECTION, L.L.C.	)))	DOCKET NO. ER18-1314-000

COMMENTS OF THE INSTITUTE FOR POLICY INTEGRITY AT NEW YORK UNIVERSITY SCHOOL OF LAW

Pursuant to the Federal Energy Regulation Commission's ("Commission" or "FERC")

April 9, 2018 Combined Notice of Filings #1, the Institute for Policy Integrity at New York

University School of Law ("Policy Integrity") hereby files these limited comments in the above-

captioned proceeding.[1] On April 9, 2018, PJM Interconnection, L.L.C. ("PJM") filed, under

Federal Power Act Section 205,[2] proposed revisions to the Reliability Pricing Model ("RPM")

rules in the PJM Open Access Transmission Tariff ("Tariff").[3] Specifically, PJM requested the

Commission accept a proposal to change the rules under which the market clearing price for

capacity is determined ("Capacity Repricing"). In the alternative, PJM requested that the

Commission approve an extension of its Minimum Offer Price Rule ("MOPR") to additional

resources ("MOPR-Ex").

As discussed further below, PJM's proposals rest on a faulty premise that state public

policies are distorting the economic efficiency of capacity market price signals. But, the state

policies at issue here—including programs to pay renewable and nuclear generation for the

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[1] On April 25, 2018, Policy Integrity filed a timely motion to intervene in this proceeding by doc-less intervention. This document does not purport to present New York University School of Law's views, if any.

[2] 16 U.S.C. § 824d.

[3] Capacity Repricing or in the Alternative MOPR-Ex Proposal: Tariff Revisions to Address Impacts of State Public Policies on the PJM Capacity Market, Docket No. ER18-1314 (filed Jan. 8, 2018) ("PJM Filing").

economic value of the air pollution emissions such as CO_2 that they avoid—are intended to correct a market failure: unpriced environmental and public health externalities. As such, these "externality payment" programs help enhance market efficiency. In contrast, changes to PJM's RPM rules that are intended to "accommodate" or "mitigate" these programs in ways that would undermine their effectiveness would distort the economically efficient entry and exit signals of generation resources, and so would not be just and reasonable.

Putting aside the fact that PJM's proposals would undermine the efficiency-enhancing effects of externality payments, PJM has not met its burden to demonstrate, with substantial evidence,[4] that "actionable" state subsidies are in any way detrimental to capacity markets. Even less so has PJM demonstrated that the "actionable" state subsidies' effects are so detrimental that they justify the potential negative impacts on economic efficiency of the proposals. In fact, due to specific market design considerations, both Capacity Repricing and MOPR-Ex themselves risk undermining the integrity of the capacity markets. They are, therefore, not just and reasonable.

PJM proposes to take action only for a subset of policies that have the effect of subsidizing generation. However, PJM has not provided clear definitions or thresholds for what constitutes a "material" or "actionable" state subsidy subject to repricing or mitigation. As such, both Capacity Repricing and MOPR-Ex are arbitrary and unduly discriminatory.

Accordingly, the Commission should reject both proposed revisions to the RPM rules because they violate Section 205's requirement that public utility rates and charges subject to the Commission's jurisdiction and rules affecting such rates or charges be just and reasonable and not unduly discriminatory and preferential.

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[4] *Kansas Gas & Electric Co. v. FERC*, 758 F.2d 713, 719-20 (D.C. Cir. 1985) (utility proposing departure from status quo bears burden of proof); *id.* at 721 ("findings of fact must be supported by 'substantial evidence in the record.'") (quoting 16 U.S.C. § 825l).

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I. DESCRIPTION OF COMMENTER

Policy Integrity is a non-partisan think tank dedicated to improving the quality of government decisionmaking through advocacy and scholarship in fields of administrative law, economics, and public policy. Policy Integrity consists of a team of legal and economic experts, trained in the application of economic principles to regulatory decisionmaking and the proper scope and estimation of costs and benefits. An area of special concern for Policy Integrity is the pricing of externalities in the promulgation of state and federal regulations. Our Director, Professor and Dean Emeritus Richard Revesz, as well as our Energy Policy Director, Dr. Burcin Unel, have published extensively in the areas of environmental law and energy policy design.

Harnessing this academic foundation, Policy Integrity has participated in numerous proceedings before the Commission, regional transmission organizations ("RTO"), and state public utility commissions regarding the socially efficient pricing of energy resources at the wholesale and retail levels. In these and other proceedings, Policy Integrity has been actively involved in the development of policies to properly account for the benefits of greenhouse gas emission reduction in the pricing and deployment of electric generation resources. In a recent report, *Capacity Markets and Externalities: Avoiding Unnecessary and Problematic Reforms*, Policy Integrity economists Dr. Sylwia Bialek and Dr. Burcin Unel have also analyzed the efficiency benefits of externality payments on capacity prices and the implications for reform of Commission-jurisdictional capacity markets.[5] These comments draw heavily on that report, which is attached as **Exhibit A**.

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[5] SYLWIA BIALEK & BURCIN UNEL, CAPACITY MARKETS AND EXTERNALITIES: AVOIDING UNNECESSARY AND PROBLEMATIC REFORMS (2018), http://policyintegrity.org/publications/detail/capacity-markets-and-externalities [hereafter "CAPACITY MARKETS AND EXTERNALITIES"].

II.   BACKGROUND

The Federal Power Act is a "collaborative federalism statute[], envision[ing] a federal-state relationship marked by interdependence."[6] Consistent with this relationship, a number of states within PJM have developed and are implementing policies to pay for the environmental benefits that result when electricity is generated by certain non-emitting resources. These payments are "premised on promoting policy goals such as improved air and water quality [and] reduction of greenhouse gas emissions."[7] Yet, PJM has submitted to the Commission two alternative proposals for changing its capacity market rules to limit the effects of these payments on capacity prices and, in the process, risks undermining their intended effects in manner that is contrary to the goals of the states.

A. Development of State Externality Payment Policies

Consistent with their traditional authority under the Federal Power Act, states and localities throughout PJM have long implemented a variety of policies intended to regulate the means of electricity generation. [8] Over half of the states within PJM have long maintained policies to compensate renewable energy resources for the environmental benefits they provide.[9] These state renewable procurement programs originated in 1998—shortly after the formation of PJM as a Commission-approved Independent System Operator and long before PJM adopted the RPM—and over time have expanded throughout the region.[10] As generally constructed, states

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[6] *Hughes v. Talen Energy Marketing*, 136 S.Ct. 1288, 1300 (2016) (Sotomayor, J., concurring).

[7] *Am. Ref-Fuel Co.*, 105 FERC ¶ 61,004, P 4 (2003) (describing state renewable energy credit programs).

[8] *Hughes*, 136 S. Ct. at 1292 ("The States' reserved authority includes control over in-state 'facilities used for the generation of electric energy'" (quoting 16 U.S.C. § 824(b))).

[9] *See e.g.,* Illinois Public Act 99-0906 § 1.5(3) (reaffirming that "the existing renewable portfolio standard has been successful in promoting the growth of renewable energy generation to reduce air pollution in Illinois").

[10] GALEN L. BARBOSE, LAWRENCE BERKELEY NATIONAL LABORATORY, U.S. RENEWABLES PORTFOLIO STANDARDS: 2017 ANNUAL STATUS REPORT 8 (2017), http://eta-publications.lbl.gov/sites/default/files/2017-annual-rps-summary-report.pdf.

require distribution utilities to purchase a certain number of renewable energy credits ("RECs") directly or indirectly from renewable generators. The purchase of RECs provides renewable generators with additional payment for attributes other than the energy they produce, including the value of the avoided environmental effects that result when renewable resources displace conventional fossil fuel generation on the electric grid.[11]

More recently, states within PJM have adopted policies aimed at compensating a broader range of generation resources for the value of avoided environmental harm. In 2016, Illinois enacted the Future Energy Jobs Act, which added a program to compensate existing nuclear generators for the reduced air pollution they provide by avoiding generation from emitting resources.[12] In 2018, the New Jersey legislature adopted a similar program for similar purposes.[13] These programs provide nuclear generators payments through the purchase of zero emission credits ("ZECs"), which are explicitly tied to the value of avoided greenhouse gas emissions.[14]

While the number of technologies and the number of megawatt-hours (MWhs) eligible under these state programs has increased, the general purpose of these programs has remained the same. They are intended as "externality payments"—that is, payments to clean generators for avoiding harmful emissions that would otherwise be produced by fossil-fuel-fired power plants.

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[11] *See* JAN HAMRIN, CLEAN ENERGY STATES ALLIANCE, REC DEFINITIONS AND TRACKING MECHANISMS USED BY STATE RPS PROGRAMS 30-31 (2014), https://www.cesa.org/assets/2014-Files/RECs-Attribute-Definitions-Hamrin-June-2014.pdf (showing the definition of REC in PJM-GATS, the tracking system used by PJM states, includes "all of the attributes from one MWh of electricity generation from" qualifying renewable resource including "environmental attributes").

[12] Illinois Public Act 99-0906 § 1.5(3) ("Illinois must expand its commitment to zero emission energy generation and value the environmental attributes of zero emission generation that currently falls outside the scope of the existing renewable portfolio standard, including, but not limited to, nuclear power.").

[13] N.J. S2313 § 1(a)(6) ("[T]o achieve its near term environmental goals, New Jersey must expand its commitment to zero-emission energy generation and value the air quality and other environmental attributes of zero-emission generation sources that currently fall outside the scope of the existing renewable energy portfolio standard, including but not limited to nuclear power").

[14] 20 ILL. COMP. STAT. 3855 / 1-75(d-5)(1)(B); New Jersey S2313 § 1(a)(8).

Like policies that aim to internalize the externality of air pollution by charging generators for emitting air pollution, these externality payments aim to align private and social costs and benefits of different types of resources by paying non-emitting generators for the value of avoided emissions.

B. PJM's Tariff Filing

At the root of PJM's filing is a concern that state policies that provide externality payments to zero-emitting resources will allow them to submit lower bids in the RPM, purportedly inefficiently suppressing capacity prices,[15] ultimately distorting investment decisions and leading to inefficient entry and exit incentives for resources in Commission-jurisdictional wholesale markets.[16] PJM has proposed two alternative changes to its Tariff aimed at "protecting the capacity market from the ill effects" of "actionable subsidies": Capacity Repricing and MOPR-Ex.[17]

Under Capacity Repricing, PJM would revise the RPM rules to introduce a two-stage capacity auction.[18] The first stage of the auction would operate as the RPM currently does. Each individual resource would submit initial bids and the resources that clear the market—that is, receive capacity obligations and payment—would be those with the lowest bids up to the point that capacity needs are met.[19] However, unlike the current RPM process, the price paid to cleared resources would not be the bid of the marginal resource that cleared the first-stage auction. Rather, at the second stage, PJM would select certain resources that it determines to have

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[15] PJM Filing at 25-26 (listing the "subsidies of concern" as zero-emission credit payments, off-shore wind procurement, and renewable portfolio standard programs).

[16] *See generally id.* at 24-35. *See also* CAPACITY MARKETS AND EXTERNALITIES at 9 (for the more thorough description of the feared price effect).

[17] PJM Filing at 51-53.

[18] *See generally id.* at 59-69.

[19] *Id.* at 51.

submitted artificially suppressed bids, and would replace their bids with an alternative that PJM determines to be "competitive."[20] The capacity price is, then determined, based on that adjusted set of bids.

PJM argues that the two-stage capacity pricing scheme would raise the capacity prices to a level reflecting the bids that would have been offered without externality payments, and hence would prevent capacity price distortions.[21] Because resources that receive externality payments would still be able to clear the capacity market and receive capacity payments, PJM asserts that Capacity Repricing "accommodates" state policies.[22]

In the alternative, PJM has requested that the Commission approve a replacement of its existing MOPR,[23] which was intended to address buyer-side market power, with a new rule more directly targeted at "mitigating" state externality payments.[24] While MOPR has applied in only limited circumstances to *new* gas-fired generation, MOPR-Ex would apply to new and existing units that receive actionable subsidies, including externality payments. Under MOPR-Ex, resources that benefit from actionable subsidies would be prevented from clearing the capacity auction if their bids exceed a level determined by PJM to represent a "competitive" bid—that is, a bid that does not reflect those subsidies.

PJM identifies externality payments as the "subsidies of concern," which it seeks to address through Capacity Repricing and MOPR-Ex.[25] While the details differ between Capacity Repricing and MOPR-Ex, a resource would be subject to the capacity market changes if it is a

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[20] *Id.* at 51.
[21] *Id.* at 63.
[22] *Id.* at 53.
[23] *See generally id.* at 96-116.
[24] *See PJM Interconnect L.L.C.*, 117 FERC ¶ 61,331 at P 34 (2006).
[25] PJM Filing at 25-26 (listing the "subsidies of concern" as zero-emission credit payments, off-shore wind procurement, and renewable portfolio standard programs).

"capacity resource with actionable subsidy."[26] A resource will be a capacity resource with an actionable subsidy if it:

(i)   is a new or existing resource, but not an energy efficiency resource;[27]

(ii)   receives *material* direct or indirect financial support from a government entity, except support intended for industrial development, intended to encourage siting resources in a particular area, or provided by the federal government;[28]

(iii)   receives a subsidy that is valued at a level greater than 1% of anticipated revenue the resource receives from the energy, capacity and ancillary services markets;[29]

(iv)   is primarily engaged in energy production rather than waste management or production of steam heat;[30] and,

(v)   is owned by an entity other than a vertically integrated, cooperative, or municipal utility.[31]

PJM has asserted that both Capacity Repricing and MOPR-Ex are just and reasonable means of addressing the effects of these "subsidies of concern,"[32] but PJM expressed a preference for Capacity Repricing. Nonetheless, PJM has requested that the Commission approve MOPR-Ex if it is not able to approve Capacity Repricing as just and reasonable.

III.   EXTERNALITY PAYMENTS HELP ENHANCE EFFICIENCY; MARKET RULES DESIGNED TO UNDERMINE THEM ARE NOT JUST AND REASONABLE

PJM characterizes its current proposals to reform RPM rules as merely the logical

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[26] For Capacity Repricing, actionable subsidies must also apply to over a threshold amount of resources that clear the first stage in PJM as a whole or in a single Locational Deliverability Area to be considered "material." *Id.* at 91.

[27] *Id.* at 72-3. Under Capacity Repricing, generation resources must be greater than 20 MW. *Id.* at 73. Under MOPR-Ex, this threshold would exclude Qualifying Facilities but would include other resources less than 20 MW. *Id.* at 99.

[28] *Id.* at 70.

[29] *Id.* at 74.

[30] *Id.* at 74.

[31] *Id.* at 75. For MOPR-Ex, PJM has proposed to retain the prior self-supply exemption and add a public entity exemption. These exemptions have limitations with respect to the net short and net long position of resources. *Id.* at 106-110.

[32] *Id.* at 53.

extension of prior Commission-approved RPM changes intended to mitigate capacity market

price suppression caused by uncompetitive state policies.[33] However, PJM's proposals fail to

take into account the fundamental difference between the state policies that prior reforms were

meant to address, and the policies at issue here. Namely, the state policies that elicited concern

from PJM and the Commission in the past were largely attempts by states to dictate capacity

additions from in-state resources for generally parochial reasons, not targeted at addressing a

specific market failure.[34] On the other hand, the state policies that PJM has labeled "subsidies of

concern" in this proceeding are designed to enhance the economic efficiency of wholesale

markets by addressing market failures. Therefore, it is misguided to treat these two separate

categories of payments in the same way. The Commission should therefore reject PJM's tariff

revisions, which would undermine state policies that enhance economic efficiency, as unjust and

unreasonable.

A. Externality Payments Help Improve Economic Efficiency

A key principle of economics is that competitive markets maximize social welfare.

However, the result that competitive markets are economically efficient relies on idealized

assumptions about the structure of the market.[35] When those assumptions are violated, markets

often fail to achieve economically efficient outcomes.[36] For example, market outcomes are not

efficient when market transactions fail to take into account the cost of damage they cause to third

parties through a "negative externality."[37] Air pollution is a classic example of a negative

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[33] *Id.* at 36.
[34] *PJM Interconnection*, 135 FERC ¶ 61,022 (2011) ("April 2011 Order"), *reh'g denied*, 137 FERC ¶ 61,145 (2011)
   ("November 2011 Order").
[35] *See* CAPACITY MARKETS AND EXTERNALITIES at 6.
[36] *Id*.
[37] *Id.*

externality. As a by-product of electric generation, fossil-fuel-fired power plants emit many

pollutants such as nitrous oxides, sulfur dioxide, particulate matter, and ammonia.[38] The

electricity sector is also one of the main sources of greenhouse gas emissions (29% of U.S.

emissions in 2015).[39]

The combined capacity, electricity and ancillary services markets have generally been

successful at providing reliable energy to consumers. Nonetheless, these markets have largely

disregarded the harm those emissions cause.[40] And, when external damages are not internalized,

polluters effectively receive an "implicit" subsidy. If polluters do not need to fully pay for the

external damages they cause, they make decisions to generate, enter, or exit that result in more

pollution than is economically efficient, and hurt social welfare. As a result, wholesale energy

markets that fail to account for externalities do not yield economically efficient outcomes.

Indeed, simply modifying PJM's own statements that purport to justify the need for capacity

market reform to acknowledge the existence of externalities provides an excellent explanation

for why markets currently lead to inefficient outcomes (bolded text is added to PJM's statements

in its filing):

- "[**Externalities**] undermine robust competition because other sellers cannot compete
  against a substantial [**implicit**] subsidy available only to select capacity sellers;
- [**Externalities**] distort price signals needed to guide orderly entry and exit because
  the clearing price does not reflect the [**social**] costs of the committed resources that,

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[38] *Id.*
[39] *Id*.
[40] For estimates of monetary damages due to air pollution exposure for $PM_{2.5}$, SO_2, NO_x, NH_3, and VOC from electric power generation, oil and gas extraction, coal mining, and oil refineries for selected years see Paulina Jaramillo & Nicholas Z. Muller, *Air Pollution Emissions and Damages from Energy Production in the U.S.: 2002-2011*, 90 ENERGY POLICY 202, 202–211 (2016) (for 2011 the paper estimates that damages associated with the investigated emissions totaled 131 billion dollars (in 2000$)). *See also* JEFFREY SHRADER, BURCIN UNEL & AVI ZEVIN, VALUING POLLUTION REDUCTIONS. HOW TO MONETIZE GREENHOUSE GAS AND LOCAL AIR POLLUTANT REDUCTIONS FROM DISTRIBUTED ENERGY RESOURCES (2018), http://policyintegrity.org/documents/valuing_pollution_reductions.pdf [hereafter VALUING POLLUTION REDUCTIONS].

in reliance on the [**implicit**] subsidy, offered well below their net [**social**] costs of committing as capacity;

- [**Externalities**] do not result in selecting least[-**social**]-cost resources that possess the attributes sought by the market, because those resources may be priced out by [**implicitly**] subsidized resources that are selected despite their higher [**social**] costs;

- [**Externalities**] undermine price transparency because the actual [**social**] cost of providing capacity is not being transparently communicated since it is masked by the [**implicit**] subsidy."[41]

Well-designed externality payments help correct these failures, and, in the process help improve economic efficiency of entry and exit behavior. Thus, the impact of state policies on capacity prices does not necessarily imply a worse outcome in terms of economic efficiency. Rather, measured from the perspective of overall societal welfare, those deviations could reflect more efficient outcomes as the markets start taking the external cost of emissions into account.

1. Externality payments help correct market failures

Whenever the market fails because of negative externalities, the typically prescribed, "first-best" solution is a corrective tax. Taxes force market participants to directly "internalize the externality."[42] However, when taxation is not feasible, policymakers can address negative externalities by subsidizing resources that do not produce the externality.[43] While such "second-best" policies are generally inferior to first-best ones, they can still substantially improve the economic efficiency of the market compared to a "no-policy" option. By introducing payments that are related to the value of avoided emissions, these policies attempt to ensure that the difference in revenues between clean and polluting generators account for the external costs to a degree similar to what would result under a "first-best" policy.

As a result, well-designed externality payments change the generation mix in a way

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[41] PJM Filing at 46
[42] *See* CAPACITY MARKETS AND EXTERNALITIES at 7.
[43] *Id.*

similar to changes induced by first-best emissions taxes.[44] A first-best emissions tax increases the marginal costs of energy generation of polluting units based on the external damages that generators cause, forcing them to bid higher in both energy and capacity markets. Generators with higher emissions would clear the auctions less frequently and, when they clear, earn less net revenue per MWh. For example, under a first-best carbon pricing policy, a coal generator would need to pay a tax equal to the climate damages it causes and, hence, would earn significantly lower net revenue. On the other hand, under a first-best emissions tax, non-emitting resources would not need to increase their bids. Therefore, they would clear the auctions more often and would receive higher net revenue.

A first-best carbon pricing policy would, therefore, give a strong exit signal to the most carbon-intensive resources because it would significantly lower their profits. Their profits might even fall to the point that some may be forced to exit the market. And, the prospect of low profits would deter new entry of these types of resources. On the other hand, non-emitting resources would face a strong entry signal under the first-best carbon pricing policy. The prospect of high revenues would lead to higher entry and slower exit of non-emitting resources.

These entry and exit incentives are similar for well-designed externality payments.[45]

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[44] *Id.* at 11.

[45] The similarity in the outcomes under taxation of externalities and payments to avoid externalities can be seen by analyzing a simple case of inelastic demand, one type of emitting generator and payments for attributes set at the value of avoided emissions. Here, the two policies are indistinguishable from the perspective of the generators as they lead to the same profits at the equilibrium. Let t denote the corrective tax rate, s the payment for clean attribute, x the amount of clean generation, y the amount of dirty generation, $MC_x(x)$ and $MC_y(y)$ the aggregate supply curves associated with the two types of generation, and ext the value of avoided emissions. The market solution under optimal tax is characterized by conditions: $x^t+y^t=Q$ and $MC_x(x^t)=MC_y(y^t)+t$. On the other hand, with payments for attributes the market will generate electricity such that: $x^s+y^s=Q$ and $MC_x(x^s)-s=MC_y(y^s)$. Whenever payment for clean attributes are set at the value of avoided pollution ($s=t=ext$) the solutions of those equations are the same: $x^s=x^t=x^*$ and $y^s=y^t=y^*$. As the market price in the tax case differs from the market price with payments for attributes by value of avoided emissions: $p^t=MC_x(x^*)=p^s+ext$, the achieved profits are the same no matter which of the policies gets implemented. Consequently, as the two regimes are undistinguishable for generators in any period, their effect on dynamic incentives for entry and exit (and, thus, the capacity market) will also be the same. Clearly, in such a case the payments for attributes send exactly right signals to the resources.

When clean resources receive externality payments, they clear the auctions more often and receive higher net revenue for their generation compared to resources that do not receive externality payments. This potential for higher revenue will lead to increased entry and slower exit. On the other hand, emitting resources receive relatively less revenue and the decrease in profits leads to relatively higher levels of exit or delayed entry.

The existence of externalities, therefore, changes what can be considered economically efficient. A generating unit that appears to be profitable given market revenue, and therefore "economic" when considering only private costs, may actually be socially "uneconomic" when its emissions are taken into account because its net revenues are lower than the harm it causes. Similarly, a generating unit that appears uneconomic based on its wholesale market revenues alone may nevertheless be socially "economic" and viable if it could capture, through externality payments, the economic value of the environmental benefits it provides.

But, because of the presence of environmental externalities, the market alone will not provide the socially optimal entry and exit signals. Under PJM's tariff proposal, generators that would leave the market under a pollution tax, but would not have left otherwise, are assumed to be "economic." However, they are socially "uneconomic" when external costs are considered. For example, the annual external damages associated with the climate change damages from CO_2 emissions of a typical 1,000 MW coal plant, not taking into account damages from other pollutants, would amount to about $234.3 million[46] based on the Interagency Working Group's

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While, current energy market conditions do not exactly match the conditions for profit equivalency described above, the results convey the intuition for similarities between corrective taxes and payments for attributes and can be seen as approximation of the actual outcomes.

[46] An average coal plant operated with a 53.5% capacity factor in 2017. Electric Power Monthly, U.S. ENERGY INFO. ADMIN. (2018), https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_a (last visited Apr. 24, 2018). A typical coal plant has an average emission rate of 1 ton per MWh. VALUING POLLUTION REDUCTIONS at 10. Therefore, a 1,000 MW coal plant would produce 1,000*8760*53.5%= 4,686,600 MWh of electricity and about 4,686,600 tons of carbon dioxide. The monetary damages of these emissions equal to

Social Cost Carbon.[47] Under a first-best carbon tax, this coal generator would pay a tax equal to this damage, and thus would face a strong exit signal.

Similarly, if a generator that would not have cleared an auction without an externality payment submits a bid that allows it to clear after getting such a payment, it does not imply that the generator is "uneconomic" and that externality payments distort competition or efficiency. Rather, it suggests that the presence of the generator is "economic" from a social perspective. State policies that are directly constructed to produce socially desirable outcomes in the form of reduced externalities should be seen as instruments that help fix a market failure and "level the playing field," not as instruments that distort the market through inefficient subsidies. For many of these policies, the level of the payments introduce a difference in revenues between clean and emitting generators that aims to approximate the revenue the resources would have gotten if the external costs of pollution were taken into account in the energy market. For example, under the Illinois ZEC program, nuclear resources receive payments based directly on the emission rate of displaced generation and the best estimate of the monetary value of the climate damages avoided by displacing that generation, which is the Social Cost of Carbon.[48] Thus, a policy offering externality payments does not inefficiently distort market outcomes but rather moves the market towards more economically efficient outcomes from a societal perspective.

$234,300,000 in 2017 dollars using the Interagency Working Group's Social Cost of Carbon value of about $50 per ton in 2017 dollars. *See* Interagency Working Group on Social Cost of Greenhouse Gases, *Technical Support Document: Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866,* at 16 (2016), https://www.epa.gov/sites/production/files/2016-12/documents/sc_co2_tsd_august_2016.pdf.

[47] The Social Cost of Carbon measures and monetizes the damage that results from emission of a ton of CO2 into the atmosphere. The Interagency Working Group's (IWG) 2016 Social Cost of Carbon estimate is the best currently available estimate for the external cost of CO_2 emissions. IWG's methodology has been repeatedly endorsed by reviewers. In 2014, the U.S. Government Accountability Office concluded that IWG had followed a "consensus-based" approach, relied on peer-reviewed academic literature, disclosed relevant limitations, and adequately planned to incorporate new information through public comments and updated research. *See* GOV'T ACCOUNTABILITY OFFICE, GAO-14-663, REGULATORY IMPACT ANALYSIS: DEVELOPMENT OF SOCIAL COST OF CARBON ESTIMATES 12-19 (2014), http://www.gao.gov/assets/670/665016.pdf.

[48] 20 ILL. COMP. STAT. 3855 / 1-75(d-5)(1)(B).

Corrective subsidies, such as externality payments, that aim to increase market efficiency in the presence of externalities are an important and desirable tool for policymakers. Capacity market reforms that could undermine these externality payments, like the Capacity Repricing and MOPR-Ex proposals, will more likely reduce rather than enhance the efficiency of markets.

Importantly, externality payments differ from traditional subsidies such as payments intended to develop generation in a particular state or location, which may result in economic development in one area, but only at the expense of economic development elsewhere.[49] These traditional subsidies that do not target any market failure reduce social welfare by inefficiently distorting market allocations. The corrective effects of externality payments are desirable given the high external costs emitting resources impose on society, even if they are second-best policies.

The market signals sent by externality payments guide the generation mix in the right direction. Therefore, externality payments help correct existing market distortions, rather than exacerbate them. And misguided adjustments to capacity markets may cancel out those corrective effects.

2. **Externality payments may increase the economic efficiency of entry and exit behavior**

Prices in energy and capacity markets are closely intertwined.[50] As prices in energy markets are distorted due to negative externalities, current capacity prices are distorted as well. Thus, well-designed externality payments that affect capacity prices do not cause a worse outcome in terms of social welfare, or, economic efficiency by "distorting" entry and exit behavior. Rather, measured from the perspective of overall societal welfare, those deviations

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[49] CAPACITY MARKETS AND EXTERNALITIES at 7,11.
[50] *Id.* at 6; James F. Wilson, *Forward Capacity Market CONEfusion*, 23 ELECTRICITY JOURNAL 25 (2010).

would reflect more efficient outcomes as the markets start taking the external cost of emissions into account.

It is insufficient to compare the marginal generation costs or going forward costs of various power plants to understand which generators are socially desirable in the long-term, which generators should receive entry signals, and which generators should receive exit signals.[51] Because capacity and energy markets are interrelated, a totality of factors, including the properties of the existing generation mix, and, capacity factors, must be considered for such an analysis.[52] Additionally, external damages associated with individual power plants must be considered as they alter the socially efficient generation mix.[53]

Externality payments indirectly affect the profitability of polluting resources, both through energy markets and capacity markets. Under a policy scenario with externality payments, emitting resources will enter less frequently and exit more quickly.[54] But this change in entry and exit incentives enhances efficiency, rather than distorts it. After all, the introduction of first-best taxation of externalities, which, by definition, would lead to a socially efficient generation mix, would also lead to lower revenues for emitting resources and, thus, faster exit of those resources. Indeed, the exit of the most polluting resources such as coal- and oil-fired plants would be even higher under the first-best policy of emissions taxes.

On the other hand, the prospect of additional revenues from externality payments cause those generators to bid lower than they otherwise would in wholesale energy markets, and encourage market entry of resources that otherwise would not have entered. Therefore, the

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[51] Engineers use a concept call screening curves to identify the efficient mix of generators. CAPACITY MARKETS AND EXTERNALITIES at 13-14.
[52] *Id.*
[53] *Id.*
[54] *See id.*

increased exit of some types of resources and the increased entry of others does not necessarily

imply that capacity markets are "distorted."[55] Rather, it shows that externality payments are

causing market outcomes to move toward a more socially efficient outcome.

B. PJM's Proposal Undermines State Policies that Enhance Efficiency And Is Unjust and Unreasonable

PJM's entire proposal rests on the claim that the underlying problem is that "subsidized

resources" are distorting efficient prices.[56] However, the underlying cause of inefficiency in

wholesale markets is the fact that wholesale markets currently do not internalize the externalities

that result from emission of air pollution. Unless the underlying problem of unpriced

externalities is addressed, either directly through federal or RTO-wide policy or less completely

through state externality payments, market outcomes will continue to be economically

inefficient. PJM's proposals (and especially the MOPR-Ex proposal) will exacerbate these

inefficiencies to the extent that they undermine state policies and move entry and exit signals

further from the socially efficient level. For that reason, PJM's proposals are not just and

reasonable, and should be rejected.[57]

In addition, both proposals will lead to decreased energy prices as the two markets are

intertwined. And, because clean resources rely on energy revenue more heavily than on capacity

payments, both Capacity Repricing and MOPR-Ex risk undermining state efforts to address

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[55] Externality payments, as currently implemented by states, and ideal pollution taxes both aim at internalizing externalities of electric generation, but are not identical. Current externality payments disregard the pollution intensity of emitting resources. Consequently, these policies treat all polluting power plants the same way. First-best policy would result in stronger negative signals for coal and oil-fired power plants than for gas generators. In other words, with the current system of externality payments, some gas generators might be likely to exit slightly too early and enter too little while coal plants might exit too slowly and enter too much, compared to the socially efficient outcome.

[56] PJM Filing at 57.

[57] *PJM Interconnection, L.L.C.*, 147 FERC ¶ 61,108 at P 68 (2014) (rejecting a tariff proposal as not just and reasonable because it would "have significant undesirable effects" while PJM failed to robustly demonstrate the significance of the problem it was purporting to address").

externalities. MOPR-Ex will further undo the states' policies by restricting the access of some of

the generators receiving the externality payments to capacity market revenue. Such revenue

curtailment decreases the profitability of those generators, reversing the signals sent by

externality payments.

Of course, not all conceivable state subsidies enhance market efficiency. The

Commission has rightly raised concerns with state policies that reduce capacity market prices not

as a byproduct of increased market efficiency, but either in order to provide rents for in-state

resources or to address concerns that the wholesale markets are already designed to address.[58] In

2011, the Commission approved the elimination of an exemption from MOPR that had been in

place for state-mandated gas resources. PJM and the Commission were concerned that state

policies explicitly intended to address concerns about in-state capacity shortfalls were

undermining wholesale market capacity prices.[59] Here, PJM's proposals fail to distinguish

between those state subsidies that detract from well-functioning competitive markets and those

that enhance social welfare. The state policies that PJM has labeled "subsidies of concern" in its

current filing are not state attempts to drive in-state capacity additions for parochial reasons.[60]

Rather these externality payments are explicitly designed to address a market failure that even

PJM acknowledges is not fully addressed under existing market rules.[61]

Within the system of cooperative federalism embodied by the Federal Power Act, the

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[58] November 2011 Order (rejecting state concerns that a state mandated resource exemption was necessary to meet reliability needs or congestion, because the RPM is itself designed to provide those attributes).

[59] *See id.* at P 77 (describing the prior state policy exemption that PJM eliminated as that is being developed as "a state regulatory or legislative mandate *to resolve a projected [capacity] shortfall*"); *New Jersey Board of Public Utilities v. FERC*, 744 F.3d 74, 99 (2014) ("New Jersey Petitioners claim that the new, gas-fired resources it seeks to build are needed to address New Jersey's capacity deficiency"

[60] PJM Filing at 25-26. While it is true that states cited general environmental reasons for adopting natural gas capacity mandates, unlike the externality payments at issue here, those mandates were in no way tied to any particular level of environmental performance.

[61] *Id.* at 54.

Commission should recognize state actions that enhance market efficiency when evaluating

whether PJM's proposals are just and reasonable attempts to enhance the efficiency of its

capacity market. While state externality payments may not be the "theoretical ideal market

approach" to addressing externalities,[62] state externality payments nonetheless enhance the

efficiency of markets by correcting, in part, market failures. PJM's proposal would counteract

the effect of these policies, and thereby would *reduce* social welfare—that is, the economic

efficiency of market outcomes. The Commission has repeatedly rejected RTO proposals as

unjust and unreasonable to the extent that they reduce market efficiency, including proposals that

would "result in higher clearing prices than if" otherwise competitive resources participated in a

capacity auction.[63] The Commission should do the same here.

IV. NEITHER OF PJM'S PROPOSED MARKET REFORMS WILL LEAD TO ECONOMICALLY EFFICIENT OUTCOMES

Even ignoring externalities, and they must not be, there are other economic problems

associated with the proposed reforms. In fact, the proposals may not even achieve the intended

goal of incentivizing efficient entry of resources.

For instance, PJM wants to achieve economic efficiency by achieving "robust supply

competition," "orderly entry and exit of capacity resources," and "selection of the least-cost set

of resources that possess the attributes sought by the markets." In addition, PJM claims that the

strategy that motivates the kind of investment "critical to enabling RPM to meet the

Commission's 'first principle' of relying on price signals to manage the orderly entry and exist

of resources" is a *"market expectation* that new entry can outcompete and displace older, less

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[62] *Id.* at 54.
[63] *PJM Interconnection, L.L.C.*, 161 FERC ¶ 61,252 at P 47 (2017).

efficient incumbent resources."[64]

However, while PJM's proposals would artificially elevate capacity market prices, it is not currently clear whether these artificially high capacity prices would in fact result in increased entry of new resources that can displace older, less-efficient existing resources, slower exit of existing generators, or a combination of both. If higher capacity prices cause existing resources to stay in the market longer than they otherwise would have, increased capacity will result in an increase in the available supply of generation in the energy market, leading to a decrease in energy prices. Because many resources rely mainly on energy market revenues, reduced energy prices, and therefore energy market revenue, may reduce entry rates, undermining PJM's goals concerning incentivizing additional efficient entry.

Moreover, PJM claims "that either Capacity Repricing or MOPR-Ex would be just and reasonable, because either would prevent state-subsidized capacity offers from suppressing prices in the capacity market."[65] Given that the two proposals would lead to two different prices and two different outcomes, it is not logical to claim that both of these proposals would be just and reasonable. The fact that PJM considers both of the two vastly different proposals that will lead to differing prices and supply curves to result in just and reasonable outcomes, seems to suggest that any outcome with increased capacity prices would be just and reasonable in PJM's judgement. But, over the years, FERC has adopted a clear interpretation of "just and reasonable" tariffs to be those that achieve economically efficient outcomes.[66] And, from an economic efficiency standpoint, *artificially high* prices are as bad as *artificially low* prices. The Commission should, therefore, reject PJM's proposals as not just and reasonable.

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[64] PJM Filing at 11-12.
[65] *Id.* at 45.
[66] Bethany Davis Noll & Burcin Unel, *Markets, Externalities, and the Federal Power Act: The Feeral Energy Regulatory Commission's Authority to Price Carbon Dioxide Emissions,* N.Y.U. ENVTL. L.REV. (forthcoming).

Logical inconsistencies in PJM's filing aside, neither Capacity Repricing nor MOPR-Ex would lead to economically efficient outcomes when evaluating both the energy and capacity markets. Thus, neither would be just and reasonable.[67]

A. The Proposed Capacity Repricing Is Not Just and Reasonable

PJM argues that Capacity Repricing would administratively adjust subsidized resource offers to raise capacity prices to a level reflecting the "competitive" bids that would have been offered without externality payments and hence would prevent capacity price distortions.[68] But, Capacity Repricing would not only fail to realize PJM's goal of achieving "competitive" prices, it would also harm economic efficiency. Therefore, Capacity Repricing is not just and reasonable.

PJM's reasoning that the proposal would "maintain the correct price signal" is misguided.[69] Restoring the prices that would have resulted in a world without externality payments requires more than just adjusting the bids of units that get those payments. As PJM states in its filing: "sellers are rational."[70] So, emitting resources should already be taking other firms' externality payments into account in their current bids. Given that clean resources are usually characterized by low marginal cost of energy generation, their presence in the market already substantially reduces the profits of emitting resources in energy markets. Because the capacity and energy markets are strongly interrelated, a rational generators' capacity bids should already reflect the profits lost on the energy market and be higher compared to a scenario without externality payments. Therefore, a true counterfactual analysis would adjust not only the capacity

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[67] *New York Indep. Sys. Operator, Inc.*, 158 FERC ¶ 61,064 at P 55 (2017) (rejecting tariff filing that "will delay efficient market signals").

[68] PJM Filing at 59-60.

[69] *Id.* at 1.

[70] PJM Filing, Keech Aff. ¶¶ 10-15.

market bids of resources that directly receive externality payments, but also the bids of others. That PJM's Capacity Repricing proposal fails to do so means that it would not accurately result in capacity prices paid to resources that are equivalent to the prices that would have been paid in a world without externality payments.

In addition, PJM's two-stage capacity repricing proposal would hurt economic efficiency. First, adding a second stage to the current auction design will change generators' bidding behavior for the first stage auction. The current auction design contributes to economic efficiency by giving generators the incentives to bid their true costs of staying in or entering the market. Knowing that, with Capacity Repricing, the price paid for capacity in the second stage will be adjusted upwards, generators would have an incentive to offer their capacity at prices below what would have been their "truthful" bid. While such bidding behavior does not necessarily lead to an inefficient outcome under every circumstance, the equilibrium outcome of the bidding can no longer be guaranteed to be efficient.[71]

PJM dismisses this possibility as "speculative."[72] But, this conclusory statement does not dispel concerns that a two-stage auction will distort bidding behavior and reduce efficiency. Accounting for the possibility that resources will be paid a higher price at the second-stage than the bid of the marginal resource at the first stage is exactly what a rational bidder would do. And, again, as PJM well recognizes, "sellers are rational."[73] There is no reason to expect that sellers can bid "rationally" in a one-stage auction based on their estimates of what they will recover in PJM's markets,[74] but then expect the same sellers to not act rationally and adjust their bidding behavior when a second-stage auction is added.

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[71] CAPACITY MARKETS AND EXTERNALITIES at 23 & n. 95.
[72] PJM Filing at 58.
[73] PJM Filing, Keech Aff. ¶ 13.
[74] *Id.* ¶ 14.

Second, the price that is determined in the second stage will no longer show the willingness-to-pay for the incremental reliability benefit for a given level of available capacity in the market as determined by PJM's capacity market demand curve. PJM decides how to set this demand curve based on elaborate analysis.[75] Even though this demand curve is administratively designed and set, bifurcating how the quantities and prices for capacity are determined ignores the logic behind instituting this downward-sloping demand curve in the first place.[76] The second-stage price in PJM's proposal would reflect the willingness-to-pay for additional capacity as if the sponsored resources were offering capacity at the PJM-specified prices, often making them look prohibitively expensive. But, if the offers were indeed this high, and, hence, the supply curve truly corresponded to the supply curve PJM would use in the second-stage auction, PJM's downward sloping demand curve would have led PJM to clear a lower level of contracted capacity in a single-stage auction than the amount that would clear in the first-stage auction of the capacity repricing proposal.

In other words, Capacity Repricing would result in a price and quantity pair that would not be on the demand curve that PJM has adopted. This outcome totally undermines the basic logic of setting a downward-sloping demand curve: the actual willingness-to-pay for the additional capacity decreases with the amount of cleared capacity because the incremental reliability benefit of additional capacity also decreases as capacity increases.[77] The repricing approach completely decouples the quantity of the contracted capacity from the benefits associated with it. As a result, the bifurcation will lead to higher prices for a given level of

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[75] SAMUEL A. NEWELL ET AL., THE BRATTLE GROUP, FOURTH REVIEW OF PJM'S VARIABLE RESOURCE REQUIREMENT CURVE 35 (2018), http://pjm.com/-/media/library/reports-notices/special-reports/2018/20180420-pjm-2018-variable-resource-requirement-curve-study.ashx?la=en.

[76] CAPACITY MARKETS AND EXTERNALITIES at 24 & n. 96.

[77] See, e.g., PJM, *Triennial Review of VRR Curve Shape* (June 2014), https://www.pjm.com/-/media/committees-groups/task-forces/cstf/20140630/20140630-item-04c-vrr-curve-background.ashx.

capacity, thereby inefficiently increasing the prices consumers pay and undermining any

efficiency gained by PJM's careful implementation of its demand curve.

PJM has failed to meet its burden to justify, with substantial evidence, its implicit

assumption that the (illusory) efficiency gains to be had by correcting any capacity price

distortions caused by state policies will outweigh the efficiency losses that will result from

distorting the bidding behavior of non-subsidized capacity resources and from the abandonment

of PJM's carefully considered and Commission-approved demand curve.[78] As such, PJM's

proposed tariff revisions to implement Capacity Repricing are not just and reasonable and should

be rejected.[79]

B. The Proposed MOPR-Ex Is Not Just and Reasonable

PJM's alternative proposal, MOPR-Ex, raises different concerns from those raised by

Capacity Repricing, but it is nonetheless also unjust and unreasonable for two reasons and should

therefore be rejected. First, MOPR-Ex would result in inefficient levels of capacity because it

disregards some of the already existing capacity in the market. Second, it would lead to

consumers paying twice for available capacity: once through higher prices in the capacity

markets and a second time through externality payments made pursuant to state programs.

MOPR-Ex will prevent some resources that benefit from externality payments from

clearing the market because they receive externality payments, while at the same time sustaining

high prices, which would reduce exit and potentially strengthen entry incentives for other

resources. If some of the resources that are subject to MOPR-Ex decide to stay in the wholesale

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[78] *Kansas Gas & Electric Co.*, 758 F.2d at 719-20 (utility proposing rate clause that departs from previous status quo
bears burden of proof).

[79] *See PJM Interconnection, L.L.C.*, 155 FERC ¶ 61,213 at P 23, 25 (2016) (rejecting a tariff filing under section 205
that fails to meet the burden justify that the benefit of changes intended to address operational concerns will
outweigh the negative impact on performance incentives).

markets even after failing to clear the capacity market—for example, because of state mandates or private market participant preferences for certain types of generation—there will be excess capacity.

In such cases, MOPR-Ex will cause total capacity to be inefficiently high. Total capacity includes all capacity procured through the RPM and from resources that do not clear the RPM but nonetheless are available to generate to meet peak demand. That is to say, there will be capacity that is not needed to meet the efficient level of capacity as PJM determined by PJM's downward sloping demand curve. Yet, consumers will have to pay for both operation and maintenance costs of this excess capacity procured through the RPM, as well as additional investment costs of the new units that are not required to ensure system reliability. This will lead to economically inefficient outcomes. And, as the Commission has recognized before, excess capacity is a "significant undesirable effect[]."[80]

In addition, this inefficiently costly excess capacity will lead to low prices in the energy market.[81] As lower energy prices will lead to lower energy revenues for all resources, all existing resources, even those that are not subject to MOPR-Ex, will need to bid higher in capacity markets to recover their net expected costs of going forward. The "counterfactual" prices—capacity prices that would have been reached in the absence of state policies—will thus not be restored. As a result, MOPR-Ex will fall short of even achieving its goal of correcting alleged price distortions in the capacity market. Besides, as capacity markets send much less granular signals for location and type of generation needed, the shift in revenues from energy to capacity

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[80] *PJM Interconnection, L.L.C.*, 147 FERC ¶ 61,108 at P 68 (2014) ("PJM's proposed OATT and RAA revisions have *significant undesirable effects* such as increasing the risk for capacity market sellers, creating undue barriers to entry, limiting opportunity for beneficial trade, and unnecessarily raising the cost of capacity through the *acquisition of excess capacity*.") (emphasis added).

[81] In particular, the prices during the (super-)peak time will be squeezed. See the discussion in section III.A.2 on the interdependence between outcomes on capacity and energy markets.

markets will impede economic efficiency of the energy markets.

Indeed, ISO-NE, which has been relying on a more expansive version of MOPR than PJM's to address the effects of state public policies, has recently moved away from this practice.[82] In approving ISO-NE's capacity market reforms that replaced its MOPR, the Commission recognized the inefficiencies of an expansive MOPR.[83] PJM does not address how its MOPR-Ex proposal could achieve economic efficiency when ISO-NE's have failed.

C. The Minimum Offer Price Rule Is Appropriate in Only Limited Circumstances

It is important to note that the MOPR was originally intended to prevent market power of net buyers. The Commission found that the original MOPR is a "reasonable method of assuring that net buyers do not exercise monopsony power by seeking to lower prices through self-supply."[84] In those instances, the MOPR attempts to correct a market failure: monopsony power. Therefore, its use can help improve social welfare in those circumstances.

However, using the MOPR in an attempt to reverse any potential market impacts of state externality payments does not have the same corrective properties. Indeed, using the MOPR in these instances would *reverse* the corrective function of externality payments and increase market inefficiency. There is no rational economic reasoning that can support the increased use of the MOPR as a way to reverse the corrective effects of externality payments on market failures.

Thus, PJM should use the MOPR only for the narrow circumstances for which it was originally intended—preventing the exercise of buyer-side market power—but not for

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[82] *ISO New England Inc.*, 162 FERC ¶ 61,205 (2018).
[83] *Id.*, Richard Glick, *dissenting in part and concurring in part* at 1 n. 1 (explaining that a majority of commissioners did not adopt a statement indicating that MOPR would be the "standard solution" to addressing state policy effects on wholesale markets).
[84] *PJM Interconnect L.L.C.*, 117 FERC ¶ 61,331 at P 104.

"accommodating" or "mitigating" state environmental and public health policies.[85]

V. PJM HAS NOT PRESENTED SUBSTANTIAL EVIDENCE THAT CAPACITY MARKETS ARE UNDER THREAT FROM EXTERNALITY PAYMENTS

PJM claims that "doing nothing is not an option."[86] But, given that any attempt at preventing potential price impacts of state externality payments could have significant negative impact on social welfare by leading to arbitrarily high capacity prices, as well as potentially increasing emissions,[87] PJM has the burden to support, with substantial evidence, that concerns in the record justify the potential negative impacts of its proposals.[88] PJM has not met this burden to justify its proposed tariff revisions in its filing.

First, the analysis put forth in PJM's filing is not sufficient to conclude that the price impacts of externality payments will be detrimental to capacity markets. Second, even if the capacity market prices decrease in magnitudes similar to the magnitudes in PJM's analysis, those decreases would not necessarily be inefficient from a social welfare perspective. Third, even significant price changes would not threaten resource adequacy. And, finally, capacity markets have withstood the pressures of a plethora of federal, state, and local subsidies that affect markets; there is no reason to suspect that the markets are reacting differently to externality

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[85] Though the minimum offer price rule began as a reasonable effort to combat "true attempts to exercise buyer-side market power," recently, it has "morph[ed]" into "an examination of whether states have provided support or a subsidy to a resource that is selling into the capacity market." Order on Rehearing, *ISO New England Inc.*, 158 FERC ¶ 61,138 (2017) (Bay, C., concurring); *see ISO New England Inc.*, 162 FERC ¶ 61,205, Richard Glick, *dissenting in part and concurring in part*.

[86] PJM Filing at 17.

[87] CAPACITY MARKETS AND EXTERNALITIES at 24-25.

[88] *PJM Interconnection, L.L.C.*, 155 FERC ¶ 61,213 at P 22 (2016) ("As discussed below, we find that PJM has not met its burden under section 205 of the FPA to justify its proposed tariff revisions. Thus, we reject PJM's proposal. We therefore must carefully weigh whether the operational concerns documented in the record justify the negative impact that PJM's proposed penalty exemption would have on these performance incentives. As discussed below, we conclude that PJM has not met that burden here."); *ISO New England Inc. & New England Power Pool Participants Comm.*, 158 FERC ¶ 61138 at P 19-21 & n. 45 (2017) (discussing the substantial evidence standard).

payments.

A. There Is No Conclusive Evidence that Externality Payments Will Be Detrimental to Markets

PJM has provided a simplified market analysis, in which a certain amount of zero-priced supply is added to the supply of capacity, in order to estimate the effects of state externality payments that result in the addition or retention of generation resources that would not be able to clear the market without externality payments.[89] But such a simplified analysis is not sufficient to conclude that externality payments will be detrimental to markets. There are reasons, based on inherent market dynamics, to expect that the effects would be rather modest, or even go in the opposite direction than currently expected.

First, not all resources receiving externality payments participate in capacity auctions. In PJM, stringent capacity performance standards require bidding generators to guarantee sustained operation on an annual basis. Because renewable resources are seasonal, they would be unable to bid into capacity markets that have those restrictions. Externality payments to these resources consequently have only an indirect impact on capacity prices—through the outcomes on energy markets.[90] Because many of the resources that PJM's reforms are targeting play only a limited role in the capacity market, it is unlikely that repricing or limiting participation from those resources would significantly affect overall capacity prices.

Second, even those resources benefiting from externality payments that do participate in

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[89] PJM Filing, Keech Aff. ¶ 7.

[90] For instance, from delivery year 2020/2021 PJM allows the resources only to bid under Capacity Performance standard which requires them to be able to sustain availability throughout the delivery year. In the first auction under the capacity performance standards only held in May 2017 wind and solar constituted only about 2 percent of capacity cleared. For analysis of the bidding results see Jeff St. John, *PJM's Latest Capacity Auction: A Tough Market for Nuclear and Demand Response,* GREENTECH MEDIA (May 24, 2017)*,* https://www.greentechmedia.com/articles/read/pjms-capacity-auction-a-poor-showing-for-nuclear-and-demand-response#gs.uwVJzdo.

capacity markets would be limited in the extent to which they reduce capacity market prices. All else equal, any decrease in the bid of an infra-marginal unit that would have cleared the auction with or without subsidies does not affect the market clearing price. Thus, externality payments can affect the auction price only in limited situations: (1) when they induce entry (or prevent exit) that otherwise would not have happened, increasing available supply of capacity, and hence lowering the market clearing price; or (2) when they directly lower the marginal bid, and hence the market clearing price.[91]

Third, under certain circumstances, externality payment policies can actually cause capacity prices to increase. As we discussed above, all resources adjust their bids in light of externality payment policies. Resources that do not get externality payments may submit higher bids in capacity markets than they otherwise would due to the prospect of decreased revenues from the energy market. Given that in some regions resources that do not get externality payments are more likely to be the marginal bidders in the capacity markets than the resources that do receive externality payments, the market clearing price in those regions might even increase under certain conditions. Therefore, any forecast exercise that attempts to determine the magnitude of the price impact of certain state subsidies by adjusting the bids only for resources that get externality payments, or by only adding zero- or low-priced supply bids without adjusting the bids of other resources, will not provide accurate information sufficient to draw informed conclusions.

Moreover, the simplified example that PJM provides to argue that externality payments are distortionary is even less helpful. PJM analyzed a hypothetical state policy (a contract for

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[91] An externality payment might directly lower the marginal bid if it decreases either the bid of the unit that would be marginal without the payments or the bid of a units that would not clear the capacity auction without the payments.

differences) to demonstrate the impact of the policies. But that example is not helpful because it does not represent any of the "subsidies of concern" PJM has identified, does not exist in any state, and, in fact, is similar to a program the Supreme Court determined was preempted by the Federal Power Act.[92]

Because the analyses and examples included in this filing fail to properly evaluate the effects of the actual policies that would likely be implicated, PJM has not met its burden to demonstrate the need for and corrective effects of its proposed capacity market changes and the filing should be rejected.[93]

B. Reduction in Capacity Market Prices Is Not Necessarily a Sign of Market Inefficiency

Even if capacity market prices decline as a result of externality payments, it does not necessarily mean that such a market outcome is economically inefficient. Given that external costs of emissions are currently not fully internalized in markets, the level of existing market distortion can be very substantial. For example, as indicated above, the annual external damages associated with the climate change damages from CO_2 emissions of a 1,000 MW coal plant, not taking into account damages from other pollutants, would amount to about $234.3 million based on the Interagency Working Group's Social Cost Carbon.[94] In comparison, PJM forecasted that a 1,000 MW seller in one LDA would see its capacity market revenue reduced by $6.75 million annually due to the capacity price changes that result from externality payments.[95] The external costs of emissions starkly outweigh the generators' losses, and suggest that the market signals

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[92] PJM Filing at 29; *Hughes*, 136 S. Ct. at 1299.
[93] *Sw. Power Pool, Inc.*, 152 FERC ¶ 61,226 at P 83 (2015) (rejecting a section 205 filing that fails to adequately support the RTO's proposed tariff changes or show that the proposed changes will address the harms it is meant to combat).
[94] For calculations see *supra* note 46.
[95] PJM Filing, Keech Aff. at ¶ 11.

sent by externality payments guide the generation mix in the socially optimal direction. Externality payments help correct existing market distortions, rather than exacerbate them. Misguided adjustments to capacity markets may cancel out those corrective effects, sustaining existing inefficiencies and harming social welfare.

C. Capacity Price Declines Would Not Harm Resource Adequacy Because of the Way the RPM Is Designed

Even if externality payments cause significant changes to capacity market prices, this fact alone does not support PJM's concern that the RPM will be unable to achieve the resource adequacy objectives it is designed to achieve. Because of the way capacity markets are designed to work, prices would adjust to ensure resource adequacy.

For example, if generators exit as a result of lower capacity prices, the supply curve would shift accordingly, leading to an increase in capacity prices. Therefore, any decrease in price can continue only so long as there is a glut in capacity. Short-term shortage or surplus conditions, and resulting price changes, are only a natural result of market dynamics, and do not warrant market design changes.

With a properly constructed capacity demand curve, as supply becomes scarce, the capacity price will automatically adjust to reflect the revenues needed by any new generators that are necessary for resource adequacy. Further, because PJM updates its demand curve every three years based on energy market revenues, if energy market revenues of resources decrease, there will be ample opportunity for the demand curve to shift up. This shift will increase the price PJM pays for any given level of capacity. In other words, capacity markets, by design, ensure that enough capacity is present to meet the highest demand in a given period. As a result, even if externality payments reduce capacity prices in the short term, capacity markets are designed to adjust to those change and keep prices at a level necessary to ensure resource adequacy.

The fact that capacity market design is robust to changing policies and prices is borne out by the RPM's performance to-date. The actual outcomes in RPM auctions undermines any worries that low or significantly-fluctuating prices will fail to send efficient entry incentives to units that are not eligible for externality payments. States' use of externality payments, in particular state RPS programs, predate the capacity markets.[96] Yet, as can be seen in Figure 1 below, capacity prices have fluctuated substantially since the introduction of the capacity markets. Despite these fluctuations, a significant amount of new generation capacity, including capacity that does not receive externality payments or other state or federal support, continues to clear capacity auctions.[97]
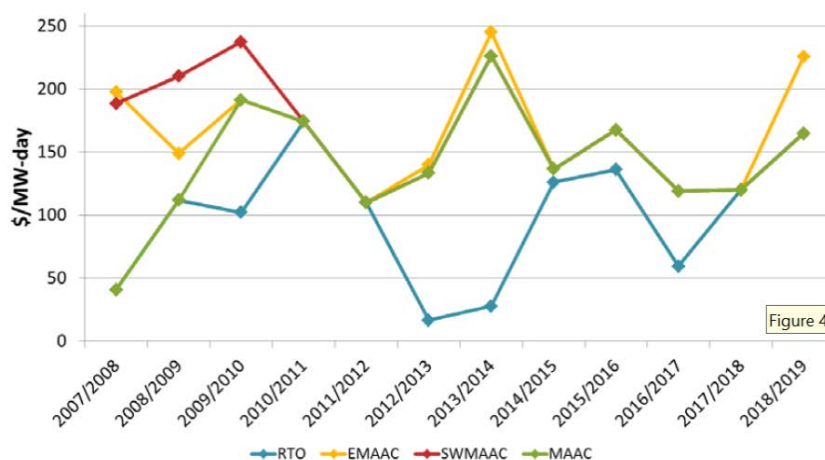

Figure 1: RPM Base Residual Auction Resource Clearing Prices within PJM over time and by sub-region (LDA).

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[96] *See supra* at Section III.A.

[97] For example, in PJM almost 3,000 MWs of new capacity, mostly in the form of new or uprates to existing gas-fired combustion turbine and combined cycle generation units, cleared in the base residual auction for the 2018/2019 delivery year, nearly 5,400 MWs cleared for the 2019/2020 delivery year, and roughly 2,400 MWs cleared for the 2020/2021 delivery year. ORGANIZATION OF PJM STATES, INC. (OPSI), RECOMMENDATION THAT THE PJM BOARD OF DIRECTORS NOT APPROVE PJM STAFF'S REPRICING PROPOSAL FOR FILING AT FERC (2018), https://citizensutilityboard.org/wp-content/uploads/2018/02/OPSI-BOD-Repricing-Letter-Final-with-vote.February.pdf; PJM, 2018/2019 RPM BASE RESIDUAL AUCTION RESULTS PJM #5154776, http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2018-2019-base-residual-auction-report.ashx (last visited Apr. 24, 2018); PJM 2020/2021 RPM BASE RESIDUAL AUCTION RESULTS PJM #5154776 (2017), http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2020-2021-base-residual-auction-report.ashx.

Source: THOMAS JENKIN ET AL., NAT. RENEWABLE ENERGY LAB., NREL/TP-6A20-65491, CAPACITY PAYMENTS IN RESTRUCTURED MARKETS UNDER LOW AND HIGH PENETRATION LEVELS OF RENEWABLE ENERGY 11 (2016).[98]

Contrary to the argument that capacity markets are under threat, they have shown themselves to be robust. PJM should not make unnecessary changes that undermine legitimate state policy objectives.

D. Capacity Markets Have Been Functioning Well Even in the Face of Many Other Subsidies

From an economics standpoint, many federal, state, and local subsidies affect price formation in a way similar to externality payments. These subsidies alter the outcomes of the wholesale markets by lowering the revenue resources needed from the capacity markets. Yet, the existence of these non-market-payments has never been raised as an existential threat to capacity markets.

On the contrary, over the years, capacity markets have co-existed with many different subsidies, both corrective and distortive, without leading to similar market distortion fears. For example, fossil-fuel generators benefit from numerous federal tax deductions, including deductions for intangible drilling costs and for investment depletion related to oil and natural gas wells. In 2015, the U.S. government estimated that these subsidies amounted $4.7 billion in reduced government revenue annually.[99] Additionally, many states have tax provisions in place that favor fossil fuels. For instance, Kentucky offers tax credits to electric-power entities operating coal-fired electric generation plants, alternative fuel facilities, or gasification

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[98] *Available at* http://www.nrel.gov/docs/fy16osti/65491.pdf.

[99] The number represents a nominal annual average figure based on the 10-year revenue estimate. *See* U.S. OFFICE OF MGMT. & BUDGET, PROGRESS REPORT ON FOSSIL FUEL SUBSIDIES, *available at* https://www.treasury.gov/open/Documents/USA%20FFSR%20progress%20report%20to%20G20%202014%20Final.pdf (last visited Mar. 29, 2018).

facilities[100] and in Pennsylvania the purchase or use of coal is exempt from the sales and use tax normally levied on sales of most goods and services in that state.[101] Independent reports quantifying federal and state fossil fuel subsidies also find significant sums.[102]

PJM never provides a clear reason for why externality payments require an urgent response whereas these significant preexisting subsidies have not. PJM's failure to grapple with these issues is exacerbated by the fact that it intends to explicitly exempt many of these distortive and federal subsidies from the definition of "actionable subsidy," as we discuss more fully below. Thus, the current record, is not sufficient to conclude that externality payments threaten the functioning of capacity markets to such an extent that immediate and drastic revisions are required.

VI.   THE PROPOSED "MATERIAL" AND "ACTIONABLE" THRESHOLDS AND DEFINITIONS ARE ARBITRARY AND UNDULY DISCRIMINATORY

PJM's filing discusses, at length, the purportedly distortive effective out-of-market subsidies on capacity prices. However, PJM proposes to reprice or mitigate only for a subset of policies that have the effect of subsidizing generation: those it considers to be "material" and "actionable." PJM's proposal is unreasonably vague regarding what it considers a "material" subsidy, and the threshold it appears to provide is both arbitrary and unsupported by economic reasoning. Moreover, those policies that PJM considers to be "actionable" are not meaningfully

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[100] *See Coal Incentive Tax Credit,* KY. DEP'T OF REVENUE, https://revenue.ky.gov/Business/Pages/Coal-Incentive-Credit.aspx (last visited Apr. 24, 2018).

[101] PJM, Database, *Subsidies to Participants in PJM States, Based on Good Jobs First Subsidy Database,* https://earthtrack.net/sites/default/files/uploaded_files/20170605-item-02-subsidy-short-list-20170531.xls (last downloaded Apr. 24, 2018); *see also* Doug Dkoplow, *Subsidies to Suppliers in the PJM Interconnection Go to Fossil and Nuclear, Not Just Renewables,* EARTHTRACK (Jul. 20, 2017), https://earthtrack.net/blog/subsidies-suppliers-pjm-interconnection-go-fossil-and-nuclear-not-just-renewables (discussing these subsidies).

[102] For example, Oil Change International reports that United States federal and state governments gave away $20.5 billion a year on average in 2015 and 2016 in production subsidies to the oil, gas, and coal industries, including $14.7 billion in federal subsidies and $5.8 billion through state-level incentives. JANET REDMAN, OIL CHANGE INTL., DIRTY ENERGY DOMINANCE: DEPENDENT ON DENIAL 5 (2017), http://priceofoil.org/content/uploads/2017/10/OCI_US-Fossil-Fuel-Subs-2015-16_Final_Oct2017.pdf.

different than policies PJM has decided are not "actionable." As such, even putting aside the fact

that externality payments enhance market efficiency and that Capacity Repricing and MOPR-Ex

are both unnecessary and would introduce other market inefficiencies, the proposals are arbitrary

and capricious, and unduly discriminatory. They should, therefore, be rejected by the

Commission.

A. The Definition of "Material" Is Arbitrary and Lacks Economic Rationale

PJM proposes to select resources for repricing by looking at whether the subsidy received

by that resource is "material."[103] PJM is proposing that "material" subsidies include only

"*impactful, material subsidies* and specifically excludes other, non-actionable subsidies."[104]

PJM's proposal is not clear as to what it considers to be a "material" subsidy. On the one

hand, PJM limits Capacity Repricing and MOPR-Ex to subsidies that provide greater than 1% of

anticipated market revenues to the resource.[105] On the other hand, PJM suggests that this may

not be only threshold for materiality.[106] In either case, however, PJM's definition of materiality

is problematic.

If PJM intends materiality to mean only that the amount of subsidies exceed 1% of

market revenue, PJM has failed to clearly specify why a fixed 1% of market revenues threshold

is the right cut-off line for materiality. An unexplained threshold is, on its face, arbitrary and

should be rejected.[107]

Moreover, in setting this 1% threshold, PJM disregards the fact that the same 1% change

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[103] PJM Filing at 70.
[104] *Id.* at 100.
[105] *Id.* at 74.
[106] *See Id.* at 70-72 (discussing material subsidies without defining any thresholds for materiality); *id.*at 73 (characterizing the 1% threshold as defining what constitutes a non-material level of Material subsidy).
[107] *Sw. Power Pool, Inc.*, 152 FERC ¶ 61,226 at P 108 (2015) (rejecting a tariff filing for failure to justify the level of certain numerical thresholds).

in revenue would lead to very different changes in the market clearing price based on a variety of factors such as the cost structures of the generators getting the subsidy, and the supply and demand conditions in the market. Applying a fixed 1% threshold across all resources and levels of capacity demand is thus disconnected from economic reasoning and should be rejected.

First, a 1% increase in a generator's revenue due to any subsidy would not directly translate into a proportional change in its capacity market bid. How a generator is going to adjust its bid in response to receiving an externality payment equal to 1% of its revenue depends on many factors. For instance, if a generator does not depend on the capacity market revenue and can earn enough revenue in the energy market, it would submit a bid of zero or close to zero in the capacity market regardless of the level of the subsidy. A 1% subsidy would not change its bidding behavior compared to no subsidy. Therefore, it is not a given that a 1% subsidy would change the bids of a resource in a certain way or magnitude.

Second, even if the 1% subsidy changes the generator's bid, the amount that the market clearing equilibrium price changes as a result of a change in a seller's bid depends on many factors. In particular, it depends on the location of the generators in the supply stack before the bidding change happens, the shapes of the demand and supply curves, and where the intersection of those curves would have been without the proposed changes. Changes in the price of capacity would differ for a given change in seller bids depending on the level of supply available. Similarly, the same change in a resource's bid would lead to a different amount of change in price based on the slope of the demand curve. Therefore, trying to identify the subsidies with "the *most potential to negatively impact auction clearing prices*" leads to an unreasonable standard that is vague, arbitrary, and that lacks economic reasoning.

A figure from the most recent Brattle study on PJM's capacity market demand curve is

helpful to highlight this point. The figure, presented as Figure 2 below, represents Monte Carlo simulations of "distributions of price, quantity, and reliability outcomes that might be realized over many years under PJM's current demand curve for capacity or alternative curves."[108] These curves are intended to "reflect long-term economic equilibrium conditions on average"[109] and, hence, are helpful in thinking about potential impacts of externality payments.
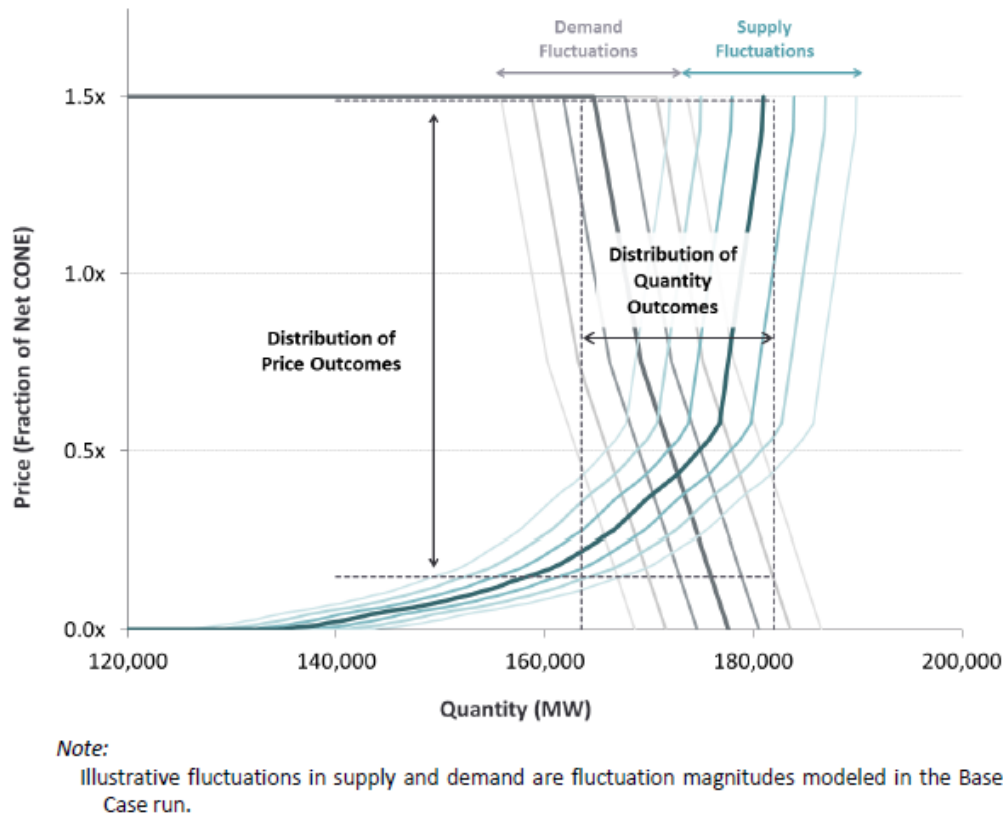

Figure 1: Stylized Depiction of Supply and Demand Fluctuations in the Monte Carlo Analysis.

Source: SAMUEL A. NEWELL ET AL., THE BRATTLE GROUP, FOURTH REVIEW OF PJM'S VARIABLE RESOURCE REQUIREMENT CURVE 36 (2018).[110]

Assume initially that the darkest gray demand curve is the realized demand curve. Given

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[108] NEWELL ET AL. 35.

[109] *Id.*

[110] *Available at* http://www.pjm.com/-/media/library/reports-notices/special-reports/2018/20180420-pjm-2018-variable-resource-requirement-curve-study.ashx?la=en.

this demand curve, the same 1% subsidy would lead to a different magnitude and percentage of a price change depending on which of the depicted supply curves is the realized supply curve. Next, assume instead that the darkest blue supply curve is the realized supply curve. Given this supply curve, the same 1% subsidy would lead to a different magnitude and percentage of a price change depending on which of the depicted demand curves is the realized demand curve. So, it is possible for the same 1% subsidy to affect prices differently from year to year based on the market conditions and PJM's decisions concerning the capacity demand curve. Further, depending on the shapes of the curves a small subsidy might lead to a large price change, or a large subsidy might lead to a small price change.

As can be seen from this exercise, which subsidy has the "most potential to negatively affect prices" does not solely depend on the amount of the subsidy but also the shapes of the demand and supply curves. The magnitude of the percentage price change relative to the magnitude of the percentage supply change depends on elasticities of demand and supply. And, given that the same 1% subsidy could lead to vastly different effects on auction clearing prices based on market conditions, it is an arbitrary threshold of "materiality."

Further, given the fact that price impacts of a subsidy depend on many factors, there is no economic rationale to think that "*comparatively small* quantities of subsidized offers *disproportionately*" reduce clearing prices in a way that should be worrisome.[111] In fact, given that PJM chooses to have a demand curve with three separate sections with three different slopes, it is clear that PJM's goal is not to try to ensure a "proportionate" price response to any given percentage change in the supply regardless of market conditions. In the horizontal part of the demand curve, an increase in the quantity of supply would not lead to any change in price; in the

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[111] PJM Filing, Keech Aff. ¶ 7.

steeper part of the demand curve, an increase in the quantity of supply would lead to a relatively

larger decrease in price; and, in the flatter part of the demand curve, an increase in the quantity of

supply would lead to a relatively smaller decrease in price.

Finally, PJM appears to suggest that the 1% threshold is not the only limit to materiality.

To the extent that PJM has left itself discretion to decide what state subsidies are "material," this

approach would be "overly broad and vague" and should be rejected.[112]

B. The Definition of "Actionable" Is Arbitrary, Unduly Discriminatory, and Not Internally Consistent

PJM has proposed that only capacity resources with actionable subsidies will be subject

to repricing or mitigation. However, PJM's proposed definition for what constitutes an

actionable subsidy—and in particular, exclusions for existing and significant subsides—

fundamentally undermines PJM's justification for imposing the new RPM rules to state

externality payments. Because PJM has proposed to exclude a number of types of similarly

situated resources that receive subsidies that would have similar effects on capacity prices as

those state policies that meet PJM's definition of actionable subsidy, PJM's proposal is both

arbitrary and unduly discriminatory.[113]

Specifically PJM has proposed to exclude from repricing and mitigation two general

types of state subsidies that are likely to have similar, if not more significant, effects on capacity

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[112] *New York Indep. Sys. Operator, Inc.*, 162 FERC ¶ 61,107 at P 174 (2018); *New York Indep. Sys. Operator, Inc.*, 155 FERC ¶ 61,037 (2016) (rejecting Tariff language that "does not establish the processes and criteria that NYISO will use to determine whether a project should be revoked").

[113] *Dynegy Midwest Generation, Inc. v. FERC*, 633 F.3d 1122, 1127 (D.C. Cir. 2011) (finding undue discrimination when similarly situated generation resources were arbitrarily treated differently); *PJM Interconnect, L.L.C.*, 161 FERC ¶ 61,252 at P 43 (2017) (rejecting PJM tariff changes as unduly discriminatory because they would "exempt some [but not all] resources from the MOPR that lack the ability or incentive to exercise buyer-side market power"); *New York Indep. Sys. Operator, Inc.*, 153 FERC ¶ 61,340 at PP 12-13 (2015) (rejecting proposed tariff revision under Section 205 because it would "result [in] two interconnection processes that are not comparable" as between otherwise similar incumbent and nonincumbent transmission owners).

prices, and that are provided for reasons less directly tied to enhancing efficiency than are the "subsidies of concern" that are motiving this proposal. First, PJM is proposing to exclude state and local government subsidies that encourage or facilitate development of specific resources in specific locations.[114] Second, PJM is proposing to exclude federal subsidies that are targeted at specific resource types.[115] PJM's justification for these exclusions undermines the underlying case that it is merely trying to correct price suppression effects of rent-seeking distortionary policies.

By reducing construction and operating costs, these policies will affect the net going forward costs of any generators that receive them, just as state externality payments affect the net going forward costs of resources that receive them. These subsidies are, therefore, just as relevant to the capacity bids of resources as state externality payments. And, to the extent they provide similar levels of support and apply to similar numbers of resources, they are just as likely to affect wholesale capacity prices as the externality payments do. PJM fails to adequately distinguish resources that receive these favored policy payments from resources that receive externality payments. Therefore, the definition of actionable subsidy is unduly discriminatory and should be rejected.

In explaining why it is excluding location-specific subsidies such as those meant to encourage economic development in a specific area, PJM states that these subsidies do not

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[114] This includes "payments (including payments in lieu of taxes), concessions, rebates, subsidies, or incentives designed to incent, or participation in a program, contract or other arrangement that utilizes criteria *designed to incent or promote, general industrial development in an area*" and "payments, concessions, rebates, subsidies or incentives designed to incent, or participation in a program, contract or other arrangements from a county or other local governmental authority using eligibility or selection criteria *designed to incent, siting facilities in that county or locality rather than another county or locality.*" PJM at 70 (emphasis added).

[115] Specifically, PJM has proposed to exclude "*federal government* production tax credits, investment tax credits, and similar tax advantages or *incentives* that are available to generators without regard to the geographic location of the generation." PJM at 70 (emphasis added).

"present legitimate price suppression concerns."[116] But PJM has this exactly backwards. Location-specific rent seeking subsidies and externality payments of similar magnitude will have similar effects on capacity market prices. But whereas rent-seeking provide no improvement to general social welfare, externality payments are explicitly designed to improve social welfare. Moreover, whereas externality payments have expanded across PJM as states learn from each other how to adopt measures that enhance social welfare, rent-seeking subsides beget other subsidies as jurisdictions are forced to compete for limited industrial development activity.

Furthermore, PJM's decision to exclude federal subsidies also completely undermines its justification for excluding local development subsidies. For example, PJM excludes federal subsidies because they support resources in a broader geographic scope.[117] Of course, the same could be said about state externality payments as compared to local development subsidies.

In addition, PJM's excludes federal subsidies because they are not *material.*[118] But the economic value of these subsidies is often significantly larger than the value of other state programs.[119]

More importantly, PJM justifies the exclusion of federal subsidies from the definition of "actionable subsidy" because it claims that applying Capacity Repricing to federal subsidies would "countermand" congressional actions intended to support certain resource types.[120] But, many federal subsidies are functionally equivalent to state externality payments. Therefore, in acknowledging that Capacity Repricing would "countermand" federal Production Tax Credit, for

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[116] *Id.* at 70.

[117] *Id.* at 71 ("Moreover from a policy point of view, these are generic actions with a nationwide scope").

[118] *Id.* at 69 (discussing these exclusions under the heading "The subsidy received must be material").

[119] For example, the 2017 value of the wind production tax credit approximately $19/MWh. Dep't of Energy, *Renewable Electricity Production Tax Credit (PTC)* (last accessed May 6, 2018), https://www.energy.gov/savings/renewable-electricity-production-tax-credit-ptc. This is greater than the 2017 value of Illinois ZECs, which was approximately $16.50/MWh. 20 ILL. COMP. STAT. 3855/1-75(d-5)(1)(B).

[120] PJM Filing at 71.

example, PJM essentially acknowledges that Capacity Repricing would countermand—or, as we term here, "undermine"—state policies as well.

To the extent countermanding incompatible federal policy is problematic, so too is undermining state externality payments. The Federal Power Act carves out jurisdiction for states to set policies to regulate the environmental characteristics of generation.[121] And if it "strains credulity" that the Commission could countermand federal policy, then the Commission, at the very least, should reject Tariff revisions that undermine legitimate, efficiency-enhancing state policy.

PJM further justifies the inclusion of state externality payment policies but not federal tax and insurance policies "from a policy point of view" and because "market participants also are more likely to have better understanding of and familiarity with acts of Congress."[122] But, it is not PJM's role to determine if externality payments are better set "with a nationwide scope" or can and should be left to state experimentation. It is arbitrary and unduly discriminatory to apply reforms to resources that receive state externality payments on account of their effect on wholesale markets, but then to also allow other resources to continue to benefit from federal subsidies that will have similar effects on those capacity prices.

The point here is not that Capacity Repricing and MOPR-Ex should be applied to legitimate federal subsidies. PJM is correct that the Commission has previously approved MOPR criteria that exclude consideration of these payments from being considered distortionary subsidies.[123] In fact, the Commission has approved of using a resource's receipt of these types of

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[121] 16 U.S.C. § 824(b)(1) ("The Commission . . . shall not have jurisdiction . . . over facilities used for the generation of electric energy").

[122] PJM Filing at 71.

[123] *Id.* at 70 ("these exclusions are the same as those employed in the MOPR for several years prior to the Commission's removal of the Competitive Entry Exemption").

financial benefits to justify that a resource's capacity bid is "competitive" even if it is below the MOPR threshold.[124] Rather, the point is that the reasons PJM has given for the exclusions of federal subsidies and location-specific economic development policies fundamentally undermine PJM's justification for imposing the new RPM rules to state externality payments. Because PJM has not proposed logical, principled criteria for what out-of-market payments are "subsidies of concern" and which merely fulfill legitimate non-discriminatory objectives, the Commission should reject both Capacity Repricing and MOPR-Ex as arbitrary and unduly discriminatory.

VII.   CONCLUSION

Externality payments aim to correct externalities associated with electricity generation and therefore are based on resources' energy generation. As such, any potential inefficiency associated with these payments, if they exist, would more directly affect the energy market. Yet, PJM's Capacity Repricing and MOPR-Ex proposals are aimed at reforming only the capacity market. They do not address the key underlying issue that prompted states to adopt externality payments in the first place: the fact that current energy markets fail to achieve economically efficient outcomes due to the presence of externalities. And, a policy that counteracts the impact of externality payments would just reverse the attempts to internalize those external costs, sustaining the existing inefficiency in the wholesale markets.

Furthermore, hasty adjustments to capacity markets would not stop states from pursuing their goals. On the contrary, as these reforms may reverse some of the results states would like to achieve, such as reducing emissions, they invite states to find alternative, potentially less

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[124] *PJM Interconnect L.L.C.*, 138 FERC 61,194 at P 5 (2012) ("a sell offer below the MOPR screen can be justified based on competitive cost advantages relative to the costs estimated for the MOPR screen, including costs resulting from the capacity market seller's business model, financial condition, *tax status*, access to capital") (emphasis added).

efficient, policies to achieve their climate change goals. As long as PJM maintains arbitrary thresholds and definitions of "material" and "actionable" subsidy, states will find policy tools that will fall outside of those thresholds. These new policies may be even less efficient than externality payments.

Finally, as states increase their clean energy targets, more of the resources in the markets will fall under the category of "Capacity Resources with Actionable Subsidy," triggering repricing of their bids. As a result, the prices will be determined by the intersection of a demand curve determined by PJM and supply bids determined by PJM, leading to capacity market outcomes that are essentially administratively determined by PJM, leading to a "market" only in name. So, while externality payments do not currently threaten the functioning of markets, fundamentally changing the market rules in reaction externality payments is a slippery slope that does threaten the future of markets.

Capacity markets undoubtedly suffer from many defects. But, the ability to provide resource adequacy while adjusting to changes in the supply conditions due to externality payments is not one of them. FERC should reject both the Capacity Repricing and MOPR-Ex.

Respectfully submitted,

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Dated: May 7, 2018

CERTIFICATE OF SERVICE

In accordance with Rule 2010 of the Commission's Rules of Practice and Procedure, I hereby certify that I have this day serviced by electronic mail a copy of the foregoing document upon each person designated on the official service list compiled by the Secretary in this proceeding.

Dated at New York, New York this 7th day of May 2018.

Respectfully Submitted,

/s/ Avi Zevin
Avi Zevin
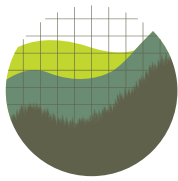Attorney
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EXHIBIT A

CAPACITY MARKETS AND EXTERNALITIES: AVOIDING UNNECESSARY AND PROBLEMATIC REFORMS

Capacity Markets and Externalities

Avoiding Unnecessary and Problematic Reforms

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This report does not necessarily reflect the views of NYU School of Law, if any.

Executive Summary

Many states have recently ramped up efforts to address climate change and accelerate their transition toward cleaner energy sources. To achieve these goals, several states have adopted Renewable Energy Credits and Zero-Emission Credits. These policies pay generators for desirable attributes such as avoiding air pollution externalities associated with electricity generation from fossil-fuel-fired resources. These "externality payments" help level the playing field between emitting and non-emitting generators.

As these policies become increasingly prevalent, policymakers have begun debating whether the payments could negatively affect the efficiency of wholesale electricity markets. In particular, the debate has focused on whether these policies could reduce capacity prices to levels that no longer support economically efficient entry and exit of generators, and threaten resource adequacy. Consequently, various groups have proposed capacity market reforms, with the aim of shielding these markets from the potential price impact of externality payments. In March 2018, the Federal Energy Regulatory Commission approved ISO-New England's Competitive Auctions with the Sponsored Policy Resources proposal. And, in April 2018, PJM Interconnection filed two different proposals to reform its capacity markets with the Federal Energy Regulatory Commission.

But, as we discuss in this report, the premises underlying these reforms are faulty. First, the argument for redesigning capacity markets in reaction to externality payments relies on the argument that resources that get externality payments cannot be considered "economic," as they cannot be supported by only the revenue they earn in wholesale markets. But this argument focuses only on private generation costs, disregarding the market failures associated with the external costs of air pollution from fossil-fuel-fired resources. Externality payments help correct this market failure, and, therefore, they are expected to increase social welfare, improving the efficiency of entry and exit behavior of generators. The reforms will sustain the existing market inefficiencies.

Second, the justification for proposed reforms tends to overlook the role of inherent market forces. Capacity market prices, by design, adjust based on supply and demand. The proposed reforms largely disregard those adjustments, thereby failing to reach their self-proclaimed goal of restoring prices that would have resulted in the absence of externality payments. In addition, capacity market designs have their own flaws that might contribute to inefficiency, but those are unrelated to externality payments. Hence, there is no conclusive evidence that capacity markets are under threat or that any decrease in capacity market prices due to externality payments would be economically inefficient.

Rushed market design changes based on the unsupported assumption that state policies negatively affect capacity markets may actually harm the functioning of the markets, while potentially undoing states' efforts to combat pollution and climate change.

Table of Contents

Introduction

As states around the country ramp up efforts to address climate change and transition toward cleaner energy sources, many have relied on policy tools such as Renewable Energy Certificates (RECs) and Zero-Emission Credits (ZECs). These programs offer payments to resources for the value of generating energy that is associated with desirable attributes such as avoided carbon-dioxide emissions (externality payments). As a result of the increasing prevalence of such policies, policymakers have begun debating their potential effect on wholesale electricity markets.

Some commentators have argued that externality payments could distort capacity markets.[1] They maintain that these payments allow generators to bid into the capacity market at below the generators' costs of providing capacity, and allow generators that have received those payments to reduce the market-clearing price for capacity. By causing a reduction in capacity prices, they argue, the externality payments would send incorrect signals for the entry and exit of generators.[2] The argument maintains that those distortions would in turn lead to economically inefficient outcomes, resulting in elevated total costs of the system and potentially flawed functioning of the market by failing to ensure that enough capacity is present to meet demand at all times, threatening resource adequacy. Given such concerns, state and federal regulators, as well as other stakeholders, have started discussing the potential need to "accommodate" or "mitigate" the effect of states' environmental and public health policies (state policies) in the design of wholesale electricity markets.[3]

As a result of the discussions, proposals for capacity market reforms that would counteract the impact of the externality payments have emerged. For example, PJM Interconnection (PJM)—a Regional Transmission Organization (RTO) that coordinates the movement of wholesale electricity in all or parts of thirteen states and in the District of Columbia—has proposed two different models to reform capacity markets in order to counteract any potential effect of those externality payments.[4] ISO-New England (ISO-NE)—an independent, non-profit RTO, serving Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, and Vermont—also proposed a capacity market reform that was approved by federal regulators in March 2018.[5]

But, as we discuss in this report, the premises underlying these proposals are faulty. For example, there is currently not sufficient evidence that the state policies designed to reduce emissions negatively affect the economic efficiency of capacity markets from a societal welfare perspective. On the contrary, rushed design changes may actually harm the functioning of the markets, while potentially undoing the states' efforts to combat pollution and climate change.

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[1]   *See generally* Monitoring Analytics, LLC., 2016 State of the Market Report for PJM (2017) [hereinafter "2016 State of the Market Report for PJM"], http://www.monitoringanalytics.com/reports/PJM_State_of_the_Market/2016/2016-som-pjm-volume2.pdf; Order on Tariff Filing, *ISO New England Inc.*, 162 FERC ¶ 61,205, P 4 (2018); for some of the contributions to the discussions, *see* FERC Docket No. AD17-11-000, *State Policies and Wholesale Markets Operations* and FERC Docket No. ER18-619, ISO-*New England Inc.* [hereinafter "FERC Dockets"] (for comments, filings, and transcripts of technical conferences), https://www.ferc.gov/EventCalendar/EventDetails.aspx?ID=8663&CalType=%20&CalendarID=116&Date=&View=L

[2]   *See generally* FERC Dockets, *supra* note 1.

[3]   *See generally* FERC Technical Conference, *State Policies and Wholesale Markets Operated by ISO New England Inc., New York Independent System Operator, Inc., and PJM Interconnection, L.L.C., Docket No. AD17-11-000*, FERC (May 1-2, 2017), https://www.ferc.gov/EventCalendar/EventDetails.aspx?ID=8663&CalType=%20&CalendarID=116&Date=&View=L (follow hyperlinks for "Transcript, May 1" and "Transcript, May 2").

[4]   PJM Interconnection, L.L.C., ER18-1314-000, Capacity Repricing or in the Alternative MOPR-Ex Proposal: Tariff Revisions to Address Impacts of State Public Policies on the PJM Capacity Market (2018) [hereinafter "PJM Filing"].

[5]   *See* Order on Tariff Filing, *ISO New England Inc.*, 162 FERC ¶ 61,205 (2018).

Externality payments are designed to correct market failures resulting from the external costs of pollution and help increase the overall economic efficiency of the market. Changes in capacity markets designed to counteract the effect of externality payments will have ripple effects on the electricity supply, and will negatively affect renewable resources. For example, the changes will likely increase available capacity, which—all else remaining equal—will reduce energy market prices and thus energy market revenue. This decrease in energy market prices would be especially worrisome for renewable and limited-duration resources that rely more heavily on energy market revenues than capacity market revenue, as these resources can be severely limited from participating in capacity markets.[6] Proposals that make it more difficult for non-emitting resources to clear in the regular capacity markets will additionally diminish capacity market revenue for any carbon-free generators that do participate, adding a second blow to their profitability.

Current capacity reform proposals would thus reverse that positive effect of externality payments on social welfare and allow the inefficiencies in wholesale electricity markets to continue—namely, the externalities associated with air pollution.

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[6]   *See* Jennifer Chen, *Is Capacity Oversupply Too Much of a Good Thing?*, 34 Nat. Gas & Elec. 15 (2017), https://doi.org/10.1002/gas.22016.

Background: Electricity Markets, Efficiency, and Externalities

In most regions of the United States, electricity is first traded in wholesale markets before being sold and distributed to consumers—households and most of businesses—in retail markets. The wholesale markets are managed by regional oversight entities called RTOs and ISOs, and regulated by Federal Energy Regulatory Commission (FERC). Most wholesale market operators run markets for energy, capacity, and ancillary services.[7] Currently, there are seven ISOs/RTOs operating in the country,[8] with PJM running the nation's largest wholesale electricity market.

Energy markets

As electricity cannot yet be stored in an economically efficient manner in large quantities,[9] generation needs to be perfectly aligned at every instant with energy consumption, which is volatile and tends to vary during the day and between seasons.[10] To address this problem in the energy markets, the wholesale price for a megawatt-hour (MWh) of electricity is established through auctions based on supply offers submitted by generators and demand bids submitted by load-serving entities (LSEs) that serve end users. Hourly day-ahead auctions ensure that energy demand and supply can be balanced at low cost, leading to a significant variation in energy prices during the day. Real-time wholesale auctions further facilitate the alignment between energy supply and demand by correcting for any unforeseen changes in market conditions.

In the auctions, LSEs submit their demand bids based on the predicted electricity consumption of the end users, and generators submit their supply bids based on the cost of generating electricity. Resources that win the auction are said to "clear" the market. The generator with the lowest bid clears the market first, followed by the next cheapest, until demand is met. The wholesale energy price for all generators that clear the market is then determined by the bid of the last resource to clear the market, plus other charges necessary to reflect the operational constraints of the grid, such as congestion and energy losses. Where there are competitive bidders, this design creates an incentive to bid true marginal costs because generators look to submit their lowest possible bid, in order to maximize the chance of their bid being

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[7] The role of energy and capacity markets is explained below. Ancillary services encompass variety of operations beyond generation and transmission that help grid operators maintain a reliable electricity system, among others, maintaining the proper flow and direction of electricity, addressing imbalances between supply and demand, and facilitating the system recovery after a power system event. As the revenues from ancillary markets constitute only a small portion of revenue for generators, this report focuses on energy and capacity markets. *See* David B. Patton et al., 2016 State Of The Market Report For The New York Iso Markets, at 14 fig.1 (2017), http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Reports/Market_Monitoring_Unit_Reports/2016/NYISO_2016_SOM_Report_5-10-2017.pdf (for the typical distribution of revenue for generators).

[8] The seven ISO/RTOs are: California independent system operator (CAISO), Electric Reliability Council of Texas (ERCOT), Midcontinent Independent System Operator, Inc. (MISO), ISO New England (ISO-NE), New York Independent System Operator (NYISO), PJM Interconnection (PJM), and Southwest Power Pool (SPP).

[9] Recent progress in energy storage technologies is likely to decrease the need for instantaneous coordination of electricity generation and consumption. For an overview of the currently available technologies and their costs see Richard L. Revesz & Burcin Unel, *Managing the Future of the Electricity Grid: Energy Storage and Greenhouse Gas Emissions* (forthcoming), http://policyintegrity.org/files/publications/ReveszUnel_EnergyStorage.pdf.

[10] Demand for electricity is low during the night. It starts to increase in the morning, and remains high through the day. It usually peaks in early evening when it is mostly used in individual households returning from work. The substantial seasonal differences in energy usage, on the other hand, are mostly due to the varying need for heating and air conditioning.

cleared, while at the same time recovering their marginal cost of generation.[11] By encouraging generators to bid their marginal costs, this auction design ensures that the private variable costs of producing the total electricity demanded at a given time and location is minimized.

Capacity markets

In some regions, such as the Northeast and Midwest, energy markets are complemented by capacity markets, in which generators can receive additional payments for committing to provide generation capacity at a certain time period. Capacity is measured in megawatts (MW) and reflects the generator's potential to reliably generate electricity during a certain period.

The existence of capacity markets sets electricity generation apart from most other sectors, where firms are rewarded only for their actual production and not for their ability to produce. Proponents of capacity markets argue that they are needed due to the unique features of electricity as a commodity, and some particularities of electricity market design that make it vulnerable to market failures.

First, electricity demand is considered to be price inelastic. In other words, end-users do not significantly alter their electricity demand as the wholesale prices change. One of the main reasons for this lack of response to price is that end users rarely observe wholesale electricity prices directly, as LSEs usually charge consumers flat rates as set by state regulators in rate cases. Therefore, even when wholesale market prices substantially increase, signaling the scarcity of energy generation, consumers do not receive this price signal and hence they do not adjust their energy usage. Consumers may thus demand more electricity than is feasible to generate at a given time, which can lead to blackouts.

Second, electricity markets are often haunted by a "missing money problem."[12] The problem refers to the idea that energy prices in competitive wholesale electricity markets do not adequately reflect the value of investment in generation needed to create a reliable electric supply.[13] Because electricity cannot be stored at a large scale, and electricity demand fluctuates significantly during the day and the year, sufficient capacity must be built to balance supply and demand reliably under any foreseeable demand conditions, in particular under maximum peak demand conditions (called "super-peak" demand).[14] However, super-peak demand, by definition, occurs during only a small number of hours per year (e.g., 10 hours per year).[15] It is only during those super-peak hours that the capacity is almost fully utilized. The fact that enough generation capacity must exist to meet the high demand during these times means that much of the generation capacity sits idle during the rest of the year. To be profitable enough to stay in the market, these generators must earn enough money on energy sales in the super-peak hours when they manage to clear the auction to cover both operations and maintenance costs, as well as their construction costs.[16]

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[11] Every unit that clears the auction receives the same price for a MWh of energy they supply at a given location. Submitting a bid higher than the marginal cost would imply that, if the energy price is higher than the marginal cost but lower than the bid, the generator misses the profits that it would otherwise make. On the other hand, if the generator bids below it marginal cost, it risks clearing an auction where the MWh price will not cover his variable costs of energy supply. Consequently, only those resources that can produce and deliver electricity below the market clearing price—the marginal cost—are dispatched.

[12] Michael Hogan, *Follow the Missing Money: Ensuring Reliability at Least Cost to Consumers in the Transition to a Low-Carbon Power System*, 30 ELECTR. J. 55 (2017).

[13] *See id.*

[14] The level of peak demand fluctuates around the year in a relatively predictable manner but sometimes may increase to unusually high values, mostly due to extreme weather conditions. *See* Paul L. Joskow, *Capacity Payments in Imperfect Electricity Markets: Need and Design*, 16 UTIL. POLICY 159, 159–170 (2008).

[15] *See id.* at 160.

[16] *See id.* at 160.

While in theory it is possible for all generators, including the highest-cost generators, to recover their full costs in such a short time interval, in practice there are a number of reasons why this may not happen. Notably, there are price caps in wholesale electricity markets.[17] While such price caps may be justified because they help limit potential market-power concerns and protect consumers, they nonetheless create a distortion: electricity market prices do not accurately reflect demand for reliability during peak-demand hours, and thus might render it impossible for some generators necessary for meeting the peak demand, specifically peaker plants, to recover their investment costs.[18] Consequently, an energy-only market with price caps may induce too little new investment to meet the maximum energy demand during super-peak hours.

Third, system reliability is a public good and markets generally underprovide public goods.[19] During a blackout, no generator is able to sell energy. As a result, when a resource prevents a blackout, benefits accrue to all of the generators that would have been otherwise unable to sell power. Similarly, given that during a blackout no consumer can receive energy, consumers would benefit from a decrease in consumption of any consumer that can forestall any blackout. As with all public goods, electricity's reliability is likely to be undersupplied without intervention in the market.[20]

In light of these limitations, some regions have chosen to set up capacity markets to assure that sufficient capacity is built to satisfy demand and thus ensure reliability at any moment of the year.[21] ISOs/RTOs such as PJM and ISO-NE run these markets by using auctions. Generators submit their bids for making their capacity available whenever the energy market price reaches a certain threshold, usually defined by the electricity price cap.[22] Capacity auctions choose the generators with the lowest offers to meet the necessary level of capacity to ensure resource adequacy—capacity amounts that are close to the predicted maximum demand plus a reference reserve margin.[23] All of the cleared generators receive the same per-MW price, equal to the bid of the last-clearing generator.

These capacity payments supplement earnings in the energy market. As the payments reward capacity only in the amount related to maximum electricity demand, they create incentives for entry up to the point where additional capacity is no

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[17]   For example, the electricity markets run by PJM and NYISO caps the admissible offers at $2,000/MWh. However, to comply with FERC Order 831, PJM verifies bids above $1,000/MWh to ensure that they "reasonably [reflect] the associated resource's actual or expected costs prior to using that offer" before using them for calculation of the clearing price. *Offer Caps in Markets Operated by Regional Transmission Organizations and Independent System Operators*, Order No. 831, FERC Stats. & Regs. ¶ 31,387 (2016) (cross-referenced at 157 FERC ¶ 61,115), order on reh'g and clarification, Order No. 831-A, 82 Fed. Reg. 53403 (Nov, 16, 2017), FERC Stats. & Regs. ¶ 31,394 (2017), https://www.ferc.gov/whats-new/comm-meet/2016/111716/E-2.pdf.

[18]   Joskow, *supra* note 14, at 162.

[19]   System reliability meets the conditions of a public good: it is both non-excludable and non-rivalrous from the perspective of generators and energy end-users. Non-excludability means that it is not possible to prevent individuals from enjoying the benefits of system reliability even if they do not pay for the reliability. Non-rivalry means that system reliability being enjoyed by some of the consumers and generators does not prevent others from enjoying it simultaneously. The technology, however, is eroding the non-excludability feature. *See* Hogan, *supra* note 12; *see* Malcolm Abbott, *Is the Security of Electricity Supply a Public Good?*, 14 Electr. J. 31 (2001) (for background on 'public goods').

[20]   *See* Joskow, *supra* note 14, at 165.

[21]   For example, PJM, NYISO and ISO-NE run mandatory capacity markets, at MISO the participation in the market is voluntary.

[22]   This threshold is usually reached during the super-peak demand hours but could also be a result of some technical problems of some generators, weather conditions disrupting the transportation of energy from some generators, or a mixture of the factors. In such situations the electricity generation becomes scarce relative to the demand, and imbalance between power generation and power consumption may lead to a blackout.

[23]   Demand in the capacity market is determined by an administratively defined downward sloping demand curve. This curve is designed to ensure adequate resources to meet expected operating needs. It is therefore is based on the super-peak demand adjusted by reference margins. Reference margins are published periodically by North American Reliability Corporation for individual regions. They dictate how much capacity needs to be obtained in excess of the predicted maximum capacity to serve as insurance against breakdowns in part of the system or sudden increases in energy demand (expressed in percentage terms, usually a value between 10 and 20%). *See M-1 Reserve Margins*, N. Am. Elec. Reliability Corp., http://www.nerc.com/pa/RAPA/ri/Pages/PlanningReserveMargin.aspx (last visited March 29, 2018).

longer needed. In this way, capacity markets ensure there is enough energy generation when it is most needed, thus meeting their basic purpose: ensuring resource adequacy. At the same time, if the total revenue an existing generator can earn is too low for the generator to be profitable, the market will give an exit signal to that generator.

Outcomes of energy and capacity markets are strongly interwoven. Generators have an incentive to bid their true net costs of staying in the capacity market because otherwise they could risk not clearing in the auction. For existing power plants, this incentive leads to them to bid the present value of their current and future costs, adjusted by expectations regarding all future profits from energy and capacity markets (known as the "net going forward cost"). The optimal bid of new entrants corresponds to the costs of building the plants, adjusted by all the expected future profits from energy and capacity markets.[24] Therefore, the resources that manage to make profits on the energy market and thereby (partly) cover their annualized fixed costs are willing to accept lower capacity payments. Holding all other things equal, higher prices on the energy market lead to lower bids in the capacity market. On the other hand, capacity markets affect the long–term composition of resources present in the market, and thus energy prices. The two markets therefore simultaneously affect each other.

Market failures and corrective subsidies

A key principle of economics is that competitive markets ordinarily maximize social welfare. And, any interference with the operation of a free market, if it changes the equilibrium price and quantity, reduces welfare. However, the assumption that competitive markets are economically efficient relies on idealized assumptions about the structure of the market.[25] Market failures often interfere with that ideal vision. For example, market outcomes are not efficient when market transactions fail to take into account the cost of damage they cause to third parties through a "negative externality."[26] Air pollution is a classic example of a negative externality. As a by-product of electric generation, fossil-fuel-fired power plants emit many pollutants such as nitrous oxides, sulfur dioxide, particulate matter, and ammonia.[27] The electricity sector is also one of the main sources of greenhouse gas emissions—29% of U.S. emissions in 2015.[28] All of these emissions harm society,[29] and wholesale electricity markets have been failing to take those external costs fully into account.[30] If polluters do not need to pay for the damages they cause, they will engage in market transactions that result in more pollution than is economically efficient.

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[24] *See* James F. Wilson, *Forward Capacity Market CONEfusion*, 23 Electr. J. 25 (2010) (for the discussion on optimal bids).

[25] For the set of conditions required for competitive equilibria to exist and be efficient see Antonio Villar, General Equilibrium with Increasing Returns 6 (1996) and Robert S. Pindyck & Daniel L. Rubinfeld, Microeconomics 315, 612-13 (7th ed. 2009). *See also* Bethany Davis Noll & Burcin Unel, *Markets, Externalities, and the Federal Power Act: The Federal Energy Regulatory Commission's Authority to Price Carbon Dioxide Emissions*, N.Y.U. Envtl. Law Rev. (forthcoming).

[26] *See generally* Paul Krugman & Robin Wells, Microeconomics 437-438 (2d ed. 2009); Jonathan Gruber, Public Finance and Public Policy 136 (5th ed. 2016).

[27] *See* Jaramillo & Muller, *infra* note 29.

[28] U.S. EPA, EPA 430-P-17-001, Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2015 (2017), https://www.epa.gov/sites/production/files/2017-02/documents/2017_complete_report.pdf.

[29] For estimates of monetary damages due to air pollution exposure for $PM_{2.5}$, SO_2, NOx, NH_3, and VOC from electric power generation, oil and gas extraction, coal mining, and oil refineries for selected years see Paulina Jaramillo & Nicholas Z. Muller, *Air Pollution Emissions and Damages from Energy Production in the U.S.: 2002-2011*, 90 Energy Policy 202, 202–211 (2016) [for 2011 the paper estimates that damages associated with the investigated emissions totaled 131 billion dollars (in 2000$)]. *See also* Jeffrey Shrader, Burcin Unel & Avi Zevin, Valuing Pollution Reductions. How to Monetize Greenhouse Gas and Local Air Pollutant Reductions from Distributed Energy Resources (2018), http://policyintegrity.org/documents/valuing_pollution_reductions.pdf

[30] RGGI permits which are obligatory for offsetting the CO_2 emissions for generators located in some of the states and are an exception here. However, their price level (currently around $3) is far below the external costs associated with emissions of the relevant greenhouse gases.

Whenever the market fails because of externalities, intervention is not just preferable but necessary to ensure that social welfare can be maximized.[31] The typically prescribed, efficient solution for an externality is a corrective tax, forcing the market participants to directly "internalize the externality"[32]—known as the "first-best" option—by, for example, imposing a "carbon price" in the form of an economy-wide emissions tax or cap-and-trade system based on the external damages caused by emissions.[33] However, taxation may not be feasible due to political considerations. As an alternative, policymakers can address negative externalities by subsidizing resources that do not produce the externality.[34] While such policies are generally inferior to taxing the externality directly, they can still substantially improve the economic efficiency of the market. These are known as "second-best" options.

Therefore, corrective subsidies, such as externality payments, that aim at increasing market efficiency in the presence of externalities are an important and desirable tool for policymakers. Corrective subsidies are clearly distinguishable from "traditional" rent-seeking subsidies that result from companies manipulating the social or political environment to increase their profits based on the personal preferences of decisionmakers for certain products, services, or technologies. These traditional subsidies that do not target any market failure reduce social welfare by distorting market allocations, as opposed to increasing social welfare by eliminating externalities.

The combined capacity, electricity and ancillary services markets have been mostly successful at providing reliable energy to consumers.[35] Nonetheless, because these markets have been disregarding a significant externality—pollution—they have failed to ensure that the energy mix is socially efficient.

The existence of externalities changes what can be considered economically efficient. A generating unit that appears to be profitable given its market revenue, and therefore economic when considering only its private costs, may actually be socially uneconomic when its emissions are taken into account because its net revenues are lower than the harm it causes.[36] Similarly, a generating unit that appears uneconomic based on its wholesale market revenues alone may nevertheless be socially economic and viable if it could capture the economic value of its environmental attributes through externality payments. Without incentives for the generators to consider the external costs of their actions, the equal treatment of emitting and non-emitting resources in wholesale markets causes too much electricity to be produced by emitting generators. As a result, energy markets currently do not yield economically efficient outcomes.

A carbon pricing policy, as explained above, would be the first-best economic approach to counteract the greenhouse gas emissions externality. This economically preferred policy takes into account the pollution intensity of the generators,

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[31] Elena Cima, *Caught Between WTO Rules and Climate Change: The Economic Rationale of "Green" Subsidies*, 4 Environ. Law Econ. 379 (2017).

[32] *See id.*

[33] While this report discusses only the externalities related to greenhouse gas emissions, the same principles applies to other pollutants such as nitrous oxides, sulfur dioxide, particulate matter as well.

[34] Gruber, *supra* note 26, at 138.

[35] In 2015, municipal utility customers experienced on average one outage and about two hours of interrupted service, investor-owned utilities' customers averaged slightly more than three hours without electric service, while co-op customers averaged nearly five hours without power over two outage events. David Darling & Sara Hoff, *Annual Electric Power Industry Report* (EIA-861), U.S. Energy Info. Admin. (Sept. 16, 2016), https://www.eia.gov/todayinenergy/detail.php?id=27892.

[36] The phrase "uneconomic" generators has been used in the discussions around the capacity market reforms. While not explicitly explained, it relates to being able to successfully compete in the market and clear the market auctions based on their private costs. *See* Order on Paper Hearing and Order on Rehearing, *ISO New England Inc.*, 135 FERC ⁋ 61,029, P 170 (2011) ("Our concern, however, is where pursuit of [states'] policy interests allows uneconomic entry of OOM capacity into the capacity market that is subject to our jurisdiction, with the effect of suppressing capacity prices in those markets.").

sending differentiated price signals to all market participants. This policy would not affect the marginal cost of non-polluting resources, would cause a small increase in the marginal costs of relatively clean sources, and would lead to a large increase in the marginal costs of highly carbon-intensive generators. In other words, the more emissions a resource produces, the more it needs to pay, which reduces its profits. This inevitably leads to a change in the composition of generation capacity, with a fraction of the most emissions-intensive resources pushed to exit the market. At the same time, it would induce entry from cleaner resources.

Importantly, the generation mix reached when emissions taxes or cap-and-trade programs that fully internalize the externalities are implemented is socially efficient because such programs minimize the sum of generators' costs necessary to meet demand given the existing fleet of generators and the external cost associated with this level of electricity production. These policy tools also ensure that the generators face economically efficient incentives for exit and entry, which necessarily reflect the cost of the emissions.

Yet, despite imposing external costs, fossil-fuel-fired resources have been receiving the exact same compensation in wholesale markets for supplying electricity as non-emitting resources. As country-level initiatives to correct that problem have been absent so far, many states have taken the lead in tackling the electricity-related externalities. However, the first-best solutions—an economy-wide emission tax or cap-and-trade program—are often not feasible for states. Consequently, states face the difficult task of choosing the economic instruments necessary to address externalities within the policy tools available to them. Some states have opted to introduce payments for the carbon-free electricity generation by requiring utility companies to buy RECs or ZECs from renewable or zero-emission resources for a certain percentage of their load. By introducing payments that are related to the value of avoided emissions, these policies are an attempt to ensure that the difference in revenues between clean and polluting generators account for the external costs.

Externality Payments Have Not Led to a Need for Capacity Market Reforms

Several ISOs/RTOs are in the process of changing their capacity markets in reaction to state policies that include externality payments. For example, PJM, the nation's largest RTO, recently submitted two proposals to FERC,[37] and ISO-NE recently received approval for a reform.[38] Both PJM and ISO-NE aim to reduce any potential impact that externality payments might have on capacity markets by increasing the market clearing price in these markets.

The proposed changes are all based on the premise that state externality payments allow generators that would otherwise not be profitable, or what ISOs/RTOs call "uneconomic," to enter the market with below-cost bids, causing the "more efficient, lower cost generators" to exit and "more expensive, less efficient generators" to stay "which will ultimately lead to higher costs for consumers."[39] Under this theory, any prices that are affected by externality payments are not competitive, but rather below competitive levels.[40] And, the theory maintains that such prices would distort entry and exit decisions by allowing uneconomic resources to enter or stay, and economic resources to exit.[41] Additionally, these ISOs/RTOs suggest that the capacity prices could settle at levels that are too low to attract new capacity not encompassed by externality payment programs[42] and, in the long term, could threaten resource adequacy.[43]

Externality payments, such as ZECs and RECs, reward the electricity production of certain resources, and in that way they affect outcomes in capacity markets. For example, externality payments may create incentives to install non-emitting generating capacity that meets state environmental objectives, and these resources would not be profitable without these payments. Entry of such new resources changes capacity prices and thereby affects entry and exit considerations for other generators. Externality payments can also affect exit and entry through changes to revenues in energy markets induced by new non-emitting generators. But, it is important to keep in mind that internalizing externalities improves economic efficiency. And, while detrimental welfare effects of externality payments on capacity markets are theoretically

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[37] PJM Filing, *supra* note 4.

[38] Order on Tariff Filing, *ISO New England Inc.*, 162 FERC ¶ 61,205, P 2 (2018).

[39] *Pre-Technical Conference Comments, Robert C. Flexton, President & CEO, Dynegy Inc., Docket No. AD17-11-000*, FERC (Apr. 13, 2017), https://www.ferc.gov/CalendarFiles/20170426151233-Flexon,%20Dynegy.pdf.

[40] *ISO New England Inc.*, 162 FERC ¶ 61,205, P 4 (2018).

[41] The suggestion of externality payments negatively affecting the entry and exit decisions has been brought forward, among others, by ISO New England in its white paper stating that "the participation of resources with out-of-market contract revenue (…) depress capacity prices for all other capacity resources for many years. Further, this potential may impair the market's ability to attract new, competitively-compensated resources when they are needed ISO-NE." ISO New England, Competitive Auctions with Subsidized Policy Resources 6 (2017), https://www.iso-ne.com/static-assets/documents/2017/04/caspr_discussion_paper_april_14_2017.pdf. FERC explained in approving ISO-NE's change, "[a]ccording to ISO-NE, these out-of-market actions could result in price suppression and thus negatively impact the market's ability to retain and justly compensate needed existing resources and to attract new, competitively-compensated resources." Order on Tariff Filing, *ISO New England Inc.*, 162 FERC ¶ 61,205, P 17 (2018); accord. PJM Filing, *supra* note 4.

[42] Order on Tariff Filing, *ISO New England Inc.*, 162 FERC ¶ 61,205, P 4 (2018).

[43] According to ISO-NE, it favored this objective "because FCM's capacity clearing price guides competitive entry and exit decisions for the region," and therefore "is essential to achieving the region's resource adequacy over the long term." *ISO New England Inc.*, 162 FERC ¶ 61,205, P 32 (2018).

possible,[44] it is far from clear whether externality payments indeed have such detrimental effects on capacity markets, as we discuss in the remainder of this report.

Before implementing reforms of the capacity market reforms under the Federal Power Act, market operators[45] must demonstrate to FERC that any rates they propose to charge for interstate electricity are just and reasonable.[46] In order to satisfy the just and reasonable standard and avoid needlessly causing inefficiencies, ISOs/RTOs need to base their decisions on economic findings pertaining to their markets when altering their market designs. In addition, given the long lifespan of power generation assets, any unreasoned alteration in market design rules has the potential to result in a long period of inefficient outcomes. While there has been a substantial discussion around state policies and the functioning of wholesale markets,[47] both comprehensive economic modeling and empirical evidence are necessary to sufficiently demonstrate any destabilization of markets.

But there is currently no such evidence that externality payments threaten the efficient functioning of capacity markets, or that these capacity markets require reform. First, the argument for reforming capacity markets in reaction to externality payments focuses only on private generation costs, disregarding the external cost of electricity generation that is being addressed by the externality payments. This approach leads the proponents of reform to incorrectly identify which generators are economic and which are not, and they incorrectly claim that any price effect of externality payments would be inefficient. Second, the arguments for proposed reforms overlook the effect of the inherent market forces of capacity markets that, by design, would lead to price adjustments based on the supply and demand conditions in the market. Proponents of reform then incorrectly claim that externality payments would threaten either the functioning of the market or resource adequacy. And, finally, the arguments disregard the other important flaws of capacity markets that need to be addressed.

Externality payments help correct market failures and improve economic efficiency

As explained above, the external costs that electricity generation imposes on society are usually not priced in the energy markets. When such external costs, such as carbon emissions, are present, they should be taken into account when deciding whether or how much a resource should be used. Externality payments for generators' desirable attributes force the market to consider the external costs of various resources.

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44 PJM's Market Monitor has explained that ZECs "are not part of the PJM market design but nonetheless threaten the foundations of the PJM capacity market as well as the competitiveness of PJM markets overall" and that "[t]he current subsidies demonstrate that the markets need protection against subsidized, noncompetitive offers from existing as well as new resources." 2016 State of the Market Report for PJM, *supra* note 1, at 37. David Patton, the President of Potomac Economics Ltd., was more cautious when discussing the relevant state policies, acknowledging that "[s]ubsidized entry in itself is not necessarily problematic. For example, if subsidized entry simply displaces non-subsidized entry in similar quantities, it would have little effect on market prices, holding all else constant. Therefore, the problem is largely one of coordination and avoiding sustained disequilibrium conditions (i.e., capacity surpluses caused by the subsidized entry)." *Comments of David B. Patton, Ph.D., Regarding State Policies Affecting Eastern RTOs, Docket No. AD17-11-000*, FERC (Apr. 24, 2017), https://www.ferc.gov/CalendarFiles/20170426150115-Patton, Potomac Economics.pdf. In ISO New England some stakeholders expressed concern that allowing state-subsidized resources to participate in capacity markets without subjecting them to a minimum offer price rule could threaten the financial viability of other resources. *See* Sarah K. Adair & Franz T. Litz, Understanding the Interaction between Regional Electricity Markets and State Policies 9 (2017).
45 Federal Power Act, 16 U.S.C. §§ 791-828(c), at § 824(e) (2010 & supp. 2010).
46 *Id.* § 824d(a).
47 For some of the contributions to the discussions, see FERC Dockets, *supra* note 1.

In particular, when a generator that would not have cleared an auction without a ZEC- or REC-style payment is able submit a bid that allows it to clear after the introduction of such a program, it does not imply that the payments distort competition or efficiency. Rather, it suggests that the presence of the generator is socially desirable when external attributes are considered. State policies that are directly related to socially desirable attributes should be seen as instruments that help fix this market failure and level the playing field. These payments introduce a difference in revenues between clean and emitting generators that aim to approximate the revenue that the resources would have gotten if the external costs of pollution were taken into account in the energy market. As such, a policy offering payments for clean attributes does not distort the market outcome but rather moves the market towards more economically efficient outcomes from a societal perspective.

It is a misguided approach to treat externality payments like distortive, rent-seeking subsidies that simply provide financial aid to a group of producers without being directly tied to a quantifiable external benefit. This misunderstanding may stem from the tendency to focus only on private costs when defining what it means to be an "economic" resource. Generators that receive externality payments, and clear the market, are indeed economic when considered from the perspective of overall social welfare. Even if externality payments are second-best policies, their corrective effects are desirable given the high external costs emitting resources impose on society.

Given that external costs of emissions are currently not fully internalized in markets, the external costs of externalities and, hence the level of existing market distortion can be very substantial. For example, the annual external damages associated with the climate change damages from CO_2 emissions of a typical 1,000 MW coal plant, not taking into account damages from other pollutants, would amount to about $234.3 million[48] based on the Interagency Working Group's Social Cost Carbon.[49] In comparison, PJM forecasted that a 1,000 MW seller in one of their areas would see its capacity market revenue reduced by $6.75 million annually given the effect of externality payments, a negligible amount compared to their external costs.[50] The external costs of emissions therefore starkly outweigh the reduction in generators' revenue, and suggest that the market signals sent by externality payments guide the generation mix in the right direction. Therefore, externality payments help correct existing market distortions, rather than exacerbate them. And misguided adjustments to capacity markets may cancel out those corrective effects.

Well-designed externality payments create changes in the generation mix that are similar to those induced by first-best pollution taxes. A first-best emissions tax would increase the marginal costs of energy generation of polluting units based on the external damages they cause, forcing them to bid higher in both energy and capacity markets. The average energy

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[48] An average coal plant operated with a 53.5% capacity factor in 2017. Electric Power Monthly, U.S. Energy Info. Admin. (2018), https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_6_07_a (last visited Apr. 24, 2018). A typical coal plant has an average emission rate of 1 ton/MWh. Therefore, a 1,000 MW coal plant would produce 1,000*8760*53.5%= 4,686,600 MWh of electricity and about 4,686,600 tons of carbon dioxide. The monetary damages of these emissions equal to $234,300,000 in 2017 dollars using the Interagency Working Group's Social Cost of Carbon value of about $50 per ton in 2017 dollars. *See* Interagency Working Group on Social Cost of Greenhouse Gases, Technical Support Document: *Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis Under Executive Order 12866*, at 16 (2016).

[49] The Social Cost of Carbon measures and monetizes the damage that results from emission of a ton of CO_2 into the atmosphere. The Interagency Working Group's (IWG) 2016 Social Cost of Carbon estimate is the best currently available estimate for the external cost of CO_2 emissions. IWG's methodology has been repeatedly endorsed by reviewers. In 2014, the U.S. Government Accountability Office concluded that IWG had followed a "consensus-based" approach, relied on peer-reviewed academic literature, disclosed relevant limitations, and adequately planned to incorporate new information through public comments and updated research. *See* Gov't Accountability Office, GAO-14-663, Regulatory Impact Analysis: Development of Social Cost of Carbon Estimates 12-19 (2014), http://www.gao.gov/assets/670/665016.pdf.

[50] PJM Filing, *supra* note 4, *Attach. E, Aff. of Adam J. Keech*, at 3.

price would increase, but generators with higher emissions would clear the auctions less frequently and, when they clear, the most pollution-intensive resources would earn less per MWh. For example, under a first-best carbon pricing policy, the 1000 MW coal generator above would need to pay a tax equal to the damages it causes—the Social Cost of Carbon— and, hence, would face even a strong exit signal. Consequently, just as is the case with externality payments, profits fall for emitting resources to the point that some may be forced to exit the market.

The generators that leave the market under a pollution tax, but would not have left otherwise, are currently being classified as "economic" in many policy discussions. However, they are socially uneconomic when external costs are considered. Clean resources, on the other hand, do not need to increase their bids under pollution taxes or payment programs, because their marginal costs are unaffected. Therefore, they would clear the auctions more often and would receive higher prices for their generation. Consequently, their profits rise, which also leads to increased entry and slower exit of non-polluting resources, just as with the externality payments.[51]

Externality payments may increase the economic efficiency of entry and exit behavior

As discussed above, capacity market prices and energy market prices are interrelated. Because prices in energy markets are distorted due to negative externalities, current capacity prices are distorted as well. Thus, deviating from the prices that would have occurred without state policies does not automatically imply a worse outcome in terms of social welfare, and, thus, economic efficiency. Rather, if we measure from the perspective of overall societal welfare, those deviations would reflect better outcomes because the external cost of emissions would be partially internalized. After all, the introduction of first-best taxation of externalities—which, by definition, would lead to a socially efficient generation mix—would also lead to lower revenues for emitting resources and, thus, faster exit of those resources.

Externality payments are meant to improve price signals by supplementing the revenue of generators that offer societal benefits through their lack of emissions. They indirectly affect the profitability of polluting resources, both through energy markets and capacity markets. Polluting resources also enter less frequently and exit quicker than under a policy scenario without externality payments. This might in particular apply to coal- and oil-fired plants given their pollution intensity.[52] Indeed, the exit of the most polluting resources would likely be even higher under the first-best policy of emissions taxes. On the other hand, the prospect of additional revenues from the externality payments cause clean generators to bid lower than they otherwise would in wholesale energy markets, and make some new resources enter the market that otherwise

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[51] The similarity in the outcomes under taxation of externalities and payments to avoid externalities can be seen by analyzing a simple case of inelastic demand, one type of emitting generator and payments for attributes set at the value of avoided emissions. Here, the two policies are indistinguishable from the perspective of the generators as they lead to the same profits at the equilibrium. Let t denote the corrective tax rate, s the payment for clean attribute, x the amount of clean generation, y the amount of dirty generation, $MC_x(x)$ and $MC_y(y)$ the aggregate supply curves associated with the two types of generation, and *ext* the value of avoided emissions. The market solution under optimal tax is characterized by conditions: $x^t + y^t = Q$ and $MC_x(x^t) = MC_y(y^t) + t$. On the other hand, with payments for attributes the market will generate electricity such that: $x^s + y^s = Q$ and $MC_x(x^s) - s = MC_y(y^s)$. Whenever payment for clean attributes are set at the value of avoided pollution ($s = t = ext$) the solutions of those equations are the same: $x^s = x^t = x^*$ and $y^s = y^t = y^*$. As the market price in the tax case differs from the market price with payments for attributes by value of avoided emissions: $p^t = MC_x(x^*) = ps + ext$, the achieved profits are the same no matter which of the policies gets implemented. Consequently, as the two regimes are undistinguishable for generators in any period, their effect on dynamic incentives for entry and exit (and, thus, the capacity market) will also be the same. Clearly, in such a case the payments for attributes send exactly right signals to the resources. The current conditions at the energy market do not exactly match the conditions for profit equivalency described above. However, the results convey the intuition for similarities between corrective taxes and payments for attributes and can be seen as approximation of the actual outcomes.

[52] *See* SHRADER, UNEL & ZEVIN, *supra* note 29.

would not have entered. Therefore, the increased exit of some types of resources and the increased entry of others types of resources does not necessarily imply that the market is failing.[53]

Claims about distorted entry and exit generally remain vague about what exactly constitutes economic inefficiency and how to measure and compare it across different outcomes. These claims mostly rely on the differences in the types of resources that would enter and exit with state policies compared to the status quo.[54] However, it is not clear that externality payments decrease the economic efficiency of entry and exit behavior compared to a business-as-usual scenario. As we show below, establishing whether the entry of a given generator combined with the exit of another specific resource is more efficient compared to the status quo may be a challenging task. Even determining which of two possible entrants is more efficient from a societal point of view can be difficult.

Given that consumers' demand for electricity is largely fixed and the electricity market is competitive, choosing a socially efficient mix of generation resources is equivalent to picking a generation mix that minimizes the total social costs associated with energy generation, while maintaining the reliability of the system. To establish the true social cost of an existing resource, one needs to consider at least four types of costs associated with it: the marginal costs of energy generation, power plant cycling costs,[55] yearly operation and maintenance costs independent of generation, and costs associated with externalities. For new resources, the construction costs are also relevant.

Engineering literature uses a concept called "Screening Curves" to identify the socially efficient composition of generators. These curves show the average cost of using a plant's capacity to summarize the different types of costs, except for externalities.[56] One important lesson from engineering literature studies is that there is no one superior type of generator that is the most-efficient under every setting, but rather, the socially efficient choice of a new resource depends on many factors. For instance, a high-marginal-cost, low-fixed-cost resource will be less costly to operate than a resource with a low-marginal-cost, high-fixed-cost when both are expected to operate for a relatively low number of hours (at low capacity factors).[57] In other words, for defining what is "efficient," the totality of factors, including the properties of the existing generation mix, and, thus the capacity factors, must be considered.[58] In particular, a simple comparison of marginal generation costs, or going forward costs, will not make clear which generators are socially desirable.

Panel A in Figure 1 shows the private annual average cost of capacity usage for three types of generators dependent on their capacity factor. The costs are composed of the generators' annual fixed costs, given by the y-intercept, and variable costs, given by the slope of the screening curves.[59] In relative terms, the Gas Turbine (GT) generates power at the lowest

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[53] However, current externality payments disregard the pollution intensity of dirty resources. Consequently, these policies treat all polluting power plants the same way, while the first-best policy would have sent stronger negative signals for coal and oil-fired power plants than for gas generators. In other words, with the current system of externality payments, some gas generators might be likely to exit slightly too early and enter too little while coal plants might exit too slowly and enter too much, compared to the socially efficient outcome.

[54] Given that externality payments are not first-best policy tools to internalize environmental and public health externalities, there may be some dynamic inefficiencies associated with them.

[55] Cycling operations include on/off startup and shutdown operations, on-load cycling, and high frequency MW changes for automatic generation control.

[56] *See* STEVEN STOFT, POWER SYSTEM ECONOMICS: DESIGNING MARKETS FOR ELECTRICITY (2002); Yusuf Emre Güner, *The Improved Screening Curve Method Regarding Existing Units*, 264 EUR. J. OPER. RES. 310, 310–326 (2018).

[57] For the intuition see Güner, *supra* note 56, at 311-312

[58] The amount of existing capacity as well as the proportion of generators of various types will determine how often a new resource of a certain category will be able to clear the energy market. This information can be summarized in form of capacity factor - the fraction of a generator's potential output that is actually produced. *See* STOFT, *supra* note 56, at 36.

[59] For the purposes of simplicity, the basic screening curves methodology is presented here that, for example, does not take into account dynamics of a power market.

costs among the other two if the power plant is run less than a certain amount of capacity factor, CF_3, annually. The Coal power plant would be the preferred choice if the new power plant is expected to operate actively over a capacity factor of CF_2. The Combined Cycle (CC) power plant is cost-effective if it runs at a capacity factor that is between CF_3 and CF_2.

Figure 1: Comparison of screening curves for various resources

Panel A: Classical screening curve

Panel B: Screening curves enhanced to reflect external costs.
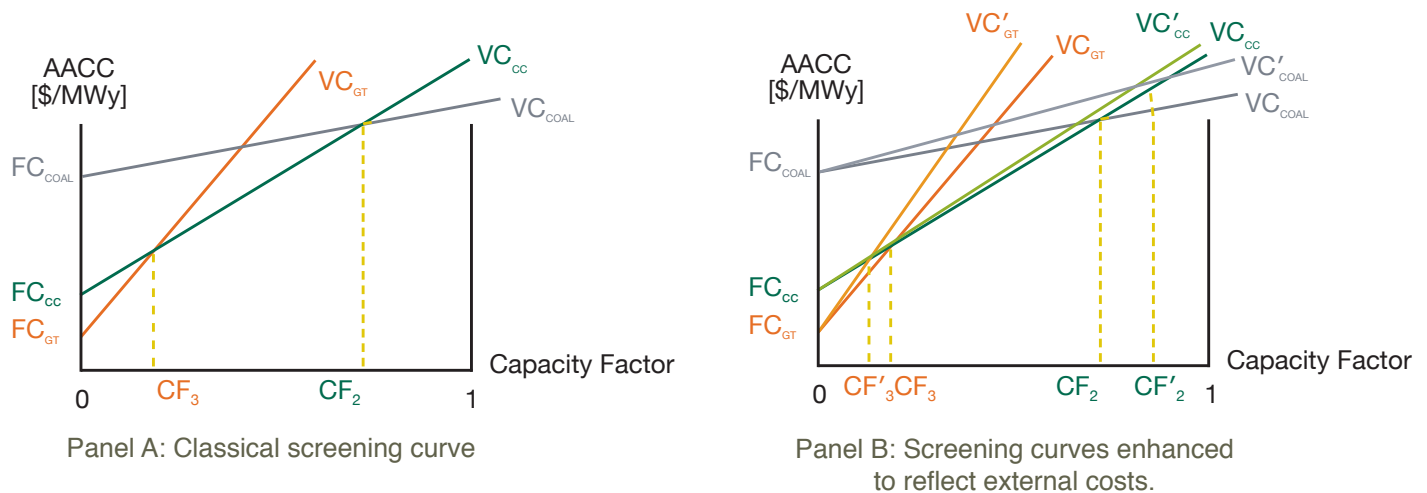
Source: Figure 1 adapted from Yusuf Emre Güner, *The Improved Screening Curve Method Regarding Existing Units,* 264 EUR. J. OPER. RES. 310, 312, fig.2 (2018).

Source: Authors' adaptation of screening curves

When external damages associated with individual power plants are considered, the socially efficient generation mix changes. In Panel B, new screening curves reflect the social screening curves. Adding the external costs of pollution increases the marginal cost of production and, thus, rotates the screening curves outwards. The degree of rotation is smaller for cleaner generators and higher for dirtier generators. Here the CC power plant is depicted as having the lowest external damages, with the coal plant having the highest external damages. With the shift in curves, the thresholds for choosing the cost-efficient generators change. The "cleaner" CC generator is now the preferred resource for a wider range of capacity factors.

As is clear from the comparison of Panels A and B, focusing solely on marginal private costs in an analysis to determine what type of new generation is socially efficient would lead to misleading conclusions. A well-functioning capacity market would automatically induce efficient entry and exit of the resources. However, the current market design disregards externality costs, and thus cannot currently incentivize socially efficient entry and exit.

There is no credible evidence that externality payments threaten the viability of markets

Concerns that externality payments would inefficiently suppress capacity market prices, and that the resulting price changes would undermine the viability of markets, have been at the heart of the arguments in favor of capacity market redesign. But, currently there is no empirical support for this argument. Any price effect of externality is likely to be modest, especially in comparison to historical price fluctuations observed in the market and the social welfare gained from avoided emissions. In fact, given the interconnected nature of energy and capacity markets, and that other

generators would also adjust their bids, clearing prices might even increase under some conditions. In addition, capacity markets prices would, by design, adjust to meet the resource adequacy requirements if capacity was indeed scarce. Past evidence also shows that capacity markets have consistently achieved their goals of resource adequacy despite a plethora of subsidies and steep price fluctuations.

The actual effect of externality payments on capacity prices is likely to be rather modest for two reasons. First, not all resources receiving externality payments participate in capacity auctions. In some regions, like PJM, stringent capacity performance standards require bidding generators to guarantee sustained operation on an annual basis. Because renewable resources are seasonal, they would be unable to bid into capacity markets that have those restrictions. Externality payments to these resources consequently have only an indirect impact on capacity price formation—through the outcomes on energy markets.[60] Similarly, in ISO-New England, Minimum Offer Price Rules have been in place to prevent resources that receive externality payments from affecting the capacity market price.[61]

Second, even if resources that receive externality payments could participate in capacity markets, they would be limited in their ability to reduce capacity market prices. Any decrease in the bid of an infra-marginal unit that would have cleared the auction anyway, all else equal, would not affect the market clearing price. Thus, externality payments can affect the auction price only in limited situations: (1) when they induce entry (or prevent exit), increasing available supply of capacity, and hence lowering the market clearing price; or (2) when they directly lower the marginal bid, and hence the market clearing price.[62] For example, if the market clearing price were $40/MW, and if a resource that would normally bid $30/MW decreases its bid to $10/MW due to externality payments, the reduction in that resource's bid would not change the market clearing price.

Furthermore, given the interconnected nature of energy and capacity markets, even the direction of the net effect of the externality payments on capacity market prices is not clear. Polluting resources may submit higher bids than they would otherwise due to the prospect of decreased revenues from the energy market. Given that in some regions such polluting resources are more likely to be the marginal bidders in the capacity markets than the resources that get externality payments, the market clearing price in those regions might even increase depending on the resource mix of the area. Therefore, any forecasting exercise that adjusts the bids only for resources that get externality payments, or simulates auctions by only adding zero- or relatively low-priced supply bids without adjusting the other bids, is not sufficient to inform decisionmaking.

The actual outcomes in capacity markets also do not support claims that low or significantly-fluctuating prices do not send efficient incentives for entry, among others, to units that are not eligible for externality payments. States have long been using externality payments, and capacity prices have been fluctuating substantially since the introduction of the

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[60] For instance, from delivery year 2020/2021 PJM allows the resources only to bid under Capacity Performance standard which requires them to be able to sustain availability throughout the delivery year. In the first auction under the capacity performance standards only held in May 2017 wind and solar constituted only about 2 percent of capacity cleared. For analysis of the bidding results *see* Jeff St. John, *PJM's Latest Capacity Auction: A Tough Market for Nuclear and Demand Response*, GreenTech Media (May 24, 2017), https://www.greentechmedia.com/articles/read/pjms-capacity-auction-a-poor-showing-for-nuclear-and-demand-response#gs.uwVJzdo.

[61] An exemption was granted for 200 MW of renewable resources a year (or up to 600 MW if the exemption was not completely used in the previous two auctions).

[62] An externality payment might directly lower the marginal bid if it decreases either the bid of the unit that would be marginal without the payments or the bid of a units that would not clear the capacity auction without the payments.

capacity markets.[63] For example, the clearing prices in the PJM market, known as the Reliability Pricing Model (RPM), have varied widely since 2007 when the market was created. They started at $40.80 for delivery year 2007/2008 in the RPM Base Residual Auction, and have since fluctuated between $174 and $16.40 (see Figure 2). The last PJM auction featured a drop from $100 to $76.53.[64] Given the prevalence of such fluctuations in the market, it is very difficult to ascribe the cause of any changes in capacity prices to any one factor, without a proper econometric analysis. And, without a proper econometric analysis, it is hard to isolate whether capacity price fluctuations are due to state policies or to other changes in market conditions.

Figure 2: RPM Base Residual Auction Resource Clearing Prices within PJM over time and by sub-region (LDA)
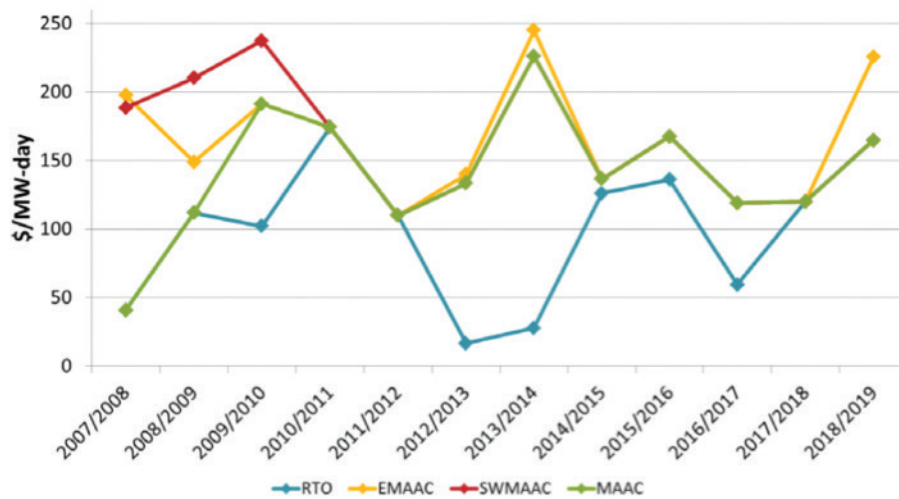
Source: http://www.nrel.gov/docs/fy16osti/65491.pdf, p. 11.[65]

But, despite all of these fluctuations, a significant amount of new generation capacity continues to clear capacity actions. This is contrary to the argument that capacity markets are under threat. In PJM, for example, almost 3,000 MWs of new capacity, mostly in the form of new or uprates to existing gas-fired combustion turbine and combined cycle generation

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[63] Short lead time between the capacity auction and the delivery year could also lead to price fluctuations. A long lead time allows more types of resources to respond through entry to unexpected changes in capacity prices. Similarly, with a longer lead time, any possible effects of the externality payments will be smoothed out over time. But if a major plant announces plans to unexpectedly exit the market, in the next capacity delivery year, only certain types of power plants can be built in time to replace it and prices may fluctuate during that period. The amount of time needed to build a power plant varies by technology. For instance, the average construction time for nuclear reactors in the US has been 9.3 years, constructing coal power plants takes around four years and gas-fired power two to three years. *See* Michel Berthélemy & Lina Escobar Rangel, *Nuclear Reactors' Construction Costs: The Role of Lead-Time, Standardization and Technological Progress*, 82 Energy Policy 118 (2015). For instance, the average construction time for nuclear reactors in the US has been 9.3 years, constructing coal power plants takes around four years and gas-fired power two to three years. *See id.* at 20, tbl.4 ; *see* Executive Summary of *Projected Costs of Generating Electricity*, IEA, www.iea.org/textbase/npsum/ElecCostSUM.pdf (last visited Apr. 11, 2018).

[64] *See* PJM, 2020/2021 RPM Base Residual Auction Results PJM #5154776 (2017) [hereinafter "PJM 2020/2021 RPM Base Residual Auction Results"], http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2020-2021-base-residual-auction-report.ashx (summarizing results of auction).

[65] Thomas Jenkin et al., Nat. Renewable Energy Lab., NREL/TP-6A20-65491, Capacity Payments in Restructured Markets under Low and High Penetration Levels of Renewable Energy 12 (2016), http://www.nrel.gov/docs/fy16osti/65491.pdf.

units, cleared in the base residual auction for the 2018/2019 delivery year, nearly 5,400 MWs cleared for the 2019/2020 delivery year, and roughly 2,400 MWs cleared for the 2020/2021 delivery year.[66]

Importantly, capacity markets have co-existed for years with many different subsidies, both corrective and distortive, without leading to similar resource-adequacy fears. For example, fossil-fuel generators benefit from numerous federal tax deductions, including deductions for intangible drilling costs and for investment depletion related to oil and natural gas wells. In 2015, the U.S. government estimated that these subsidies amounted to $4.7 billion in reduced government revenue annually.[67] Additionally, many states have tax provisions in place that favor fossil fuels. For instance, Kentucky offers tax credits to electric-power entities operating coal-fired electric generation plants, alternative fuel facilities, or gasification facilities.[68] In Pennsylvania, the purchase or use of coal is exempt from the sales and use tax normally levied on sales of most goods and services in that state.[69] Independent reports quantifying federal and state fossil-fuel subsidies also tend to find substantial numbers.[70]

These subsidies similarly alter the outcomes of the wholesale markets, by lowering the revenue resources needed from the capacity markets. Yet, the effects of these non-market-payments on capacity markets have scarcely been discussed. Any change in market design in response to externality payments must be accompanied by an explanation for the different treatment of externality payments and fossil-fuel subsidies.

By design, capacity market prices would adjust to ensure resource adequacy

Another basis cited for reforming capacity markets has been that externality payments threaten resource adequacy. But, as we show below, externality payments do not pose any challenge for capacity markets fulfilling their main function. Even if the payments reduce the capacity prices, which, as we argue above, is not necessarily inefficient, they would still not undermine resource adequacy because of the design of the capacity markets.

Figure 3 shows a simplified depiction of PJM's capacity market. It presents the capacity supply curve and the capacity demand curve, called Variable Resource Requirement Curve. Because capacity demand is set by PJM, when PJM keeps the demand unchanged, the market clearing capacity price can decrease only if the supply of capacity increases and shifts the curve out as indicated by red arrows in Figure 2. In the context of externality payments, such a shift may happen if

[66] ORGANIZATION OF PJM STATES, INC. (OPSI), RECOMMENDATION THAT THE PJM BOARD OF DIRECTORS NOT APPROVE PJM STAFF'S RE-PRICING PROPOSAL FOR FILING AT FERC (2018), https://citizensutilityboard.org/wp-content/uploads/2018/02/OPSI-BOD-Repricing-Letter-Final-with-vote.February.pdf; PJM, 2018/2019 RPM BASE RESIDUAL AUCTION RESULTS PJM #5154776, http://www.pjm.com/~/media/markets-ops/rpm/rpm-auction-info/2018-2019-base-residual-auction-report.ashx (last visited Apr. 24, 2018); PJM 2020/2021 RPM Base Residual Auction Results, *supra* note 64.

[67] The number represents a nominal annual average figure based on the 10-year revenue estimate. *See* U.S. OFFICE OF MGMT. & BUDGET, PROGRESS REPORT ON FOSSIL FUEL SUBSIDIES, *available at* https://www.treasury.gov/open/Documents/USA%20FFSR%20progress%20report%20to%20G20%202014%20Final.pdf (last visited Mar. 29, 2018).

[68] *See Coal Incentive Tax Credit*, KY. DEP'T OF REVENUE, https://revenue.ky.gov/Business/Pages/Coal-Incentive-Credit.aspx (last visited Apr. 24, 2018).

[69] PJM, Database, *Subsidies to Participants in PJM States, Based on Good Jobs First Subsidy Database*, https://earthtrack.net/sites/default/files/uploaded_files/20170605-item-02-subsidy-short-list-20170531.xls (last downloaded Apr. 24, 2018); *see also* Doug Dkoplow, *Subsidies to Suppliers in the PJM Interconnection Go to Fossil and Nuclear, Not Just Renewables*, EARTHTRACK (Jul. 20, 2017), https://earthtrack.net/blog/subsidies-suppliers-pjm-interconnection-go-fossil-and-nuclear-not-just-renewables (discussing these subsidies).

[70] For example, Oil Change International reports that United States federal and state governments gave away $20.5 billion a year on average in 2015 and 2016 in production subsidies to the oil, gas, and coal industries, including $14.7 billion in federal subsidies and $5.8 billion through state-level incentives. JANET REDMAN, OIL CHANGE INTL., DIRTY ENERGY DOMINANCE: DEPENDENT ON DENIAL 5 (2017), http://priceofoil.org/content/uploads/2017/10/OCI_US-Fossil-Fuel-Subs-2015-16_Final_Oct2017.pdf.

existing clean resources that were previously unable to clear the market lowered their bids, or if new clean resources entered the market.

Figure 3: Capacity Supply and Demand in RPM
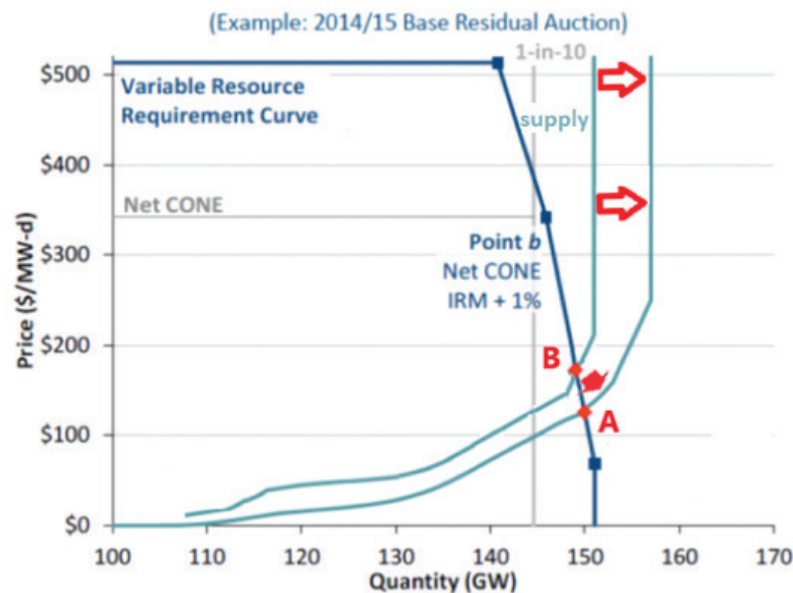
Source: Samuel A. Newell Pfeifenberger et al., *Third Triennial Review of PJM's Variable Resource Requirement Curve*, The Brattle Group (May 15, 2014), https://www.pjm.com/-/media/committees-groups/task-forces/cstf/20140630/20140630-item-04c-vrr-curve-background.ashx.

But, by design, the capacity market would react to those changes. A capacity market serves as a means of recovering fixed investment costs for many generators.[71] While lowered capacity prices will tend not to push the existing clearing generators out of the market,[72] they may discourage the entry of certain types of resources: namely, those resources for which the lower capacity price level, combined with expected profits from energy markets, would be insufficient to cover the investment costs. In the long term, such discouragement would change the supply curve, shifting it back to the left and thereby increasing capacity prices. Therefore, any decrease in price can continue only as long as there is a glut in capacity. Short-term shortage or surplus conditions, and resulting price changes, are only a natural result of market dynamics, and do not warrant market design changes.

With a properly constructed capacity demand curve, the capacity price automatically adjusts to reflect the costs of the new generators that are necessary for resource adequacy when supply becomes scarce.[73] Further, because the Variable Resource Requirement curve is updated every three years based on energy market revenues, it will shift up if energy market revenues go down, increasing the price PJM is willing to pay for any given level of capacity. In other words, capacity markets, by design, ensure that enough capacity is present to meet the highest demand in a given period. As a result, even if externality payments reduce capacity prices in the short term, capacity markets are designed to adjust to that change and keep prices at a level necessary to ensure resource adequacy.

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[71] Some of the resource might be able to fully recoup the investment costs through profits made at energy market.

[72] For existing clean generators, the investment costs are already sunk and even if the change in market conditions renders the full recovery of the initial capital costs impossible, staying in the market is still more profitable for them than shutting down if they can cover their variable costs, including their yearly maintenance costs, in the energy market.

[73] A separate question is how firms form expectations about the future capacity prices. If they expect the prices to fluctuate as described in the above paragraph, the initial discouragement effect will be much weaker.

Current capacity market designs exhibit flaws unrelated to externality payments that must be addressed

While externality payments do not threaten the capacity markets, there are other flaws in current markets that must be studied and addressed. In fact, as the U.S. Government Accountability Office recently concluded, the performance of capacity markets has not been well studied.[74] While FERC has conducted assessments of individual aspects of the market design, it has never fully assessed "how well the capacity markets have performed individually or overall relative to their objective of ensuring adequate resources at just and reasonable prices."[75] At the same time, "stakeholders continue to raise questions about the performance of capacity markets."[76] Nonetheless, it is clear that there are three categories of problems present in capacity markets today—all of which cause problems in capacity markets that are unrelated to externality payments. Yet, none are addressed by the reforms.

First, there is a capacity glut in many regions. For example, PJM's capacity auctions have led to commitments well above the required target reserve margin of 16.6%. For delivery year 2020/2021, though, a record-high reserve margin of 23.9% cleared the RPM Base Residual Auction.[77] That result represents a surplus-above-target margin of about 11,000 megawatts, which amounts to maintaining an extra 22 coal or gas plants (at 500 megawatts each) or 11 nuclear plants (at 1,000 megawatts each).[78] The ISO-New England annual capacity auction completed in February 2017 closed with the lowest prices since 2013 and ample reserves. ISO-New England has acknowledged this significant excess capacity.[79] Moreover, in both markets, many generators that do not clear the capacity auction still participate in the energy market.

Those numbers suggest that the amount of capacity operating in the market is inefficiently high. The capacity market needs time to adjust to design changes and many frequent changes create unclear signals. Therefore, in PJM, frequent changes in the design of the capacity market might have contributed to the oversupply. It is also possible that the design of the market, such as the lack of seasonality or an unnecessarily high Variable Resource Requirement Curve, exhibits deficiencies that cause the inefficiently high amount of capacity to be present. In any case, given this glut, price signals in the near future should either encourage exit of inefficient generators, rather than discourage it, or discourage entry of inefficient generators. Given this evidence, it is not clear why the potential price suppression effects of externality payments, if indeed present, is a cause for concern.

Second, the use of a Minimum Offer Price Rule (MOPR) in many regions is problematic. This rule imposes a minimum offer price for a new resource when the decisionmakers suspect that the resource would submit an "uncompetitive" low bid and thus artificially lower capacity auction clearing prices. MOPRs were initially designed to prevent the exercise of buyer-side market power. However, it is currently used widely and without any regard for market power issues. The

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[74] *See* U.S. Gov't Accountability Office, Gao-18-131, Electricity Markets: Four Regions Use Capacity Markets To Help Ensure Adequate Resources, but FERC Has Not Fully Assessed Their Performance (2017), https://www.gao.gov/assets/690/688811.pdf.

[75] *Id.* at 49.

[76] *Id.* at 49.

[77] PJM 2020/2021 RPM Base Residual Auction Results, *supra* note 64.

[78] Jennifer Chen, *Got Clean Energy? Not So Much from PJM's Latest Auction*, Nat. Res. Def. Council (May 23, 2017), https://www.nrdc.org/experts/jennifer-chen/got-clean-energy-not-much-pjms-latest-auction.

[79] The grid operator needed to procure about 34,000 MW and wound up with more than 35,800 MW. *ISO New-England*, 162 FERC ¶ 61,205, P 38 (2018).

premise of a MOPR "appears to be based on an idealized vision of markets, free from the influence of public policies."[80] But as former FERC Chairman Norman Bay explained, markets are indeed affected by many different public policies.[81] Therefore, it is irrational to take action to address externality payments without also considering other subsidies. More recently, FERC Commissioner Richard Glick similarly criticized the application of MOPRs to resources receiving externality payments as "ill-conceived, misguided, and a serious threat to consumers, the environment and, in fact, the long-term viability of the Commission's capacity market construct."[82]

Additionally, a MOPR adjusts the bids deemed uncompetitive to the level determined by the levelized cost of construction net of a historical average of annual net revenue from sales of energy and ancillary services (Net CONE). However, the levelized Net CONE is not the economically rational capacity bid for a generator.[83] For a resource that is committed to being in operation in the given delivery year, for instance because it is already under construction, it would be optimal to submit its net going-forward cost or its opportunity cost, implying that the bid would be at a level lower than Net CONE. Thus, MOPRs fail in their attempts to create "competitive" bids by forcing the resource to submit a bid a higher than it would have bid even in the absence of externality payments, and penalizes the resources subject to a MOPR while inefficiently inflating the capacity clearing prices.

Particularly in ISO-NE, the MOPR prohibits some resources from clearing the market even though those resources will continue to stay in the market because of the externality payments they get from the states. Consequently, the capacity market may be sending signals about the relative scarcity of capacity, leading to new installations, despite enough generation being available on the market. MOPRs can therefore be seen as one of the main drivers of the overcapacity.

Third, the current designs do not address variations in seasonal peak loads. For example, PJM's extreme weather forecasts for the 2021-2022 season suggest that summer peak loads will exceed winter peak loads by over 25,000 MW.[84] Thus, capacity requirements needed to maintain resource adequacy are considerably larger in the summer than in the winter. However, the fact that PJM adopted a Capacity Performance requirement of year-round availability in its 2017 RPM auction implies that the market does not send the proper signal about when the additional capacity is needed. Combined with the seasonal character of some resources,[85] lack of seasonality creates an inefficiency—the market sends signals for investment in year-round capacity even though the existing year-round capacity combined with seasonal resources might be able to meet the demand at all times during the year.

[80] *See* Modern Markets Intelligence, Inc., *Bay Picks Apart MOPR Concept on Last Day at FERC*, PowerMarketsToday (Feb. 7, 2017), https://www.powermarketstoday.com/public/Bay-picks-apart-MOPR-concept-on-last-day-at-FERC.cfm.

[81] *Id.*

[82] *See* Comm'r. Richard Glick, *Dissenting Comments about The ISO-NE Competitive Auctions with Sponsored Policy Resources Proposal Docket No. ER18-619-000*, FERC (Mar. 9, 2018) [hereinafter "Glick Dissenting Comments"], https://www.ferc.gov/media/statements-speeches/glick/2018/03-09-18-glick.asp#.Wr1p0q2ZPUo.

[83] *See* Wilson, *supra* note 24, at 29-32; *Post Technical Conference Comments of James F. Wilson, Docket No. AD17-11-000*, FERC (June 22, 2017), https://www.ferc.gov/CalendarFiles/20130911145022-Wilson%20Comments.pdf.

[84] Organization of PJM States, Inc., OPSI Resolution #2017-01, Demand Side Resource Participation in PJM Markets (2017), http://www.pjm.com/-/media/about-pjm/who-we-are/public-disclosures/20171010-opsi-letter-and-resolution-regarding-demand-side-resoruce-participation-in-pjm-markets.ashx?la=en.

[85] For example, the solar generation stronger in the summer than in the winter and thus has difficulty fulfilling the Capacity Performance year-round requirements.

Economic theory gives a clear reasoning for this inefficiency.[86] Economics prescribes that policymakers need to have at least as many policy tools available as they have targets.[87] As economic literature demonstrates, in capacity markets with at least two different seasonal maximum demand levels, which is tantamount to various capacity "targets," having just two instruments – a capacity price and energy price cap, cannot lead to efficient outcomes. Market designers should think of introducing other dimensions into their designs, such as capacity markets with targets that vary with location and season.

Additionally, as capacity price signals are less granular with respect to location and time relative to energy market price signals, decreasing energy prices means that resources like energy storage, demand response, and variable renewables would not receive any additional compensation for the additional benefit they provide in being able to provide energy in certain places and times.[88]

Understanding and addressing these flaws is imperative to the functioning of the capacity markets. Before moving forward with any more design changes that can potentially harm economic efficiency, it is important to recognize the root cause of any observed outcomes, and to address those causes directly.

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[86] *See* Paul Joskow & Jean Tirole, *Reliability and Competitive Electricity Markets*, 38 RAND J. Econ. 60, 60–84 (2006).
[87] *Id.* at 75; *accord* Jan Tinbergen, On the Theory of Economic Policy (2d ed. 1952).
[88] Chen, *supra* note 6.

Current Capacity Market Reforms

Reforms currently underway in ISO-NE and PJM do not solve the underlying problems in wholesale markets. Further, they might even fail to achieve the stated goal of these reforms—inducing efficient entry—while creating other distortions to economic efficiency.

First, externality payments for resources are based on their energy generation, rather than on their capacity. As such, any potential inefficiency associated with these payments, if they exist, would be directly connected to the energy market. Reforms suggested in PJM and ISO-NE, however, are aimed at reforming only the capacity market, without addressing the key underlying issues that prompted the externality payments in the first place—the fact that current energy markets fail to achieve economically efficient outcomes due to the presence of externalities. And a policy that counteracts the impact of the externality payments would just reverse the attempts to internalize those external costs.

A more desirable approach to reforming wholesale markets to address externalities is being taken by New York ISO (NYISO). NYISO is currently considering the introduction of a charge for CO_2 emissions in the energy market.[89] Such a charge would automatically level the playing field among various generators depending on their emissions intensity, without the need for resource-specific attribute payments.[90] NYISO's approach therefore directly targets the source of the inefficiency in the energy markets—the externality—and it is therefore a superior approach to any of these capacity market reforms.

Second, the reforms may not achieve the intended goal of incentivizing efficient entry. Reforms try to achieve the goal of keeping capacity prices elevated in the presence of externality payments. Higher capacity prices will, if all other things are held constant, reduce the incentives for existing generators to leave the market and increase the incentives for entry. Thus, the increase in capacity prices will increase the supply of available capacity. However, it is not currently clear whether the increase in capacity will be achieved by slower exit of existing generators, faster entry of new resources, or a combination of both. Thus, it is not even clear that attempts to modify capacity markets in order to keep capacity prices high, in response to the introduction of externality payments, would lead to more entry as desired by the ISOs/RTOs.

Without knowing which type of resource is the most responsive to capacity prices, it is hard to know the relative magnitudes of the changes in entry and exit behavior. If, for example, older and higher emitting resources are most price responsive, and if these types of generators usually set the price in capacity markets, then an increase in the prevailing capacity prices would lead them to stay in the market longer. As a result, the existence of this additional capacity that would not have stayed in the market otherwise, would lower the clearing price in the capacity market, partially counteracting the goal of the market redesign proposal. In addition, if these resources stay in the market longer than they otherwise would have now that the capacity prices are higher, they increase the available supply for the energy market, leading to a decrease in the energy prices. Because many resources rely mainly on energy market revenues, such potential for reduced revenue

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[89] For additional information on planned carbon pricing in New York see N.Y. Indep. Sys. Operator, Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals (2017), http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Studies/Market_Studies/Pricing_Carbon_into_NYISOs_Wholesale_Energy_Market.pdf

[90] With a carbon charge the generators still do not have incentives to internalize the external costs associated with local pollutants such as SO_2 or NOx.

might lead to a decrease in the entry rates, which would contradict the goals of market operators. Importantly, because the clean resources rely on the energy revenue more heavily than on capacity payments, a redesign not only might fail to attract entry, but could also additionally undermine states' efforts in addressing externalities.

Whether the higher entry rates or slower exit rates would be the main driver of the capacity increases depends on the characteristics of the market participants, in particular their costs of going forward, marginal costs of energy generation, and investment costs for the potential entrants. A simple scenario analysis with added resources that get externality payments would not be sufficient to understand the implication of externality payments on market outcomes, or on entry and exit incentives. A sophisticated modelling of the interconnected capacity and electricity markets, including the explicit consideration of formation of expectations concerning future periods, would be needed to determine the effect of the reform proposals and whether they would indeed lead to increased entry. Such modeling necessary to inform decisionmaking has not been done.

Third, each of the reforms would create additional distortions and harm economic efficiencies in different ways, depending on the specifics of the designs. Below, we review the reforms that are being discussed, and explain economic inefficiencies caused by each of the three reforms.

PJM's capacity repricing proposal

PJM is considering two proposals: a two-stage capacity repricing proposal and an Extended Minimum Offer Price Rule (MOPR-Ex).[91] The capacity repricing proposal introduces a two-stage auction. The first stage of the auction determines which resources clear the capacity auction based on the initial bids submitted by each resource.[92] The second stage, in which the initial bids of the resources are substituted with PJM-determined "competitive" bids, determines the price to be paid to all the resources cleared in the first stage.[93] PJM argues that the two-stage capacity pricing proposal scheme would raise the capacity prices to a level reflecting the bids that would have been offered without externality payments and hence would administratively adjust subsidized resource offers to prevent capacity price distortions.[94]

There are several reasons why PJM's two-stage capacity repricing proposal would hurt economic efficiency. First, adding a second stage to the current auction design will change generators' bidding behavior for the first stage auction. As we explained in Section I, the current auction design contributes to economic efficiency by giving generators the incentives to bid their true costs of staying in or entering the market. However, when a second-stage, in which the price is adjusted upwards, is added to the current design, the first-stage incentives of the generators change. Knowing that the final price will be adjusted upwards, generators might offer their capacity at prices below what would have been their "truthful" bid. While such bidding behavior does not necessarily lead to inefficiency under every circumstance, the equilibrium outcome of the bidding can no longer be guaranteed to be efficient.[95]

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[91] PJM filing, *supra* note 4.

[92] PJM filing, *supra* note 4, at 51.

[93] PJM filing, *supra* note 4, at 51.

[94] PJM, *Capacity Market Repricing Proposal*, (June 29, 2017), http://www.pjm.com/-/media/committees-groups/task-forces/ccppstf/20171016/20171016-pjm-executive-summary.ashx

[95] Inefficiency may happen when generators have differing beliefs about each other's bids. In such a case their submitted bids may lead to more expensive generators clearing the market while the cheaper ones lose the auction. It is also possible with the shading that the adjusted price will not cover the true costs of generators. *See* Paul Milgrom, *Auctions and Bidding: A Primer*, 3 J. Econ. Perspect. 3 (1989) (for introductory discussion about the efficiency and information available to bidders).

Second, the price that is determined in the second stage will no longer show the willingness-to-pay for the incremental reliability benefit for a given level of available capacity in the market as determined by PJM's capacity market demand curve. Even though this demand curve is administratively designed and set, bifurcating how the prices and quantities are determined ignores the logic of the demand curve.[96] The second-stage price would reflect the willingness-to-pay for additional capacity as if the sponsored resources were offering capacity at the PJM-specified prices, often making them look prohibitively expensive. But, if the offers were indeed this high, and, hence, the supply curve truly corresponded to the supply curve PJM would use in the second-stage auction, the PJM-determined downward sloping demand curve would have led to a lower level of contracted capacity at the equilibrium than the amount that cleared the first-stage auction. This result highlights the basic logic of a downward-sloping demand curve—the actual willingness-to-pay for the additional capacity decreases with the amount of cleared capacity because the incremental reliability benefit of additional capacity, given the level of available capacity, is lower. The repricing approach completely decouples the quantity of the contracted capacity from the benefits associated with it. As a result, the bifurcation will lead to higher prices for a given level of capacity, thereby increasing the prices consumers pay, but also undermining the logic behind the design of demand curve. Any justification for the elaborately chosen shape of demand curve would be lost if such a proposal is implemented.[97]

PJM's reasoning that the proposal would "maintain the correct price signal"[98] by restoring the prices that would have resulted in a world without externality payments by adjusting only the bids of units that gets these payments is also misguided. Emitting resources might already be taking other firms' externality payments into account in their current bids. Given that clean resources are usually characterized by low marginal cost of energy generation, their presence in the market already substantially reduces the profits of emitting resources in energy markets. Because the capacity and energy markets are strongly interrelated, emitting generators' capacity bids should already reflect the profits lost on the energy market and be higher compared to a scenario without externality payments. Therefore, a counterfactual analysis that adjusts only the bids of the resources that get externality payments, and not others, would not correctly simulate what would have happened without these payments. PJM's "correct price signal" is bound to be higher than the counterfactual price that would have been reached in a hypothetical market without any state policies.

The effect of capacity repricing on PJM's emissions would depend on how various types of resources respond to increases in capacity prices. Under the likely scenario that inflated capacity prices prolong the economic life of emitting resources while having no (or low) impact on the entry of clean resources, total emissions would rise. On the other hand, should the higher capacity price attract new zero-emission resources, the redesign of the market would decrease emissions.

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[96] Levelized net cost of new entry (Net CONE) serves as a reference point for constructing the capacity demand curve. It is the estimated nominal levelized fixed costs of entry based on a 20 year asset life of a combustion turbine net of estimated energy and ancillary service margins. PJM states that: "In designing the VRR Curve, PJM seeks to ensure that the amount of capacity it procures satisfies a loss of load expectation of one event in 10 years. The price axis of the VRR Curve contains multiples of the Net CONE value, and the megawatt quantity axis contains the target reliability requirement. Higher prices (above Net CONE) are associated with capacity shortage conditions and lower prices are associated with excess capacity conditions", Order on Rehearing and Compliance, *PJM Interconnection, L.L.C.*, 153 FERC ꝺ 61,035, P 1 (2015), https://www.ferc.gov/whats-new/comm-meet/2015/101515/E-23.pdf.

[97] *See* for example Triennial Review of VRR Curve Shape (June 2014) *available at* https://www.pjm.com/-/media/committees-groups/task-forces/cstf/20140630/20140630-item-04c-vrr-curve-background.ashx

[98] PJM Filing, *supra* note 4, at 1.

PJM's Extended Minimum Offer Price Rule

The Extended Minimum Offer Price Rule (MOPR-Ex), on the other hand, would extend the existing MOPR by applying it to all existing and new resources that will receive revenue outside of the market, regardless of the resource types, while providing a narrowly-defined renewable portfolio standard exemption.[99] PJM's Independent Market Monitor, which originally suggested the MOPR-Ex, argues that the MOPR-Ex would "preserv[e] the efficient market outcomes and accurate signals for entry and exit that are necessary for well-functioning and competitive markets."[100]

However, the MOPR-Ex would cause all the standard problems that have been raised related to any MOPR. In particular, it will cause excess capacity because it disregards some of the already existing capacity in the market. And, it leads to consumers paying twice for available capacity through (1) higher prices in the capacity markets and (2) externality payments through state programs.[101]

The MOPR-Ex will prevent some of the clean resources from clearing the market because they receive revenue outside the market, while strengthening the incentives for entry by sustained high prices. If some of the resources that are subject to the MOPR-Ex decide to stay in the wholesale markets even after failing to clear the capacity market, there will be excess capacity, reducing the prices in the energy market.[102] As lower energy prices will lead to lower energy revenues for all resources, all existing resources, even those that are not subject to the MOPR-EX, will need to bid higher in capacity markets to recover their net expected costs of going forward. The "counterfactual" prices—capacity prices that would have been reached in the absence of state policies—will thus not be restored.

In addition, with the MOPR-Ex, total capacity costs will be inefficiently high. Consumers will have to pay for operation and maintenance costs of the excess capacity as well as additional investment costs of the new units that are not really required to ensure the system's reliability.

If the MOPR-Ex leads to some zero-emission resources exiting, or not entering the market in the first place, it also will counteract the goals of state policies or make it costlier for states to achieve their goals. Because resources subject to the MOPR-Ex cannot get capacity market revenues, they will have to rely on energy market revenues and externality payments. If, for whatever reason, energy market revenues fall, states may have to increase externality payments to achieve their environmental goals. Such an increase in externality payments would not only make it inefficiently costly for states to achieve their goals, but would increase the amount "out-of-market" revenues that parties were so concerned about at the beginning of the process. Thus, a MOPR should be used only for the narrow circumstances for which it was originally intended—preventing the exercise of buyer-side market power—but not for "accommodating" or "mitigating" state environmental and public health policies.[103]

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[99]   PJM filing, *supra* note 4.

[100] *Id*, at 1.

[101] *See* ISO New England Inc., ER18-619-000, Revisions to ISO-NE Tariff Related to Competitive Auctions with Sponsored Policy Resources 3 (January 8, 2018), https://www.iso-ne.com/static-assets/documents/2018/01/er18-619-000_caspr_filing.pdf.

[102] In particular, the prices during the (super-)peak time will be squeezed. *See* the discussion in section X on the interdependence between outcomes on capacity and energy markets.

[103] Though the minimum offer price rule began as a reasonable effort to combat "true attempts to exercise buyer-side market power," recently, it has "morph[ed]" into "an examination of whether states have provided support or a subsidy to a resource that is selling into the capacity market." Order on Rehearing, *ISO New England Inc.*, 158 FERC ₲ 61,138, 892 (2017) (Bay, C., concurring); *see* Glick Dissenting Comments, *supra* note 82.

Zero-emission resources that receive externality payments but do not qualify for the narrowly defined renewable portfolio standard exemption will potentially not receive any capacity revenue, and will thus be harmed. Additionally, with a MOPR leading to overbuilding of capacity, the energy revenue of zero-emission resources will, all other things held constant, fall as well. Therefore, units subject to a MOPR will see their relative competitiveness and profitability decrease, leading to a slower entry of clean resources and a slower rate of emission reductions. But, it is not clear how the redesign will impact the zero-emission resources exempted from a MOPR. The effect and thus the change in emissions will depend on their responsiveness to the price changes relative to the price responsiveness of polluting resources.

ISO-NE's Competitive Auctions with Sponsored Policy Resources

ISO-NE also proposed a change, which FERC recently approved.[104] That proposal, known as Competitive Auctions with Sponsored Policy Resources (CASPR), allows new generators that receive externality payments (or "sponsored policy resources" as defined by ISO-NE) to enter the capacity market when those generators replace the older existing capacity resources that are willing to exit. To coordinate the entry of new resources and the exit of existing resources, CASPR introduces a new substitution auction that runs immediately after the regular capacity auction. The substitution auction settles at a clearing price differently than the regular capacity auction, based on the new supply capacity of "sponsored policy resources" and the capacity of existing resources that are willing to exit. This price is then paid to the new resources by retiring resources to take over the obligations assigned in the initial auction. Therefore, the retiring resources receive revenues based on the difference between the higher price in the primary auction and the lower price in the substitution auction as a "severance" payment to leave the market.[105] The new sponsored policy resources receive the lower price in the substitution auction, while new resources that are not state-sponsored receive the higher price in the primary auction. [106]

Prior to CASPR, ISO-NE applied a MOPR to new capacity resources and required the "sponsored assets" to bid at their unsubsidized cost.[107] Its rules allowed for a limited exemption for certain types of renewables to address states policies. Given that the application of a MOPR is in itself problematic, modifying rules to allow for more participation from resources that get externality payments was desirable. CASPR, however, only partially achieves that goal at the cost of bringing new distortions to the market.

With CASPR, new resources that receive externality payments will still be subject to a MOPR in the primary auction. However, they will be allowed to participate in the substitution auction without a MOPR if they could otherwise not clear the primary auction. Thus, these new resources will be able to receive capacity payments only if they can clear the substitution auction, which is intended to coordinate the entry of new policy resources with the exit of existing resources that are willing to "buy out" their obligation and retire.[108] As a result, this setup implies that the rate of entry from resources that receive externality payments will hinge on the willingness of existing plants to exit, without regard for states' preferences. Furthermore, CASPR considers a clean resource to be "new" as long as it does not clear the substitution auction. This means that, in an extreme case where no existing resource is willing to exit the market, ISO-NE would treat that resources as "new" throughout its entire physical life, always subjecting it to a MOPR.

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[104] *See* Order on Tariff Filing, *ISO New England Inc.*, 162 FERC ¶ 61,205, P 4 (2018).

[105] *See Competitive Auctions with Sponsored Policy Resources (CASPR) Key Project*, ISO New England, Inc., https://www.iso-ne.com/committees/key-projects/caspr/ (last visited Mar. 29, 2018).

[106] The sponsored policy resources can also bid into the primary auction but they would be subject to MOPR, and thus less likely to clear.

[107] ISO New England, Inc., *supra* note 105, at 2.

[108] The Renewable Technology Resources exemption will be phased out within the next 3 years.

In addition, the proposal will lead to distorted incentives, both for existing resources close to retiring and for new resources that do not get externality payments. The existing generators that may be willing to retire will have incentives to distort their bids in the primary auction. Without the substitution auction, the generator would have earned the difference between the primary auction price and its net cost of going forward. The substitution auction, however, creates a new revenue potential. If an existing resource clears the substitution auction and exits the market by transferring its obligations to a new resource, it would earn the difference between the primary auction price and the substitution auction price. Therefore, if the price in the substitution auction is lower than the cost of going forward for a resource, that resource would be better off if it clears the primary auction, participates in the substitution auction and transfers its obligations to a new resource. The possibility of higher earnings through the substitution auction will create incentives for resources to lower their primary auction bids enough, even below their costs of going forward, to ensure that they clear. As a result, if resources expect that the substitution auction price will be lower than their own cost of going forward, they will submit low bids in the primary auction. Again, because resources are no longer incentivized to bid their marginal costs, the efficiency of the primary auction results can no longer be guaranteed.

Further, the final mix of resources in the market may not even be the cost-minimizing capacity mix. By design, the first stage considers the generators receiving externality payments only at price levels above the MOPR. However, capacity clearing prices are usually far below MOPR floor prices. Consequently, when the bids of some resources are mitigated, the prices may indicate capacity scarcity, sending signals for entry, despite enough capacity being present in the market to guarantee resource adequacy. New emitting resources may clear the primary market as long as they bid lower than the MOPR, leading to inefficiently high costs.[109] Therefore, CASPR might lead some of the existing capacity to retire based on the revenue from the substitution auction, even if that capacity would have been considered economic in the previous setting based on going-forward costs. It would do so while allowing new resources that have higher costs, and hence would not have been economic in the previous setting, to enter and clear the market.[110]

CASPR forces the new sponsored policy resources to participate in the substitution auction where, by design, the clearing prices are lower than in the primary auction. In this way, CASPR curtails the revenue of clean resources compared to emitting generators. The reduced competitiveness of the sponsored policy resources will lead to higher pollution levels than those that would occur with regular, one-stage capacity markets.
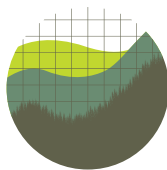
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[109] For a discussion, *see* Motion to Intervene and Protest of the ISO-New England External Market Monitor, Docket No. ER18-619-000, *Revisions to ISO New England Transmission, Markets and Services Tariff Related to Competitive Auctions with Sponsored Policy Resources* (Jan. 30, 2018), https://www.potomaceconomics.com/wp-content/uploads/2018/03/EMM-Protest-FERC.pdf.

[110] *Id.*

Conclusion

Wholesale market operators have begun considering and implementing several proposals to reform capacity markets in order to counteract the feared impact of state-level externality payments. These proposals are misguided for two important reasons. First, the proposals are based on the unfounded premise that externality payments have or will cause inefficient capacity-market distortions. Externality payments help internalize externalities, and thus help improve economic efficiency. And, to the extent that externality payments have affected the market, this is the natural effect of policies that help internalize the cost of carbon pollution.

Second, there is no sound evidence that state-level externality payments cause economically inefficient distortions to capacity market prices or that they harm resource adequacy. To the contrary, capacity markets continue to be marked by over-supply. Capacity markets are designed to ensure resource adequacy, and will adjust according to changing conditions in the market. Reforms that aim to counteract externality payments will bring new distortions to the market at the cost of states' ability to combat climate change.