



## Understanding the Interaction between Regional Electricity Markets and State Policies

Sarah K. Adair\* and Franz T. Litz\*\*

### CONTENTS

Introduction	2
Understanding How RTOs Can Be Affected by State Policies	3
Understanding the Proposed Changes to RTO Market Design	9
Evaluating Proposals to Align RTO Markets and State Policies	14

### Author Affiliations

\*Nicholas Institute for Environmental Policy Solutions

\*\*Great Plains Institute

### Citation

Adair, Sarah K., and Franz T. Litz. 2017. "Understanding the Interaction between Regional Electricity Markets and State Policies." NI Primer 17-01. Durham, NC: Duke University, <http://nicholasinstitute.duke.edu/publications>.

### Acknowledgments

The authors thank David Hoppock, Brian Murray, Ari Peskoe, and Doug Scott for helpful comments on an earlier draft of this paper. Funding for the research reflected here was provided by Energy Foundation grant number G-1701-25762.

### Review

This primer has been reviewed by experts in the field.

*Published by the Nicholas Institute for Environmental Policy Solutions*

**R**egional electricity markets—operated by regional transmission organizations (RTOs)—span multiple states and bring significant benefits to the electricity grid. States policies—such as renewable or clean energy portfolio standards or procurement mandates—have always helped shape market outcomes, but increasingly they are aimed at addressing perceived market shortcomings. Recent state policy actions to support new or existing resources in RTO markets have renewed attention to issues of RTO market design, including how RTO markets and state policies interact. Those actions, a rapidly changing electricity sector, and low electricity and capacity prices have heightened the urgency of calls for changes in market designs to address perceived inequities, such as market designs that fail to value certain environmental or reliability attributes.

This primer is aimed at policy makers and stakeholders who seek an understanding of regional electricity markets and the effect of state policies on those markets as well as an understanding of recent market design proposals to address the RTO-state policies interaction. It explains the workings of RTOs and how they differ between states with traditional regulation of electricity generation and states with restructured electricity markets. Next, it presents illustrative examples of how state policies interact with regional markets. It then discusses the state policy goals that are not reflected in RTO markets and describes discussions about how to better align RTO markets and state policy goals in three eastern RTOs. It next tackles proposed changes to regional market design. Finally, it identifies key questions for evaluating potential solutions.

## INTRODUCTION

Economies of scale and regional integration of wholesale power markets play a pivotal role in today's electricity grid. These two factors helped transform Thomas Edison's first electrical grid, which served a square mile of lower Manhattan in 1882, into today's eastern interconnect, which spans the entire eastern half of North America. More than a century later, the idea that benefits are realized at scale—and that diversification can improve grid management—also led to the evolution of regional transmission organizations (RTOs) covering large, multistate regions of the country.<sup>1</sup>

Although RTOs manage the electricity grid and operate competitive wholesale electricity markets across multiple states, those states retain their ability to set certain energy policies within their borders—policies such as renewable portfolio standards and tax incentives for preferred resources. States' pursuit of these policies has raised a fundamental question: can regional competitive wholesale markets function alongside state policies?<sup>2</sup>

Much has changed since RTOs were established in some regions of the country in the late 1990s and early 2000s. Public policy goals and market forces are driving the electricity sector toward more renewable and distributed energy resources, more complex interactions between consumers and the grid, and less carbon dioxide and other pollution.<sup>3</sup> Meanwhile, wholesale energy prices have declined in recent years due in large part to low natural gas prices.<sup>4</sup> Other factors driving prices down include a combination of flat or declining electricity demand, increased generation from low- or no-marginal-cost renewable energy resources, actions by states and consumers to support new technologies, and longstanding market design challenges.<sup>5</sup>

Although state-by-state policy differences have always been present, recent state policy actions to support new or existing resources in RTO markets have brought increased attention to issues of RTO market design, including how RTO markets and state policies interact.<sup>6</sup> In some cases, states have provided existing power plants with additional revenue to avoid closures, reasoning that the markets are failing to recognize certain attributes of those plants, such as their contributions to achieving low-carbon goals, reliability, or fuel diversity.<sup>7</sup> In other cases, states have acted to procure large amounts of renewable resources at above-RTO-market prices. Opponents of these policies argue that RTO market prices are meant to motivate market entry and exit and that these state policies interfere with that intent.

This renewed focus on the interaction between state policies and RTO market design has led all of the eastern RTOs—ISO New England (ISO-NE), New York ISO (NYISO), and PJM Interconnection (PJM)—to actively consider a range of changes to RTO market designs. Those potential changes include two-stage capacity market constructs, clean energy capacity markets, and carbon pricing in wholesale energy markets. Most of these changes would require approval by the

---

<sup>1</sup> For simplicity, this primer refers to both independent system operators (ISOs) and regional transmission organizations (RTOs) as RTOs.

<sup>2</sup> Federal Energy Regulatory Commission (FERC), *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), May 1–2, 2017.

<sup>3</sup> National Renewable Energy Laboratory, *Capacity Payments in Restructured Markets Under Low and High Penetration of Renewable Energy Resources*, by Thomas Jenkin, Philip Beiter, and Robert Margolis, (February 2016).

<sup>4</sup> U.S. Department of Energy (DOE), *Staff Report to the Secretary on Electricity Markets and Reliability*, (August 2017); FERC, *Office of Enforcement Division of Energy Market Oversight*, 2016 State of the Market Report, April 2017, <https://www.ferc.gov/market-oversight/reports-analyses/st-mkt-ovr/2016-som.pdf>; U.S. Energy Information Administration (EIA), *Wholesale Power Prices Decline Across the Country in 2015*, January 11, 2016, <https://www.eia.gov/todayinenergy/detail.php?id=24492>; EIA, *Wholesale Power Prices Fell in 2016, Reflecting Lower Natural Gas Prices*, January 11, 2017, <https://www.eia.gov/todayinenergy/detail.php?id=29512>.

<sup>5</sup> DOE 2017, *supra* note 4; FERC, 2016 *State of the Market Report*, (April 2017), <https://www.ferc.gov/market-oversight/reports-analyses/st-mkt-ovr/2016-som.pdf>; Analysis Group, *Electricity Markets, Reliability, and the US Power System*, by Paul Hibbard, Susan Tierney, and Katherine Franklin, (June 2017), [http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/ag\\_markets\\_reliability\\_final\\_june\\_2017.pdf](http://www.analysisgroup.com/uploadedfiles/content/insights/publishing/ag_markets_reliability_final_june_2017.pdf); Energy Institute at Haas, *The U.S. Electricity Industry 20 Years After Restructuring*, by Severin Borenstein and James Bushnell, (May 2015).

<sup>6</sup> FERC 2017, *supra* note 2. PJM Interconnection, *Context for Market Design Initiatives Responding to State Public Policy Initiatives*, June 12, 2017, <http://www.pjm.com/~media/library/reports-notice/special-reports/20170612-context-for-pjm-market-design-proposals-responding-to-state-public-policy-initiatives.ashx>; NEPOOL, *Policies and Markets Problem Statement*, May 17, 2016, [http://nepool.com/uploads/IMAP\\_20160517\\_Problem\\_Statement.pdf](http://nepool.com/uploads/IMAP_20160517_Problem_Statement.pdf); Wilkinson Barker Knauer LLP, *State Actions in Organized Markets*, by Raymond L. Gifford and Matthew S. Larson, (February 2017), [http://www.wbklaw.com/uploads/file/White%20Paper%20-%20Market%20Design%20Issues%20\(September%202016\).pdf](http://www.wbklaw.com/uploads/file/White%20Paper%20-%20Market%20Design%20Issues%20(September%202016).pdf).

<sup>7</sup> For example, see New York Public Service Commission, *Order Adopting a Clean Energy Standard* (Case 15-E-0302, 16-E-0270), August 1, 2016; Future Energy Jobs Act, Public Act 099-0906, enacted December 7, 2016; 155 FERC 61,102, *Order Granting Complaint*, (Docket No. EL16-33-000), April 27, 2016.

Federal Energy Regulatory Commission (FERC), which regulates wholesale electricity markets.<sup>8</sup> FERC could also act independently to require RTOs to update their rules in light of state policy goals that affect wholesale electricity prices.<sup>9</sup> Any and all of the proposals would affect states' ability to decide their electricity futures.

This primer aims to help policy makers and stakeholders, especially those relatively unfamiliar with regional electricity markets and their interaction with state policies, to understand the issues and the options for aligning markets and goals. It begins with a brief introduction to RTOs and their role in those states with traditional regulation of electricity generation and in those states with restructured electricity markets. Next, the primer uses illustrative examples to explain how state policies interact with regional markets. It then discusses the state policy goals that are not reflected in RTO markets and provides an overview of ongoing discussions about how to better align RTO markets and state policy goals in three eastern RTOs. Next, the primer applies the concepts to elucidate some of the proposed changes to regional market design as well as other options that could be considered. Finally, it concludes by identifying key questions for evaluating potential solutions.

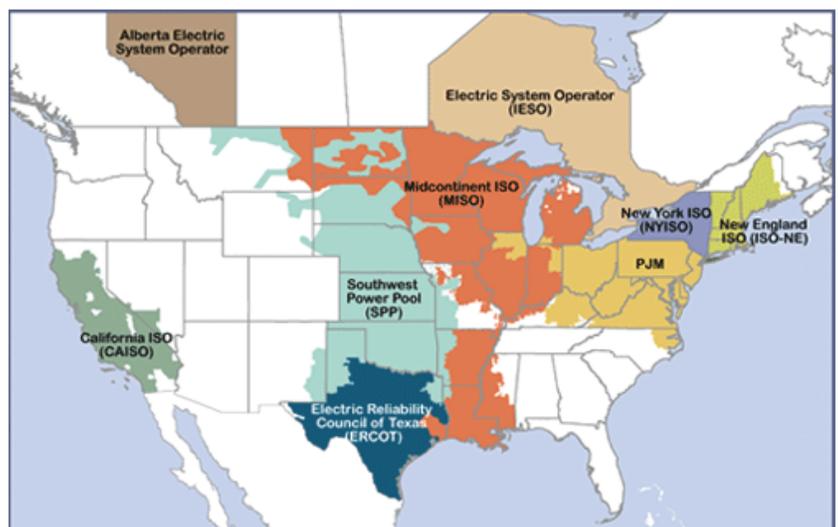
## UNDERSTANDING HOW RTO MARKETS CAN BE AFFECTED BY STATE POLICIES

### *The What, Why, and How of RTO Markets*

Historically, most of the United States was served by vertically integrated monopoly electric utilities that owned generation (power plants), bulk transmission (high-voltage lines for transmitting power long distances), and distribution (low-voltage lines for transmitting power short distances and delivering it to customers) infrastructure. In areas not served by investor-owned utilities, electric cooperatives and public power entities generated, transmitted, and distributed power to customers in much the same way. These utilities, cooperatives, and public power entities managed their own systems, making decisions about which plants to dispatch and ensuring the system had adequate resources to meet electricity demand at all times. Any connections to other utilities were generally handled through bilateral contracts.<sup>10</sup> This approach persists in the Southeast and large parts of the West, while the remainder of the country is served by RTOs, as shown in Figure 1.

RTOs operate on the principle that bigger is often better when it comes to managing the electrical grid. Before RTOs, each utility would meet most of its electricity demand using its generation fleet, even if that fleet were more expensive to operate than relying at times on the plants owned by other entities.<sup>11</sup> RTOs expanded the territory from which generation is dispatched, allowing the lowest-cost energy

**Figure 1. Map of Regional Transmission Organizations**



Source: Federal Energy Regulatory Commission.

<sup>8</sup> PJM's carbon pricing whitepaper contemplates a state-driven carbon pricing policy that is not subject to FERC approval (e.g., a RGGI-like state program). However, any changes to PJM's tariff, such as a border adjustment mechanism as described below, would likely require FERC approval.

<sup>9</sup> On May 1–2, 2017, FERC staff focused on these issues at a technical conference on RTO markets and state policy. Some stakeholders have petitioned FERC to require PJM to mitigate the effect of certain state policies on PJM's capacity market. See, *Calpine v. PJM*, FERC Docket No. EL16-49-000.

<sup>10</sup> For example, one utility might approach another to offer access to excess capacity on its system in exchange for payment, leading to a bilateral contract. RTOs seek to facilitate these mutually beneficial arrangements through formal market constructs or at least by helping participating entities to identify areas where they can work together.

<sup>11</sup> Before RTOs, utilities also bought and sold electricity through bilateral transactions or power pools.

mix to be dispatched across a larger set of resources.<sup>12</sup> By pooling resources, RTOs also make it easier and less costly to maintain capacity reserve margins—capacity that must be maintained to make sure that the grid is ready to serve demand in unusual circumstances. Whereas in the past each utility had to maintain enough generation at all times to meet electricity demand on the highest-demand day, RTOs can take advantage of excess capacity in one area to benefit another area. Pooling resources also allows for greater reliability at a lower cost because a plant outage in one part of the RTO’s operations can be remedied using a plant from another part of the RTO.<sup>13</sup>

Importantly, in those states and regions where the electricity sector has been restructured, RTOs have largely replaced the vertically integrated utility. Between 1995 and 2002, restructured states sought greater efficiency and lower costs through competitive wholesale markets for generation and, in some cases, retail competition.<sup>14</sup> Transmission owners turned over operation of their transmission lines to RTOs that provide non-discriminatory transmission access to competitive generators and that operate competitive wholesale markets that largely determine which plants are dispatched to generate electricity. Distribution utilities, competitive electricity retailers, and other so-called load serving entities (LSEs) purchase electricity at wholesale for sale to consumers. RTOs also perform a resource adequacy function for those states that have restructured their electricity markets—they operate capacity markets that ensure sufficient capacity exists to meet reserve margins. The basics of RTO energy and capacity markets are described below.

Some states that have kept traditional regulation of vertically integrated utilities have utilities and other similar entities that participate in RTO markets. For the most part, these states do not rely on RTO capacity markets to maintain resource adequacy. Instead, these traditionally regulated states—including states throughout the Midcontinent ISO (except Illinois) and the Southwest Power Pool RTO and a few states in PJM—meet reserve margins through state-level resource planning.

### **Basics of RTO Electricity Markets and How State Policies Can Change Outcomes**

A general understanding of RTO markets is necessary to appreciate the ways that state policies can affect market outcomes. RTOs operate markets to identify the least-cost set of resources to meet demand and provide a platform for generators to compete. These markets determine which resources are called upon and compensated on the system. The markets function as an auction, wherein suppliers submit bids to supply a certain amount of electricity or capacity (depending on the market), and the auction clears to determine which suppliers win and what price they will be paid.<sup>15</sup> In general, any state policy that adds or subtracts supplier costs will affect auction bids and can affect market outcomes, such as the clearing price or the generators that clear the auction.

### **The Energy Market and How It Determines Which Generators Supply Power**

The *energy market* determines which units will be dispatched to supply electricity for a specific day or hour. The RTO determines the expected demand for electricity for the next day and solicits bids from generators offering to supply electricity. After the bids are received, the market operator will stack (line up) the bids from lowest to highest cost until demand is met for the time period covered by the auction.

Figure 2 illustrates a simplified bid stack.<sup>16</sup> Each bar represents a particular power plant’s bid to provide a specific quantity of energy. All of the bids to the left of the demand line are winning bids. The market-clearing price is determined by the most expensive supplier necessary to meet demand (the bidder that supplies the last MW needed to satisfy demand, also called “the marginal bid”). All winning bidders receive the same price—the price set by the marginal bid.<sup>17</sup> Generators that

<sup>12</sup> Because the cost of generating electricity changes depending on the cost of fuel, environmental regulations, and weather, the lowest-cost generation mix will also change. Wholesale electricity markets operated by RTOs are designed to daily or even hourly shift generation on the basis of cost.

<sup>13</sup> For example, if transmission is not constrained, resources located in MISO’s southern (northern) region can be used to back up resources in the northern (southern) region in the event of an unexpected outage.

<sup>14</sup> Energy Institute at Haas 2015, *supra* note 5.

<sup>15</sup> RTOs operate other markets as well. For example, “ancillary services” markets exist to procure other services, like demand response.

<sup>16</sup> The following simplified example illustrates the basics of how the market operates and how state policies can affect market outcomes.

<sup>17</sup> Fixed costs do not factor into bids because fixed costs are incurred whether the generator operates or not. Bidders will always bid their actual operating expenses (or variable costs) because they want to run as much as possible to take in as much revenue as possible. As long as a generator’s variable costs are covered, operating more always increases the likelihood that the generator will cover its fixed costs (i.e., break even) and even make a profit. The market pays all generators that clear the market the same price (the market clearing price)—rather than the price they bid—because this system encourages generators to bid their actual costs.

submit bids that are more expensive than the marginal bid are not dispatched for the time period covered by the auction.

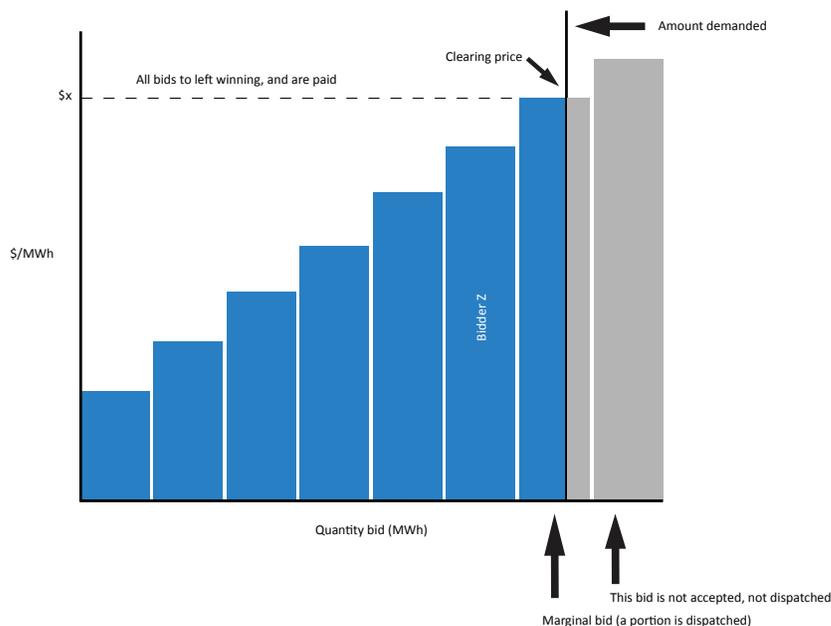
The simplified bid stack illustrates how the price offered by a bidder will determine whether the bid is successful in a given auction. As a general matter, generators will always submit bids that reflect their operating costs to generate electricity—their variable costs, not fixed costs; generators have to pay their fixed costs no matter what, and it is always better to operate and earn money as long as operating costs are covered.<sup>18</sup> Because state policies can add to or subtract from a generator’s variable costs (and thus bid price), state policies can affect which units clear in the energy market and therefore which plants are dispatched in a given auction and what the market-clearing price will be.

Suppose that Bidder Z from Figure 2 is the recipient of a state production credit (or subsidy) that it receives for every unit of power it generates. Because the subsidy will offset Bidder Z’s operating costs, Bidder Z will deduct the subsidy amount from its bid in the energy auction, because it only needs the electricity price to cover its unsubsidized cost. Figure 3 illustrates how the subsidy results in a reduction in Bidder Z’s bid relative to the bids of bidders A and B.

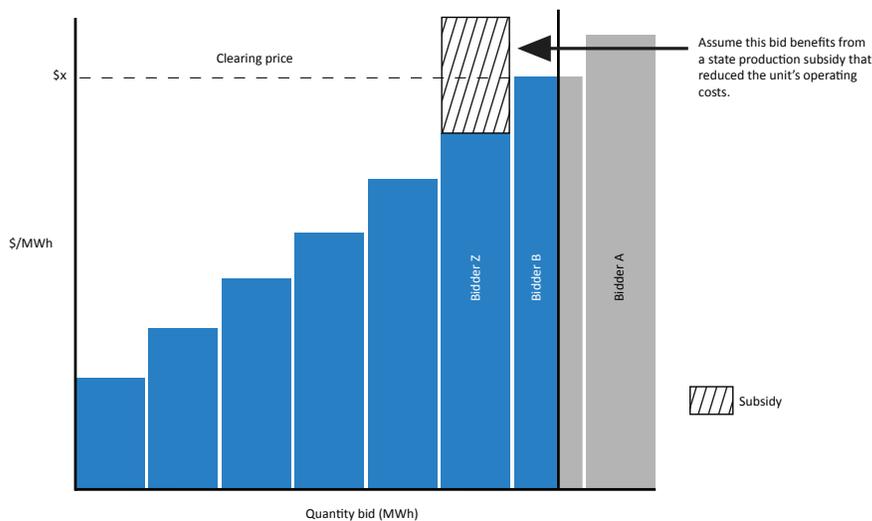
Figure 4 shows what the bid stack would have looked like if Bidder Z had not received the state production subsidy. Bidders A and B would have cleared the auction, and the clearing price would have been set by Bidder A. A state policy that acts as a production subsidy can thus affect which resources clear the auction, and it can suppress the market-clearing price. This type of subsidy is present in the case of state renewable portfolio standards as well as clean energy standards that award zero emissions credits to nuclear power plants.

This example was designed to illustrate the impact that a state policy *could* have on an energy market outcome by deliberately creating a situation in which the subsidy shifts the bid stack to change the units that clear and the price paid. A state subsidy can also have no impact on the bid order or the marginal price.<sup>19</sup>

**Figure 2. Simplified Bid Stack**



**Figure 3. Simplified Bid Stack with State Policy Affecting Bids**



<sup>18</sup> *Capacity markets*, discussed below, provide an opportunity to recover their long-term fixed costs.

<sup>19</sup> For example, if Bidder Z had cleared the auction anyway and had not operated the marginal unit, the subsidy would have affected neither the resources that cleared the market nor the market-clearing price. A real-world example of this situation might include a wind or solar subsidy that reduces a very low-cost bid to zero.

Consider that bidders A and B may be generators located in a state other than the state giving Bidder Z the production subsidy. In such a case, bidders A and B might argue that the state subsidy is disadvantaging them in the regional wholesale electricity market. Bidders A and B might argue for a policy that corrects the situation by negating the effect that Bidder Z's subsidy has on the market outcomes.

State policies that have the effect of adding a production cost will increase an in-state generator's operating costs and will increase the likelihood that the generator will not win at auction when its bid is close to the marginal bid. The Regional Greenhouse Gas Initiative (RGGI), a nine-state cap-and-trade program covering fossil-fuel-fired electric generating units in the Northeast and MidAtlantic, creates a production cost by requiring that generators spend a valuable emissions allowance for each ton of carbon dioxide (CO<sub>2</sub>) they emit to generate electricity with fossil fuels. Generators subject to a RGGI allowance cost will add that cost to their bids in the energy market. To the extent that only some states in a multistate RTO are also RGGI states, the generators subject to a RGGI allowance cost will compete against generators that do not face that cost.

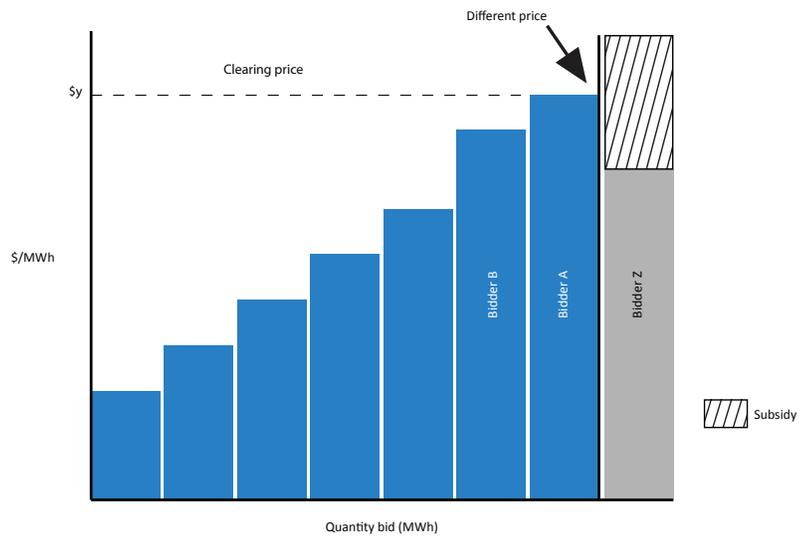
### The Capacity Market and Ensuring Generating Capacity Sufficient to Meet Demand

Following an auction process similar to an energy market, a *capacity market* aims to determine which plants will be paid to be available to grid operators in the future. Capacity markets are designed to ensure resource adequacy—capacity sufficient to reliably meet electricity demand—in restructured wholesale electricity markets.<sup>20</sup> Generating units submit bids that are based on their total (fixed plus variable) cost of operation to make this capacity available in the future year.<sup>21</sup> Just as in the energy market, state policies that subsidize a specific resource (or category of resources) will decrease the total operating cost of the resource, potentially changing its place in the capacity market bid stack and potentially altering the regional market outcome.

Over the past decade, the eastern RTOs' capacity markets have exhibited significant price volatility and have undergone frequent rule changes.<sup>22</sup> For example, RTOs have updated parameters such as the shape of the administratively determined demand curve and length of the commitment period for capacity resources. They have also introduced the minimum offer price rule (MOPR) to protect against buyer-side market power—the potential for a large buyer such as an LSE or government to subsidize new capacity resources and thereby artificially lower prices to its own benefit.<sup>23</sup>

MOPRs require, with some exceptions, plants to bid into the capacity market at or above a price floor unless they can prove that their (lower) bid is economic. Application of a MOPR to subsidized resources can nullify the resources' competitive advantage in the capacity market. It also can deter changes in the capacity mix by providing capacity payments to resources that clear the capacity market but would not have cleared the auction had their competitors been allowed to make bids

Figure 4. Simplified Bid Stack without State Policy Affecting Bids



<sup>20</sup> Whether capacity markets are necessary and how to design them are subjects of longstanding debate. One perspective—which underpins current capacity market designs—holds that capacity markets are necessary to procure sufficient resources to meet long-term reliability standards because short-run energy and ancillary services prices in well-designed markets do not rise high or fast enough to attract investment in new resources sufficient to maintain resource adequacy. According to this view, omitting capacity payments leads to long-term underinvestment. The eastern RTOs—in which most states have introduced retail competition and which no longer oversee utility resource planning—adopted mandatory capacity markets in response to concerns about resource shortfalls; these markets are viewed as filling the resource adequacy role that state utility regulators hold under cost-of-service regulation. In Texas, which has also introduced retail competition, utilities do not have a capacity requirement. Instead, ERCOT relies primarily on scarcity pricing—spikes in energy prices that occur when demand is very high relative to installed capacity—to attract investment and enable suppliers to recover their fixed costs.

<sup>21</sup> Adam James, "Explainer: How Capacity Markets Work," *Midwest Energy News*, June 17, 2013, <http://midwestenergynews.com/2013/06/17/explainer-how-capacity-markets-work/>.

<sup>22</sup> National Renewable Energy Laboratory 2016, *supra* note 3.

<sup>23</sup> *Id.*

below the price floor. To the extent that states continue to subsidize resources that do not receive capacity payments, the MOPR also increases the cost of the electricity system for customers.

### ***Beyond Affordability and Reliability: What State Goals Are Not Reflected in RTO Market Design?***

As described above, RTO markets are designed to minimize costs for consumers by selecting the lowest-cost resources to reliably meet electricity demand.<sup>24</sup> Electricity regulators have long focused on these central tenets of affordability and reliability, but state policy makers have articulated other goals, such as promoting economic development, reducing emissions, improving energy security, addressing equity and social justice, increasing consumer choice, and fostering innovation.<sup>25</sup> States pursue some or all of these goals through a wide range of policy mechanisms, including tax policy, emissions limits, renewable/clean energy portfolio standards, and government procurement decisions.<sup>26</sup>

Recently adopted state policies—including those that have spurred debate about how to make RTO markets and state policies work better together—reflect these multifaceted goals.<sup>27</sup> For example, Illinois' 2016 Future Energy Jobs Act and New York's Clean Energy Standard order cited avoided emissions of carbon dioxide and local air pollutants as well as fuel diversity and reliability concerns in adopting their zero emissions credit (ZEC) programs to support existing nuclear plants.<sup>28</sup> Connecticut lawmakers cited concerns about the loss of a large emissions-free power source when they passed Senate Bill 1501, which authorizes state utility regulators to conduct a competitive procurement process for nuclear energy similar to that conducted for renewable resources.<sup>29</sup> Ohio regulators cited reliability concerns when they approved power purchase agreements to protect in-state coal and nuclear generation, which were ultimately disallowed by FERC.<sup>30</sup> Massachusetts Governor Charlie Baker identified goals of diversifying the energy supply, promoting innovation and clean energy, and reducing greenhouse gas emissions when he signed the 2016 Act Relative to Energy Diversity, which directed his state's distribution utilities to procure up to 2,800 MW of clean energy, including 1,600 MW of offshore wind.<sup>31</sup> One Massachusetts lawmaker called that legislation "a historic occasion...in creating a new industry via offshore wind."<sup>32</sup> These actions—alongside increasingly ambitious state renewable energy and greenhouse gas reduction goals—have spurred discussion within RTOs and at FERC about the relative roles of state policies and RTOs in shaping the quantity and composition of resources needed to cost-effectively meet reliability and operational goals in RTO markets.

Courts have historically held that the Federal Power Act (FPA) draws a bright line between state (retail) and federal (wholesale) jurisdiction of electricity markets, but more recent Supreme Court holdings have recognized that reality blurs that line.<sup>33</sup> As described above, any state policy that adds or subtracts from a generator's costs can affect the outcomes in the regional market. As a result, it appears likely that challenges to state policies will be commonplace. Most recently, two federal courts dismissed challenges to the programs in Illinois and New York that award zero emissions credits to

---

<sup>24</sup> Energy Institute at Haas 2015, *supra* note 5.

<sup>25</sup> National Association of State Energy Officials, *An Overview of Statewide Comprehensive Energy Plans from 2002 to 2011*, (July 2013), [https://www.naseo.org/Data/Sites/1/naseo\\_39\\_state\\_final\\_7-19-13.pdf](https://www.naseo.org/Data/Sites/1/naseo_39_state_final_7-19-13.pdf); J. Monast and S. Adair, "A Triple Bottom Line for State Utility Regulation: Aligning State-Level Energy Environmental and Consumer Protection Goals," *Columbia Journal of Environmental Law* 38(1), April 2013, <https://nicholasinstitute.duke.edu/climate/triple-bottom-line-electric-utility-regulation-aligning-state-level-energy-0>.

<sup>26</sup> For example, the State Policy Opportunity Tracker—developed by The Nature Conservancy and Colorado State's Center for the New Energy Economy—tracks the implementation of more than 30 state clean energy policies ranging from renewable and energy efficiency portfolio standards to interconnection standards, net metering, and standard offer rates for renewable energy to building codes, financing options, grid modernization, and new utility business models. The Database of State Incentives for Energy Efficiency and Renewable Energy (DSIRE) contains more than 3,900 entries (including state and local policies). See, "State Policy Opportunity Tracker," accessed November 7, 2017, <http://spotforcleanenergy.org>; Database of State Incentives for Renewable Energy and Energy Efficiency, accessed November 7, 2017, <http://programs.dsireusa.org/system/program>.

<sup>27</sup> New York Public Service Commission 2016 *supra* note 7; Future Energy Jobs Act 2017, *supra* note 7.

<sup>28</sup> *Id.*

<sup>29</sup> Mark Pazniokas, "Millstone Bill Passes House, Goes to Governor," *The CT Mirror*, October 26, 2017, <https://ctmirror.org/2017/10/26/millstone-bill-passes-house-goes-to-governor/>.

<sup>30</sup> FERC 2016, *supra* note 7.

<sup>31</sup> An Act Relative to Energy Diversity, Ch.23M, August 8, 2016.

<sup>32</sup> "Governor Baker Signs Comprehensive Energy Diversity Legislation," Office of Governor Charlie Baker, August 8, 2016, <http://www.mass.gov/governor/press-office/press-releases/fy2017/governor-baker-signs-comprehensive-energy-diversity-law.html>.

<sup>33</sup> J. Rossi, "The Brave New Path of Energy Federalism," 95 *Texas Law Review* 399 (2016).

nuclear plants.<sup>34</sup> Challengers argued that these programs invaded FERC’s jurisdiction over wholesale rates. Despite their initial outcomes, these cases illustrate the friction between state and federal regulation of the electricity sector and have motivated, in part, discussions among states, RTOs, and other stakeholders to explore opportunities to better align RTO market design and state policy goals.

In addition to their impact on the energy and capacity auctions, state energy policies can affect RTO markets in multiple other ways. Energy efficiency policies can reduce overall demand for electricity, potentially reducing the marginal cost of electricity in the region beyond the state’s borders.<sup>35</sup> By contrast, policies that promote electrification of transportation or heating may increase overall demand and alter electricity consumption patterns and potentially increase regional prices.<sup>36</sup> Renewable energy portfolio standards and other incentive programs influence the supply of electricity and the generation mix through subsidies. Environmental policies, such as the Regional Greenhouse Gas Initiative for carbon dioxide emissions and regulation of localized pollutants (like NO<sub>x</sub>, SO<sub>x</sub>, particulates, and mercury), influence the costs of certain generation resources and therefore may influence investment and retirement decisions and dispatch order beyond the borders of the RGGI states. State policy will influence regional markets, leaving the question of how best to manage that influence, if at all.

### ***Other Factors Affecting Market Outcomes: Natural Gas Prices and the Increasing Role of Renewables***

This discussion of the tensions between state policies and regional markets comes at a time when natural gas prices are at historical lows and renewable generation is a growing part of the capacity mix. Natural gas is the main operating cost for natural gas-fired power plants, meaning it determines the size of a natural gas generator’s bid into the regional energy markets. That is, whenever a natural gas-fired power plant is the marginal unit in the energy market, the clearing price for all generators will be lower compared to what it would have been if natural gas prices were higher.<sup>37</sup> Power plants that are typically price takers—meaning that they have little ability to affect the market clearing price because they have very low operating costs—like nuclear and renewable power—will realize lower revenues when natural gas prices fall. Similarly, as the bid stack includes more and more low- or zero-operating-cost resources, like wind and solar, the marginal unit setting the clearing price will be lower and lower. Indeed, if the marginal unit is a zero-cost unit—as is sometimes the case during some low-demand hours—the clearing price for power can be zero for that period. Thus, one view of the perceived conflict between state policies and regional markets is that the challenges facing some existing power plants are a result of the markets doing exactly what they are designed to do.

### ***Market Design Discussions in the Eastern RTOs***

Responding to concerns that state actions to shape the generation mix may undermine competitive prices in RTO markets—and the financial viability of competitive power producers—eastern RTOs have initiated discussions of possible changes to RTO market designs.

#### **ISO-NE**

Since mid-2016, ISO-New England and its stakeholders have been discussing possible changes to the wholesale markets to address state policy objectives through New England Power Pool’s (NEPOOL) Integrating Markets and Public Policies (IMAPP) process.<sup>38</sup> IMAPP’s stated goal is to “identify and explore potential changes to the wholesale power markets that could be implemented to advance state public policy objectives in New England.”<sup>39</sup> NEPOOL convened IMAPP in response to concern that markets are not delivering the low-carbon resources that states need to meet their environmental policy objectives, including legal obligations under state laws; as a result, some states are turning to increasing amounts of out-

<sup>34</sup> *Electric Power Supply Association v. Star* No. 1:17-cv-01164 (N.D. Ill. Feb. 14, 2017); *Coalition for Competitive Electricity et al. v. Zibelman, et al.* No. 1:16-cv-08164 (S.D.N.Y. Oct. 19, 2016). Appeals for these cases are pending in the 2nd and 7th circuits, where decisions are likely in early 2018.

<sup>35</sup> Analysis Group, *The Impacts of the Green Communities Act on the Massachusetts Economy: A Review of the First Six Years of the Act’s Implementation* by Paul Hibbard, Susan Tierney, and Pavel Darling, (March 4, 2014).

<sup>36</sup> Brattle Group, *Electrification: Emerging Opportunities for Utility Growth* by Jurgen Weiss, Ryan Hledik, Michael Hagerty, and Will Gorman, (January 2017).

<sup>37</sup> To the extent that current low gas prices were unforeseeable at the time an existing resource was constructed, that means that owners of existing plants did not anticipate these low energy prices when they made their long-term decisions to construct and operate their plants. This appears to be true of many existing nuclear plants, and the reason states like Illinois and New York have had to step in to provide additional revenue to existing nuclear plants to keep them operating.

<sup>38</sup> “Integrating Markets and Public Policy,” NEPOOL, accessed November 7, 2017, <http://nepool.com/IMAPP.php>.

<sup>39</sup> *Id.*

of-market procurements for above-market-cost resources through bilateral contracts outside of the wholesale market. These states have expressed concern that those procurements could lead to consumers paying for duplicative capacity if the procured resources do not clear the ISO-NE capacity market.<sup>40</sup> Other stakeholders have expressed concern that allowing state-subsidized resources to participate in wholesale markets without subjecting them to a minimum offer price rule could result in artificially low prices and could threaten the financial viability of other resources.

Stakeholders participating in IMAPP are considering ways in which wholesale market design and state policy objectives can work better together. IMAPP participants have brought forth several potential changes to market design, including (1) two-stage capacity market constructs, (2) forward clean energy capacity market constructs, and (3) carbon pricing in the energy market.<sup>41</sup>

## NYISO

In New York—which has a single-state ISO, the NYISO—the discussion has largely focused on a proposal to institute a carbon-pricing policy at the RTO-level. On August 10, 2017, the NYISO and the New York Department of Public Service jointly issued a report that evaluates a carbon pricing program that would implement a carbon adder for fossil-fuel-fired generation in New York State, an adder based on the social cost of carbon. The concept is meant to assist New York in achieving its decarbonization goals.

About a year before the carbon pricing proposal was released, the New York Public Service Commission adopted a clean energy standard (CES) to implement the state’s goal to achieve 50 percent renewable energy by 2030 and to retain existing nuclear generation at risk of retirement.<sup>42</sup> The CES requires distribution utilities in New York to procure zero emissions credits (ZECs) from certain at-risk nuclear power plants at a rate that is based on the social cost of carbon. Some stakeholders contend that the ZEC program interferes with FERC-regulated wholesale markets, but their challenges have so far been unsuccessful in the courts.<sup>43</sup> The NYISO, in its comments on the CES, found that the program would not adversely affect its markets, but that in principle, out-of-market payments could suppress prices and undermine a competitive market price; thus, the NYISO suggested that the ZEC program could serve as a bridge until it could explore a market-based mechanism such as carbon pricing to meet the state’s policy objectives.<sup>44</sup>

## PJM

In December 2016, Illinois also enacted a CES to retain certain nuclear units at risk of retirement. Ohio policy makers have considered similar supports for at-risk nuclear and coal units, and other states are likely to entertain them. Given these developments, PJM has considered two options: (1) a regional or sub-regional template (e.g., a carbon price) to support state policy goals and (2) market reforms in response to state subsidies (e.g. two-stage pricing or “capacity market repricing”).<sup>45</sup> In addition, PJM has initiated a discussion about allowing all resources to set clearing prices in its energy markets—which would tend to increase energy market clearing prices and to reduce the need for out-of-market payments to generators.<sup>46</sup> Through its likely effect on prices, this change, PJM believes, could potentially reduce drivers of state policies to protect at-risk resources.<sup>47</sup>

---

<sup>40</sup> NEPOOL, “Policies and Markets Problem Statement,” May 17, 2016, [http://nepool.com/uploads/IMAP\\_20160517\\_Problem\\_Statement.pdf](http://nepool.com/uploads/IMAP_20160517_Problem_Statement.pdf).

<sup>41</sup> “Integrating Markets and Public Policy,” *supra* note 35.

<sup>42</sup> <https://www.nysersda.ny.gov/All-Programs/Programs/Clean-Energy-Standard>.

<sup>43</sup> “Clean Energy Standard,” New York State Energy Research and Development Agency, accessed November 7, 2017, <http://www.lexology.com/library/detail.aspx?g=78f4de53-4afa-41d0-9502-ae34d368ca31>.

<sup>44</sup> Comments of Bradley C. Jones, President and Chief Executive Officer, New York Independent System Operator, Docket No. AD17-11-000, accessed November 7, 2017, <https://www.ferc.gov/CalendarFiles/20170426150524-Jones,%20NYISO.pdf>.

<sup>45</sup> PJM, *Advancing Zero Emissions Objectives Through PJM’s Markets*, (May 2017), <http://www.pjm.com/~media/library/reports-notice/special-reports/20170502-advancing-zero-emission-objectives-through-pjms-energy-markets.ashx>; PJM, *Capacity Market Repricing Proposal*, (June 2017), <http://www.pjm.com/~media/library/reports-notice/special-reports/20170502-capacity-market-repricing-proposal.ashx>.

<sup>46</sup> Currently, only those units of energy production beyond a generator’s economic minimum are eligible to set prices. This rule prevents large and inflexible resources, such as base-load coal and nuclear facilities, from setting energy market prices, even when they are the highest-cost resource needed to meet demand. Instead, these resources are compensated through out-of-market “uplift” payments, which do not affect the clearing price and thus the price paid to all other resources. Allowing all resources to set the price, as PJM proposes, would tend to increase energy market prices whenever this situation occurs. <http://www.pjm.com/~media/library/reports-notice/special-reports/20170615-energy-market-price-formation.ashx>.

<sup>47</sup> PJM, *Energy Price Formation and Valuing Flexibility*, (June 15, 2017), <http://www.pjm.com/~media/library/reports-notice/special-reports/20170615-energy-market-price-formation.ashx>.

## UNDERSTANDING THE PROPOSED CHANGES TO RTO MARKET DESIGN

RTOs and other stakeholders have proposed a wide range of changes to market design in response to tensions between RTO markets and state public policy goals, including changes to capacity and energy markets. RTO proposals include two-stage capacity markets that treat subsidized and unsubsidized resources differently and carbon pricing in energy markets. Stakeholders have proposed yet other designs, such as the addition of clean energy capacity market mechanisms or replacement of mandatory capacity markets with voluntary residual markets. Described here are leading proposals and key evaluation issues.

### Two-Stage Capacity Markets

ISO-NE, PJM, and various stakeholders have proposed multiple designs for a two-stage capacity market that would treat subsidized and unsubsidized resources differently. Generally, such a market is designed to allow subsidized resources to clear the capacity market—and avoid duplicative capacity—without suppressing the clearing price paid to unsubsidized resources. ISO-NE and PJM have proposed two variations on a two-stage capacity market design.

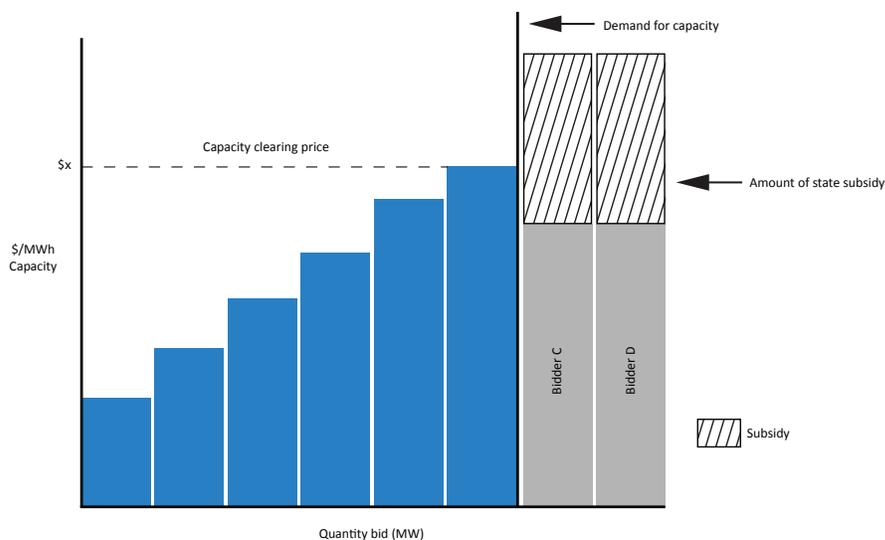
#### ISO-NE Substitution Auction Proposal: Getting Around MOPR to Usher Out the Old, Bring in the New

ISO-NE proposed a framework for a two-stage capacity market that aims to encourage older resources to exit the market while giving a share of their capacity money to subsidized resources—primarily renewables—that are otherwise shut out of the capacity market because of the MOPR. The proposal calls the second-stage auction a *substitution auction* to capture this substitution of new, cleaner subsidized resources for the older unsubsidized resources.

Figure 5 presents a simplified example of the bid stack when subsidized resources fail to clear the capacity market because of the MOPR. In the example, two phenomena are evident. First, requiring resources C and D to bid in at an unsubsidized cost level means they will receive no capacity payment. Although the resources fail to clear the capacity auction, the subsidizing jurisdiction wants them and is paying them to remain in the market. From a total system perspective, this means capacity will exceed demand for the time period covered by the auction. Second, the clearing price in the capacity auction is higher than it would be if resources C and D had been permitted to bid in at their after-subsidy cost. The effect of both phenomena is that consumers pay more for the resources on the system than they would absent the MOPR. The rationale for the MOPR is that the clearing price in the example is a better representation of the actual market cost of keeping the cleared resources online and is therefore more likely to maintain adequate capacity over time.

Faced with the requirement that it keep the MOPR in place, ISO-NE seeks to encourage older capacity resources to retire by offering them an economic incentive to do so in the form of a partial capacity payment. Under ISO-NE's proposed approach, the capacity market would first be run as usual, applying the MOPR to all new resources.<sup>48</sup> This primary stage of the capacity market would determine the competitive clearing price and initial capacity obligations for all resources. This outcome is shown in Figure 5.

Figure 5. Simplified Bid Stack Showing Application of MOPR



<sup>48</sup> ISO-NE's current MOPR includes a limited exemption for up to 200 MW of renewable energy per year. The ISO-NE substitution auction proposal would replace that limited exemption and apply MOPR to all new resources in stage one.

Under the New England proposal, a second “substitution” stage would immediately rerun the auction without applying the MOPR. In the example, the result depicted in Figure 5 would change as depicted in Figure 6. Subsidized resources C and D would clear the second stage auction, and the substitution price would be determined to be the amount resources would have gotten absent the MOPR.

After both auction stages are run, existing capacity resources that cleared in the first stage but wish to retire could transfer their capacity obligations to subsidized resources that did not clear stage one. The subsidized resources substituted in this manner would receive the lower capacity payment based on the second auction clearing price. Retiring resources would receive the (higher) stage-

one clearing price less the (lower) stage-two clearing price as a payment for permanently exiting the market. Compared with the stage-one auction result, the stage-two auction result would mean consumers face the same or lower capacity costs after any substitution.<sup>49</sup> Because the substitution is voluntary, the approach does not run afoul of the MOPR requirement. Over time, the incentive structure is meant to ease existing resources into retirement and to correct a situation that increases costs to consumers and supplies too much capacity.

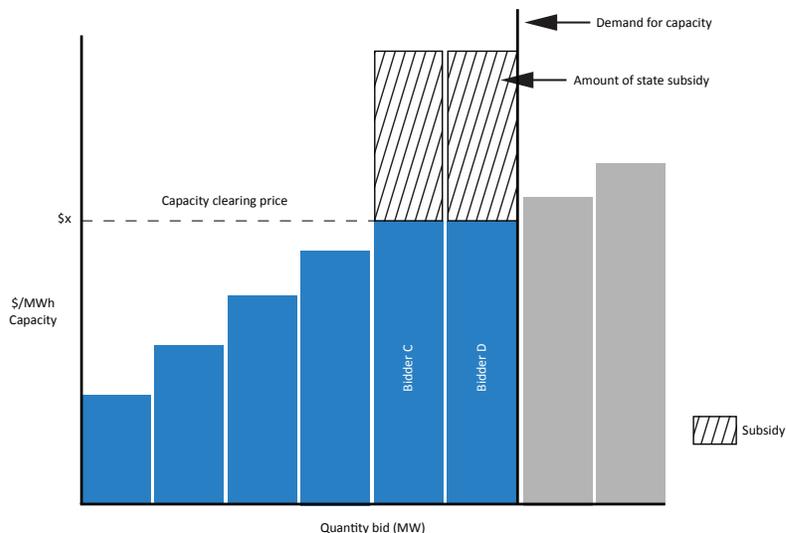
### PJM Capacity Market Repricing Proposal

ISO-NE’s proposal is designed to work with the existing MOPR and to mitigate some of its effects. PJM’s capacity market repricing proposal involves a two-stage capacity market construct that is designed to replace the current MOPR by addressing subsidies in an altogether different manner.<sup>50</sup> In PJM’s two-stage proposed design, generation resources would bid into a single capacity market, but capacity obligations and clearing prices would be determined separately. In the first stage, PJM would determine which resources clear the capacity market without adjusting for the effect of state subsidies. In the second stage, it would adjust bids to eliminate the value of the subsidies and rerun the auction to determine the clearing price.

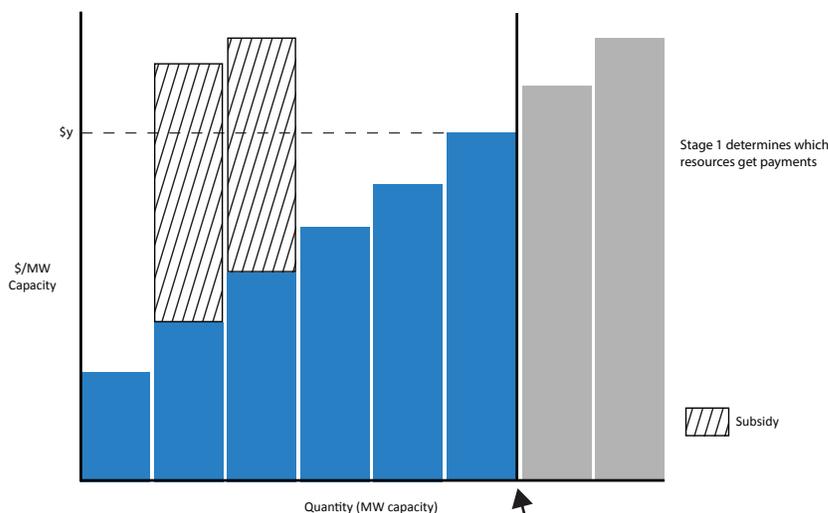
Figure 7 presents a simplified stage-one auction under the PJM proposal. Figure 8 shows the same resources in a simplified stage-two auction. The resources that receive a capacity obligation and payment are shaded in both figures. The capacity clearing price is determined in Figure 8.

Figure 7 presents a simplified stage-one auction under the PJM proposal. Figure 8 shows the same resources in a simplified stage-two auction. The resources that receive a capacity obligation and payment are shaded in both figures. The capacity clearing price is determined in Figure 8.

**Figure 6. Simplified Bid Stack Showing Application of “Substitution Auction”**



**Figure 7. Simplified Bid Stack for Stage 1 of PJM’s Proposed Action**



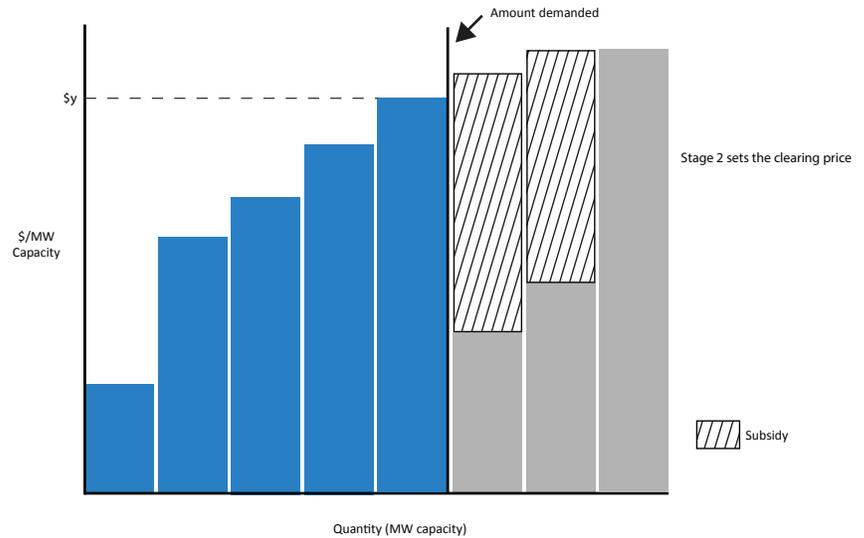
<sup>49</sup> Consumers would be indifferent because the capacity payment determined in the stage one auction would simply be split between the substitute resource (which is paid the stage 2 clearing price) and the retiring resource (which keeps the difference between the stage 1 clearing price and the stage 2 clearing price).

<sup>50</sup> PJM June 2017, *supra* note 45.

The stage-one auction would determine which resources receive a capacity obligation and payment. The stage-two auction would determine the capacity clearing price. The auction would clear at a so-called suppressed capacity price. PJM would then reinsert the subsidized resources at administratively determined reference prices and clear the auction again to determine a (higher) reconstituted price. All resources that cleared in stage one could receive the price from stage two, or if a state prefers, PJM would assign a different price to subsidized resources such as the suppressed capacity price.

In the examples above, PJM's first auction would be similar to that shown in Figure 6, whereby resources are permitted to bid into the auction without adjusting for the amount of the subsidies they receive. The second stage of the auction adjusts for any price effects of those subsidies but does not change which resources receive a capacity payment. Notably, the white bars in figures 7 and 8 represent units that are used to determine costs paid to the resources that clear the auction in stage one (Figure 7). However, because these units do not clear the stage-one auction, they receive no capacity payment. As a result, consumers face the higher stage-two clearing price, and some resources (those represented by the white bars in figures 7 and 8) are eliminated from the auction without compensation.

**Figure 8. Simplified Bid Stack for Stage 2 of PJM's Proposed Two-Tier Action**



### Carbon Pricing in Energy Markets

Carbon pricing in energy markets is another market design feature under discussion. As noted above, one of the single largest drivers for regional market reform is low wholesale electricity prices. These prices have been low in recent years because of very low natural gas prices as well as increasing renewables penetration and relatively flat electricity demand. These conditions have created difficult economics for some existing plants, including some in the nation's nuclear fleet. A carbon price, as illustrated below, would raise prices. It would also explicitly value a key attribute of many state subsidy recipients: zero carbon emissions. Proponents of carbon pricing at the RTO level argue that it could satisfy many of the state policy goals that are leading to varied state subsidies as well as buoy plants that have suffered under low electricity prices and increase long-term investment in capacity. Carbon pricing, it appears to proponents, could fix many of the problems that other policies are attempting to fix. For these reasons, RTOs and stakeholders are exploring how a carbon price could better align RTO market outcomes with state public policy goals. However, opponents argue that a carbon price may raise prices without actually changing dispatch in markets with little or no coal (such as ISO-NE) and will be insufficient to motivate construction of the renewable resources that states want (such as offshore wind).

### NYISO Carbon Pricing Study

The New York ISO has also developed a project to examine the potential for using carbon pricing—beyond the existing RGGI price—within its wholesale markets to advance New York's energy goals.<sup>51</sup> As an initial step, the NYISO, in partnership with the Department of Public Service, commissioned a study of whether and how New York state environmental policies could be pursued within the existing wholesale market structure. That study, released in August 2017, focused on identifying market design options for a NYISO carbon charge and on estimating how a carbon charge would affect customer costs. The analysis considered a carbon charge of \$40 per ton of CO<sub>2</sub> in 2025, roughly consistent with the \$58 per ton social cost of carbon adopted in New York's Clean Energy Standard order less an estimated RGGI allowance price of \$17 per ton. It estimated a customer bill impact of -1 percent to 2 percent, assuming all carbon charge

<sup>51</sup> The Brattle Group, *Pricing Carbon into NYISO's Wholesale Energy Market to Support New York's Decarbonization Goals*, by Samuel Newell, Roger Lueken, and Tony Lee, (August 10, 2017), [http://www.nyiso.com/public/webdocs/markets\\_operations/documents/Studies\\_and\\_Reports/Studies/Market\\_Studies/2017-09-06\\_Brattle\\_Study\\_Overview.pdf](http://www.nyiso.com/public/webdocs/markets_operations/documents/Studies_and_Reports/Studies/Market_Studies/2017-09-06_Brattle_Study_Overview.pdf).

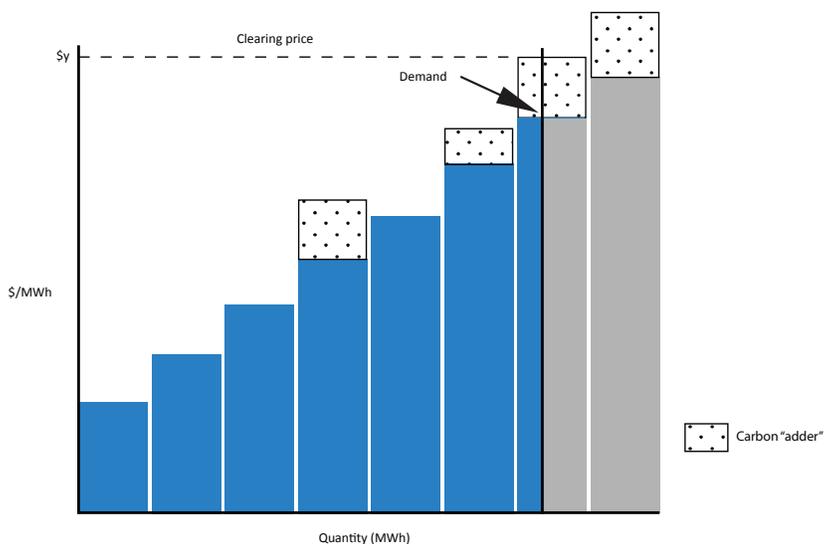
revenues are returned to customers and accounting for estimated reductions in REC and ZEC payments as well as expected market responses to the carbon charge. The study also identified several key market design challenges, including the level of the carbon price, how to return carbon revenues to customers, and how to address possible leakage of emissions to and from neighboring areas.

### PJM Carbon Pricing Proposal

Citing recent state policy actions to value the zero emissions attributes of certain at-risk nuclear units, PJM released a whitepaper outlining a possible framework for a voluntary, state-driven RTO carbon price, which could be applied region wide or, more likely, to a subset of states.<sup>52</sup> Under this framework, interested states would agree to a carbon price and implement an internal border adjustment mechanism to isolate the impact of the carbon price to participants. PJM could facilitate the collection and disbursement of carbon price revenue, or states could choose to delegate this responsibility to another entity. The PJM proposal does not propose specific design elements such as where to set the carbon price, what to do with revenues, or how to design a border adjustment mechanism.

Using a simplified energy market bid stack, Figure 9 illustrates how a carbon price would work. That price would increase the bids of fossil-fuel generators that are required to pay the price. This increase would lead to potential changes in the bid stack order as well as to a higher wholesale clearing price whenever a fossil unit subject to the carbon price is setting the clearing price in the auction.

**Figure 9. Simplified Bid Stack Showing Carbon Price “Adder”**



### Other Approaches to Making RTO Markets and State Policies Work Better Together

#### Clean Energy Capacity Market Mechanisms

Another option is to adopt a clean energy forward capacity market mechanism to allow states to accomplish some of their public policy goals through, rather than outside, RTO markets. Stakeholders have put forward several possible frameworks for such a mechanism as part of the IMAPP process in New England.<sup>53</sup> These proposals aim to make demand for new clean energy resources more transparent in the RTO market and to facilitate competition in meeting that demand.

In general, a clean energy forward capacity market mechanism would work by soliciting demand bids to procure clean energy from states or distribution utilities, such as in quantities necessary to meet state renewable energy or CO2 reduction goals. Some proposals would also allow states to define desired quantities of specific resources, such as offshore wind or energy storage, for which they are willing to pay a higher price. New or existing clean resources would submit supply bids to meet aggregate clean energy demand, and resources that cleared the auction would be paid a price per megawatt hour for either the clean energy attribute of their generation or the clean energy attribute plus the energy provided.

A clean energy forward capacity auction could be cleared in coordination with the primary capacity market to meet the overall resource adequacy requirement. Some mechanism designs would allow resources to earn revenues in multiple markets, whereas others would prevent those resources participating in the clean energy capacity market from also earning revenue in the capacity or energy markets.

<sup>52</sup> PJM May 2017, *supra* note 45.

<sup>53</sup> Pete Fuller, “A Thought Experiment in FCEM,” November 10, 2016, [http://www.nepool.com/uploads/IMAPP\\_20170125\\_NextEra\\_RENEW.pdf](http://www.nepool.com/uploads/IMAPP_20170125_NextEra_RENEW.pdf); Nextera & RENEW Northeast, “Forward Clean Energy Capacity Market,” January 25, 2017, [http://www.nepool.com/uploads/IMAPP\\_20170125\\_NextEra\\_RENEW.pdf](http://www.nepool.com/uploads/IMAPP_20170125_NextEra_RENEW.pdf); Kathleen Spees and Judy Chang, “A Dynamic Clean Energy Capacity Market,” May 17, 2017, [http://www.nepool.com/uploads/IMAPP\\_20170517\\_LT\\_Straw\\_Dynam\\_Clean\\_Energy\\_Market.pdf](http://www.nepool.com/uploads/IMAPP_20170517_LT_Straw_Dynam_Clean_Energy_Market.pdf).

## Voluntary/Residual Capacity Markets

Rather than add complexity to existing capacity markets with two-stage auctions or a separate clean energy mechanism, some stakeholders have proposed replacing the eastern RTOs' mandatory capacity markets with voluntary residual capacity markets. Proponents of these voluntary markets—including representatives of municipal and cooperative utilities—view mandatory capacity markets as a barrier to (and a poor substitute for) long-term resource planning, which allows LSEs and their state-level regulators to consider factors such as fuel diversity, environmental attributes, economic development, and other state policy goals.<sup>54</sup> These proponents contend that voluntary residual capacity markets would better meet the needs of LSEs by allowing them to fulfill most of their capacity obligations through bilateral contracts or self-supply and to provide a transparent centralized procurement auction to meet any unmet need. This approach would rely relatively heavily on LSEs to conduct traditional resource planning and to procure a mix of resources through a combination of bilateral contracts, voluntary auctions, or, where state law allows, ownership of generation (self-supply).

## Allowing More Resources to Set the Energy Market Clearing Price

Rules governing price formation in RTO energy markets are yet another subject of ongoing debate. In 2014, the FERC opened an investigation of price formation issues affecting energy and ancillary services markets. The investigation included use of out-of-market payments to resources that are needed to meet demand but that are ineligible to set prices—so-called uplift payments—and other RTO actions that may affect clearing prices.<sup>55</sup> Following that inquiry, the FERC proposed three rules addressing various aspects of price formation: one raising caps on offer prices (bids) meant to prevent abuse of market power, one allowing fast-start resources set price, and one improving cost allocation and increasing transparency of uplift payments by RTOs.<sup>56</sup>

More recently, PJM initiated a dialogue on two additional price formation issues: (1) expansion of price formation eligibility to all resources that are needed to meet demand in a given interval and (2) negative prices, which are sometimes offered by wind energy resources that earn revenues for output from the federal production tax credit.<sup>57</sup> According to PJM, raising prices by allowing all resources to set prices could partially address some concerns that states have acted on through out-of-market policy mechanisms and could enable development of a new flexibility product that could better facilitate integration of variable renewable generation. States and stakeholders may wish to consider the degree to which changes to price formation rules could address current challenges and whether these changes could substitute for or work in concert with other solutions.

## EVALUATING PROPOSALS TO ALIGN RTO MARKETS AND STATE POLICIES

As states and other stakeholders evaluate proposals to alter RTO markets in light of evolving state policy goals, they may wish to consider not only the specific problem any given proposal aims to solve but also the threshold questions of whether and how RTO markets should account for state policies:

- What are FERC/RTO obligations to adjust RTO rules to account for or better align with state policies?
- What is the full menu of options for better aligning RTO markets and state policies, including strategies discussed here and others. For example, can typical state policy goals beyond reducing CO2 emissions—fuel diversity, innovation, resilience, and the like—be better reflected in market design?
- How do RTO proposals to alter market designs—individually or in combination—perform in light of the goals of maintaining market efficiency and ensuring that states have adequate tools to pursue their public policy goals?
- How do those proposals—individually or in combination—perform in light of longer-term market design challenges such as integrating a large fraction of low- or no-marginal-cost renewable energy generation?

<sup>54</sup> J. Morrison, "Capacity Markets: A Path Back to Resource Adequacy," *Energy Bar Association*, 2016; E. Caplan and P. McCullar, "Markets in Name Only: Mandatory Capacity Markets and Their Adverse Impacts on LSEs," *The Electricity Journal*, July 2013.

<sup>55</sup> "Energy Price Formation," FERC, accessed November 7, 2017, <https://www.ferc.gov/industries/electric/indus-act/rto/energy-price-formation.asp>.

<sup>56</sup> FERC, "Offer Caps in Markets Operated by Regional Transmission Organizations and Independent System Operators," *Federal Register* 81, no. 233, (December 5, 2016); FERC, "Fast Start Pricing in Markets Operated by Regional Transmission Organizations and Independent System Operators," *Federal Register* 81, no. 251, (December 15, 2016); FERC, "Uplift Cost Allocation and Transparency in Markets Operated by Regional Transmission Organizations and Independent System Operators," *Federal Register* 82, No. 24, (February 7, 2017).

<sup>57</sup> PJM, *Energy Price Formation and Valuing Flexibility*, (June 15, 2017), <http://www.pjm.com/~media/library/reports-notice/special-reports/20170615-energy-market-price-formation.ashx>.

Changes to RTO market design that integrate typical state policy goals, such as CO2 emissions reductions and clean energy procurement targets, may better align market outcomes with state policy goals and reduce, to some degree, out-of-market payments. For example, proposals to implement an RTO carbon price could reduce the size or prevalence of REC and ZEC payments to eligible renewable energy and nuclear generators. However, the significant variation in policy goals across states within multistate RTOs and the multifaceted nature of state policy goals present significant challenges to this approach.

States and stakeholders may also wish to consider proposals to address state policies within RTO capacity markets in light of longstanding discussions about whether capacity markets are needed and how to best design them. As the amount of low- or zero-marginal-cost renewable resources grows, capacity payments or payments for other reliability or flexibility attributes may assume increased importance.<sup>58</sup>

Table 1 summarizes the proposals described in this primer, the problem or issue each proposal aims to address, and key design questions for each proposal.

**Table 1. Summary of Proposals to Better Align RTO Markets and State Policy Goals**

Proposed RTO market design	Problem the proposal attempts to address	Key design questions
<p><b>ISO-NE Two-Stage Capacity Market (Substitution Auction)</b></p> <p>Introduces a two-stage capacity auction.</p> <p><b>Stage 1:</b> MOPR applies to all new resources. Cleared resources gain capacity obligation and payments.</p> <p><b>Stage 2:</b> Substitution auction determines clearing prices and cleared resources without MOPR. Stage 1 resources can retire and transfer capacity obligation to state-subsidized resources that did not clear stage 1 because of their subsidy. Retiring resources pay state-supported resources stage-two clearing price and keep difference as “severance pay.”</p>	<p>State-subsidized resources that do not clear the capacity auction because of MOPR are resources for which states (and consumers) will continue to pay. The overall result is too much capacity, which is inefficient and duplicative. But FERC requires MOPR and not applying MOPR lowers capacity prices (reflecting additional supply), raising concerns that markets may not attract or retain sufficient investment to maintain resource adequacy. The proposal aims to provide an incentive for exit and entry that can coexist with the MOPR requirement.</p>	<p>Does FERC have the obligation or authority to approve an RTO tariff that adjusts prices for differences in state policies (among states, among resources, or both)?</p> <p>What is the effect of the proposed two-stage market on state policy options? Does the capacity construct limit states’ ability to pursue their public policy goals?</p> <p>Does the proposal distort bidding incentives for RTO market participants (e.g., an incentive to bid low in stage one to clear the market with the expectation of a higher price in stage two)?</p> <p>How does the RTO determine which subsidies trigger repricing or authorize a resource to participate in a second stage auction?</p> <p>Does the market design distinguish between new and existing (subsidized) resources?</p> <p>How much are subsidized resources that clear the capacity market paid?</p>

<sup>58</sup> NREL 2016, *supra* note 3.

Proposed RTO market design	Problem the proposal attempts to address	Key design questions
<p><b>PJM Two-Stage Capacity Market</b> Introduces a two-stage capacity auction that would replace MOPR. Stage 1: PJM clears quantity and identifies which resources gain a capacity obligation without requiring subsidized resources to subtract subsidies from bids. Stage 2: PJM reruns auction after the bids of subsidized resources are adjusted to remove their subsidy. All resources clearing stage 1 receive stage 2 price (unless states desire subsidized resources to receive another price).</p>	<p>If existing state-subsidized resources (currently not subject to MOPR) clear the capacity auction, capacity price is lower as a result of the state policy, raising concern that markets may not attract or retain sufficient investment to maintain resource adequacy. At the same time, current MOPR disproportionately burdens subsidized resources.</p>	<p>The questions applying to the ISO-NE market proposal also apply to the PJM market proposal.</p>
<p><b>Carbon Pricing</b></p> <p>Charge all fossil-fuel-fired generators a carbon price in the energy market, increasing their operating costs and their bids into the energy market. Carbon price is a transparent price signal that values lower emissions or the emissions-free attributes of resources that do not emit carbon.</p>	<p>Many state energy and environmental policy goals are aimed at increasing emissions-free resources or reducing emissions. An RTO carbon price could reduce or eliminate the need for out-of-market payments to these resources. Carbon price raises wholesale electricity prices for plants currently suffering from low revenues, such as some existing nuclear plants.</p>	<p>Does FERC have authority to approve the tariff?</p> <p>What is the carbon price?</p> <p>What is the likely impact on generation, emissions, and wholesale and retail prices?</p> <p>What are the options for carbon revenue use and how do those options affect consumers?</p> <p>Is some sort of border adjustment needed to address emissions or price leakage?</p>
<p><b>Clean Energy Capacity Markets</b></p> <p>Introduce clean energy capacity markets to centrally and transparently procure resources to meet state policies. States would submit amounts of types of desired resources. RTO would clear clean energy capacity market in coordination with mandatory market to meet total resource adequacy requirements without duplication.</p>	<p>Reduce out-of-market payments for state-preferred resources—which may suppress prices in competitive markets and thereby undermine those markets—by bringing state clean energy goals into the capacity market.</p>	<p>Does FERC have authority to approve the tariff?</p> <p>What is the effect of the proposed clean energy capacity market on state policy options?</p> <p>How does the proposal account for variation in state preferences with respect to resource types (e.g., support for a budding industry), locations (preference for resources that contribute to in-state environmental goals), and other factors?</p> <p>How does the proposal coordinate with the mandatory capacity market to avoid too much or too little procurement?</p>

Proposed RTO market design	Problem the proposal attempts to address	Key design questions
<p><b>Voluntary/Residual Capacity Markets</b></p> <p>Allow LSEs to meet resource adequacy requirements through a combination of bilateral contracts, self-supply, and voluntary residual capacity auctions.</p>	<p>The current system of mandatory capacity markets does not differentiate between resources that states and LSEs may value differently for various public policy or risk-related reasons.</p>	<p>What is the likely effect on resource adequacy?</p> <p>How will LSEs in states that do not allow utilities to own generation plan for and meet resource adequacy requirements?</p> <p>Will a voluntary auction provide sufficient price transparency to stimulate competitive capacity prices?</p> <p>Will a voluntary auction and bilateral markets provide a sufficient long-term investment signal for future investment?</p>
<p><b>Changes to Price Formation Rules in Energy Markets</b></p> <p>Update the rules governing how prices are set in energy markets to better reflect the cost of meeting demand in each interval, such as by allowing any resource needed to meet demand in a given interval to set the price.</p>	<p>Reduce out-of-market payments by RTOs to resources that are needed to meet demand but, under current rules, are ineligible to set prices. Changes under consideration would tend to raise prices in energy markets.</p>	<p>What is the likely effect of the proposed rule change on energy market prices?</p> <p>How does the proposed change improve the price signal for market participants?</p> <p>How does the proposed change interact with state policy goals? Does it limit the effects of state policies?</p> <p>Is the energy market the most appropriate venue to incorporate this price feature in comparison, for example, with a new ancillary service or other market component?</p>

## Nicholas Institute for Environmental Policy Solutions

The Nicholas Institute for Environmental Policy Solutions at Duke University is a nonpartisan institute founded in 2005 to help decision makers in government, the private sector, and the nonprofit community address critical environmental challenges. The Nicholas Institute responds to the demand for high-quality and timely data and acts as an “honest broker” in policy debates by convening and fostering open, ongoing dialogue between stakeholders on all sides of the issues and providing policy-relevant analysis based on academic research. The Nicholas Institute’s leadership and staff leverage the broad expertise of Duke University as well as public and private partners worldwide. Since its inception, the Nicholas Institute has earned a distinguished reputation for its innovative approach to developing multilateral, nonpartisan, and economically viable solutions to pressing environmental challenges.

## The Great Plains Institute

The Great Plains Institute is a non-partisan, non-profit organization that convenes and helps diverse interests forge agreement on solutions to our most important energy challenges. Engaging partners and stakeholders at national, regional, state and community levels, our programs span a range of key priorities, including energy efficiency, energy infrastructure and markets, fossil energy, renewable energy, and transportation.

### Contact

Nicholas Institute, Duke University  
P.O. Box 90335  
Durham, NC 27708

1201 Pennsylvania Avenue NW  
Suite 500  
Washington, DC 20004

Duke Marine Lab Road  
Beaufort, NC 28516

919.613.8709  
[nicholasinstitute@duke.edu](mailto:nicholasinstitute@duke.edu)

[nicholasinstitute.duke.edu](http://nicholasinstitute.duke.edu)