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The role of governance systems and rules in wind energy development: evidence from Minnesota and Texas

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Abstract: Wind energy presents significant opportunity to provide a series of public goods. Drawing on the ideas of J.Q. Wilson and E. Ostrom, we compare options to overcome the obstacles that stand in the way of deploying wind energy in two US states, Texas and Minnesota. Texas outperformed Minnesota in deploying wind energy technology despite Minnesota's ample wind and other natural advantages. To explain this gap in performance, we argue that Texas outperformed Minnesota because of a more fitting governance system and rules for determining (i) boundaries, (ii) cost and benefit allocation, (iii) conflict resolution, and (iv) rule revision. Our approach sheds an alternative yet overlooked lens upon the topic of wind energy development by focusing on how the concentration of power and authority in the hands of a few dominant public and private elites can lead to the successful deployment of a complex renewable technology under some circumstances.

1 Introduction

Wind energy development is an approach to a collective action problem in that it addresses the provision of public goods – not least a breathable planet. Similarly, it represents a form of regional economic development as it creates jobs, increases the tax base, and spurs economic development in rural communities.[1] The US National Renewable Energy Laboratory (NREL) has estimated that the economic development benefits of wind farms are twice that of equivalent

1 Wilson and Stephens (2009).

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coal- and gas-fired electric plants.[2] If by 2030 the United States generated 20 percent of its electricity from wind, it is projected that the nation would create 180,000 new jobs.[3] Nonetheless, to deploy wind energy the activities of many public and private organizations have to be coordinated. Without this coordination, conflict among disparate interests too often results in stalemate and delay.[4]

In this paper, we argue that the speedy deployment of a complex technology like utility-scale wind power generation depends on governance systems and rules to coordinate diverse interests and prevent deadlock and indecision. In building our argument, we draw on the thinking of Wilson (1966) and Ostrom (1990) concerning governance systems and rules. Wilson has characterized governance systems that address a collective action problem, similar to which wind power represents, as being top-down or bottom-up in nature.[5] As we apply these concepts to characterize governance systems for wind power, we conceptualize top down as a concentration of power in the hands of a few dominant public and private elites that have been empowered to coordinate their actions and induce cooperation by fiat and subsidy. In contrast, by bottom-up we mean an approach that relies more heavily on broad participation and an inclusive governance design where power is fragmented.

Our aim in this paper is not to argue that in the provision of public goods, like wind energy, that strong government is always superior to voluntary action and/or weak government. Rather, our aim is to make a claim about how and under what circumstances a top-down approach may be more effective than a bottom-up approach. Wilson argued that the top-down approach was better suited for policy implementation (the realization of policy goals), while the bottom-up approach was a better fit for policy innovation (the setting of these policy goals). In a discussion of regional economic development, Bell, Tracey, and Heide (2009) concur that the top-down approach generally has outperformed the bottom-up approach when implementation was the specific task that

2 Lantz and Tegen (2009). The supply chain consists of basic industries, including cement, steel, metal casting, machining, and the making of the cast iron parts. These industries produce the bearings, nuts, bolts, blades, gears, rotator blades, braking systems, and controls for the turbines, rotors, blades, structural towers, hubs, and generators that need to be designed, manufactured, assembled, installed, maintained, and inspected. Design teams, project management companies, and construction firms pour concrete, build roads, lay cable, install wiring, and do excavation and transport. More than 400 workers are needed to install 100 wind turbines and towers (Renner, Sweeney, and Kubit, 2008).

3 Barrett and Hoerner (2002).

4 Olson (1965); Hardin (1968); Gulati and Gargiulo (1999); Dougherty and Dunne (2011); Gulati, Puranam, and Tushman (2012).

5 Wilson (1966).

was being performed.[6] Our contribution in this paper is to combine Wilson's idea about the importance of a top-down governance system in implementation with Ostrom's concept of rules as a means for tackling the problems of coordinating diverse interests, dissipating conflict, and avoiding delays in implementation. We hold that it is not just governance structure that best tackles these problems, but the rules that underlie the governance structure. Ostrom characterizes such rules as those that deal with (i) the collective boundaries of the participants, (ii) the ways costs and benefits are allocated, (iii) how conflict is resolved, and (iv) those rules that exist to revise the rules.

To make these points, we analyze the effects of diverging systems of governance and rules on the development of wind energy in Texas and Minnesota. In 2009, Minnesota was the fourth-largest wind power producer, based on Megawatt hours generated, in the United States. It had many natural and technical advantages that should have allowed it to outpace Texas, yet by 2014 Texas was far ahead of Minnesota in wind energy development, ranking first among US states in wind energy capacity, while Minnesota lagged behind in seventh place.[7] In this paper, we attribute this result to the jurisdictions' different governance systems and rules. The governance system and rules in Texas allowed an elite set of disparate interests to align their activities, which enabled this state to cope well with various barriers to wind energy development, while the price Minnesota paid for its more inclusive bottom-up governance approach and weaker and less well-defined rules was indecision and delay. In this paper we also consider what jurisdictions like Minnesota can do to hasten the deployment of a complex technology.[8] We argue that while hybrid proposals that lie between the top-down and bottom-up ideal types make some advances, they are not likely to be to be completely effective.

2 Wind energy and collective action

The deployment of renewable technologies has been studied from many lenses. Some studies recognize that subsidies for generation, like feed-in tariffs (FIT), or supply-side programs, like renewable portfolio standards (RPS), have been

6 Saxenian (1994); Bresnahan and Gambardella (2004); Bell, Tracey, and Heide (2009). At the end of this paper we note some of the limitations with a top-down approach.

7 Wind provided 7.5 percent of the Minnesota's electricity generation in 2009, at the time, the highest share for a state in the nation, but by 2014 Minnesota fell behind. American Wind Energy Association (2015).

8 Lewis (2000); Powell et al. (2002); Farjoun (2010); Klass and Wilson (2012); Osofsky and Wiseman (2012).

necessary for successful deployment. Others point to the importance of overcoming technological hurdles. We argue that the root of the challenge to deploying this complex renewable technology is in coordinating the activities of a set of diverse participants whose interests are not aligned.[9] The rewards of successful governance of a diverse set of organizational interests are public goods in the form of both a more environmentally conscious form of electricity generation and distributed economic benefits across a region.

The costs of organizing these diverse interests are borne by a few while the environmental and social benefits are realized by many.[10] The central issue jurisdictions face is to forge collaboration among the numerous actors, such as incumbent utilities, renewable energy developers, environmentalists, policy makers, and the rate-paying public, each of which can behave opportunistically and shirk from its responsibilities. Hardin (1982) recognizes the issue of asymmetric interests in the similar case of providing the collective good of cleaner air.[11] Likewise, in the case of wind energy each of the parties is likely to value the collective good of deploying the technology differently; the costs are not uniformly distributed among these parties and free riding could undermine deployment. For example, multiple transmission line connections provide some states and some firms with inter-state export advantages. This collective action issue is exacerbated by inter-state rivalry for leadership in wind power generation development.[12] As a higher level of collaboration does not exist, efforts to deploy the technology and realize the public goods stall or are likely to proceed at a slow rate.[13]

Since Hobbes' (1651) work, political and social theorists have developed approaches to the problems of coordinating the activities of separate agents for the purposes of collective action.[14] Wilson maintains that once jurisdictions choose a policy focused on deployment, a governance system that accentuates exclusivity and increases group cohesiveness hastens implementation.[15] Ostrom's focus has been on the rules that enable groups with disparate interests to coordinate their activities and grapple with the management of common pool resource problems.[16] According to Ostrom, without tacit and explicit rules to govern, too much

9 Olson (1965); Hardin (1968).
10 Slattery, Lantz, and Johnson (2011).
11 Hardin (1982).
12 Fremeth and Shaver (2014).
13 Olson (1965).
14 Hobbes (1651).
15 Wilson (1966).
16 For Ostrom (1990) rules closely matching formal laws regulations, and court decisions monitored and enforced by public officials but are not identical with them. Rules are both explicit and tacit.

opportunistic behavior and shirking of collective responsibilities mean that groups are unlikely to achieve solutions to collective problems in their common interest.

2.1 Game theory solutions

Many approaches to collective action rely on game theory to identify possible solutions. If two actors play a game, like prisoner's dilemma, their choice is binary – whether to cooperate or defect (i.e. shirk responsibility). Key assumptions are that the two players are rational and selfishly optimize and that under such conditions a solution does not emerge. Additional assumptions are that payoffs are fixed and known in advance, the moves of the players are made simultaneously, and that the game has but a single iteration. If these assumptions are relaxed, and the game has more than two actors and is iterated many times, cooperative solutions are supposed to evolve from below in a self-organizing way via the "tit for tat" (TFT) strategies the players employ over many iterations of the game.[17] These strategies are supposed to provide an explanation for spontaneous self-organized behavior witnessed in everyday life.

Ostrom criticizes the assumptions of the game-based models.[18] She considers them overly restrictive and not reflective of real-world conditions. In the real world, she maintains the actors are not necessarily self-interested, rational, calculating, or homogeneous. They do not have close-to-perfect knowledge of other players' moves and near-perfect understanding of the history of past interactions. Indeed, empirical evidence from conditional cooperation experiments supports Ostrom's critique. The evidence shows that cooperation diminishes rather than increases when games are repeated many times with many players.[19] Over the many rounds, the actors learn from each other not to cooperate. They withdraw their contributions from joint efforts and conflict grows, suggesting alternatives are needed to address such problems. Ostrom's contribution has been to suggest what these alternative solutions might be.

2.2 Charismatic leadership as a way to engender cooperation

Ostrom also provides a critique of charisma as a way to engender cooperation. One might think that charismatic leaders can use the powers of persuasion to

17 Axelrod and Hamilton (1981); Axelrod (1997).
18 Ostrom (1990).
19 Gachter (2007).

engender cooperation. The social movement literature is rife with this suggestion. It proposes that emotional appeals can solve the problem.[20] Charismatic leaders depend on ideologies to fashion collective identities. They instill moral obligations to serve common interests and ensure the provision of public goods. Ostrom, however, suggests that even with charismatic leaders cooperation does not evolve.[21] Her view is that charisma is personal and short-lived.[22] To the extent that it does not rest on a governance system and a set of rules, it is not likely to be effective. Moreover, we would maintain that examples typically given for successful charismatic leadership are retrospective in nature.[23] These do not consider how many times appeals of charismatic leaders fall short. In addition, we argue that discourse of charismatic leaders may be considered cheap, deceptive, and divisive. Additionally, rather than bringing diverse actors together to achieve common purposes, their appeals to collective identity has the tendency to degenerate into mistrust and discord.[24]

2.3 Rules as the foundation of governance systems

Acording to Ostrom, rules are the building blocks for the systems that enable diverse actors to coordinate their behavior.[25] She points to four types of rules that play this role[26]:

1. Boundary rules**:** The presence of clear boundary rules helps to determine with whom key players will interact.[27] These rules pertain not just to the inclusion or exclusion of participants, but also to their interactions and the domains of their activity and deal not only with the question of who may participate but also how they may participate.
2. Allocation rules**:** How costs and benefits are allocated across groups is of the utmost importance.[28] Rules for allocating costs and benefits help to identify the activities that groups and organizations collectively pursue.

20 Hargrave and Van de Ven (2006); Ansari, Wijen, and Gray (2009).
21 Ostrom (1990).
22 Weber (1964).
23 Rosenzweig (2009).
24 Marcus, Geffen, and Sexton (2002); Mesquita (2007).
25 Ostrom (2000).
26 Ostrom (1990).
27 See also Gulati, Puranam, and Tushman (2012).
28 Gray (2000); Dyer, Kale, and Singh (2001).

3. Rules for conflict resolution**:** Also needed are easy-to-use and low-cost rules for resolving conflict.[29] Such rules establish well-understood community-imposed norms and sanctions. Regulators and the courts typically take on the responsibility of upholding the norms and imposing sanctions, but non-partisan intermediaries or ad hoc groups and committees also may play this role.
4. Rules for revising and updating the rules: The rules that govern the collectives' activities need to be continuously revised and updated to accommodate shifting balances of power and to cope with external pressures and changes in conditions.[30] Without a clear method to change rules, collectivities stagnate as they fail to cope with new developments that challenge their earlier methods for allocating public goods.

3 Prior studies on wind energy development in Texas and Minnesota

In creating our argument concerning how governance systems and rules influenced wind energy development in Texas and Minnesota, we build upon the work of prior researchers who note that the different rate of deployment of wind energy in Texas and Minnesota cannot be explained by the availability of the resource alone. Three main points emerge from their work.

First, prior research shows that Texas' administrative structure for wind power deployment has been more unified and centralized than Minnesota.[31] Various studies have paid particular attention to the ability to expand high voltage transmission capacity, which is essential for transporting wind power from outlying regions. Unlike Minnesota, Texas has its own regional transmission organization (RTO) – the Electricity Reliability Council of Texas (ERCOT) – that is separate from other regional grids, while Minnesota is a part of a broader RTO that encompasses many states (see Figure 1).[32] Decision making within ERCOT involves elites who wield central power and political support to deploy new technology. Discussions between an exclusive set of technical staff, elected officials, firm executives, and engineering consultants, isolated from politics, determines

29 Ostrom (1990, 2000)
30 Ostrom and Walker (1991).
31 Langniss and Wiser (2003).
32 Fischlein et al. (2010).

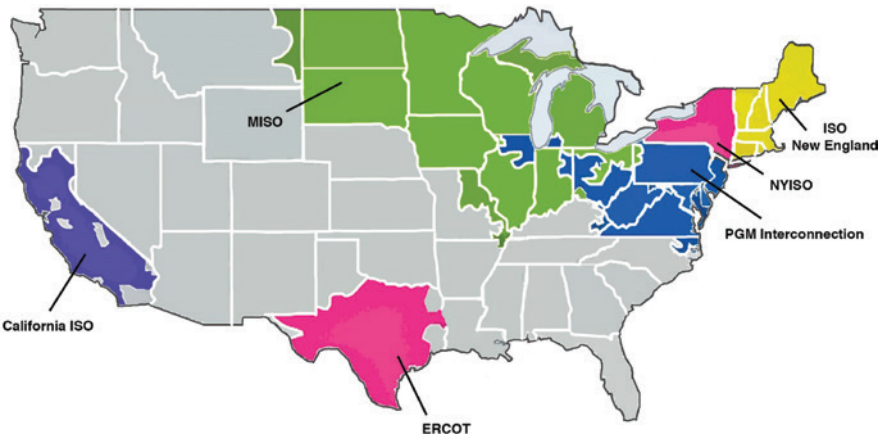

Figure 1: Regional transmission operators and independent system operators in the United States (2012). MISO, Midwest Independent Transmission System Operator; ISO, Independent System Operator; NYISO, New York Independent System Operator; ERCOT, Electric Reliability Council of Texas.
Source: ISO/RTO Council.

the outcomes. Such an environment has lowered the political risk for developers and encouraged greater rates of investment.[33]

Second, prior studies have pointed out that subsidies in Texas have effectively altered the cost benefit allocation of deploying wind energy.[34] ERCOT established competitive renewable energy zones (CREZ) that had nearly $7 billion dollars to invest in transmission infrastructure. The Texas Senate supported this initiative in 2005 when it mandated that ERCOT develop a plan to construct transmission to carry up to 18,456 MW of wind power from the western parts of Texas, where wind was generated, to the metropolitan regions in the state's east where it was consumed. Ironically, one commentator notes that a state recognized for its libertarian ideology obtained financial support for this effort from ratepayers: "in a libertarian-minded state … these lines would be paid for by a socialized fee, payable by all Texans whether they bought wind power or not."[35] Minnesota, in contrast, did not have such a vast system of subsidies to solve the problem of who would pay for needed transmission to bring wind from where it was generated to where it was used.

33 Holburn (2012).
34 Fischlein et al. (2010); Zarnikau (2011); Baldick (2012).
35 Galbraith and Price (2013: p. 149).

Third, the previous studies of wind power deployment in Texas and Minnesota have highlighted that Texas had central siting rules in place for resolving conflict that did not exist in Minnesota. Texas' rules minimized local opposition and prevented not-in-my-backyard (NIMBY) siting concerns. A commentator notes that it was "remarkable in a state (like Texas with its) … deep respect for private property rights that companies … could seize the land they needed through eminent domain."[36] Local perspectives on the development of wind industry were couched in favorable terms to curry support. In Minnesota, by contrast, transmission siting was a historically contentious issue.[37] The state required multiple permits from local, state, regional, and federal agencies before wind power installations and power lines could be built. Indeed, a quantitative assessment of 38 states that developed wind power has shown a statistically significant relationship between simplified siting procedures, like those in Texas, and wind power deployment.[38]

4 Governance and rules in Texas and Minnesota

Moving beyond the afore-mentioned approaches, this section applies Wilson's and Ostrom's ideas to further contrast Texas' structure and rules for deploying wind power with those in Minnesota (see Table 1). Among US states, Texas and Minnesota were positioned to achieve the most gains from wind power deployment. The potential economic development expected from the wind sector was geographically concentrated in these states, not to mention the environmental benefits from forgoing fossil fuel generation that previously provided the bulk of electric generation and had significant negative environmental consequences. These two states accounted for more than a third of US forecasted wind energy jobs. Yet to realize these benefits they needed to mobilize a collective effort among the key actors – utilities, power producers, environmentalists, governments, and the rate paying public.[39]

In deploying wind energy, Minnesota had advantages that Texas did not have. Its wind resources were closer to major population centers than Texas. Its public policy on renewable energy, in addition, was more stringent than Texas. Minnesota's RPS, passed in 2007, mandated that the state's largest utility, Xcel

36 *Ibid*.
37 Brannstrom, Jepson, and Persons (2011).
38 Bohn and Lant (2009).
39 U.S. Department of Energy (2008).

Table 1: Governance systems and rules in Texas and Minnesota.

Rule	Rule definition	Texas: conformity to rule	Minnesota: violation of rule
1. Boundary rules	Who are the participants? What property is jointly held?	The regional transmission operator, Electric Reliability Council of Texas (ERCOT), covers approximately 75 percent of state, including major urban centers and the southernmost portion of windy panhandle	Regional transmission operator, Midwest Independent Transmission System Operator (MISO) must manage and coordinate grid of 12 other Midwest states and Manitoba
2. Allocation rules	Who provides essential inputs? Who benefits from those inputs? How much benefit is accrued?	The 2005 Texas amendment to the renewable portfolio standards (RPS) grants the regulator the authority to allocate costs and benefits to bring about timely construction of new transmission facilities	Regulator lacks effective authority to allocate costs and benefits of new transmission construction
3. Conflict resolution rules	How to manage violators? What is the nature of sanctions? Who imposes sanctions?	Texas bill orders PUCT to designate Competitive renewable energy zones (CREZs) as the best areas for wind; once selected, CREZs have right to expand transmission, thereby mitigating conflict	Construction of additional transmission spreads discord: some environmental groups and citizens oppose new transmission lines because of the detrimental effects on wildlife and private property
4. Revising and updating the rules	How to build in flexibility to enable adjustments to rules for feedback and change?	The jurisdictions of ERCOT and PUCT overlap, thereby allowing opportunities to fine-tune policies	Players not stable; the intervention of the Federal Energy Regulatory Commission (FERC) and Department of Energy (DOE) to reduce backlog only adds to the confusion

Energy, generate 30 percent of its energy from renewable sources by 2020 and all other utilities, 25 percent, by 2025. In contrast, Texas's RPS, created in 1999 and amended in 2005, required the state to achieve just about 5 percent of the state's total electricity demand from renewable sources by 2025. The background to these policies also differed significantly, as the Texas policy was introduced as a rider to broader market restructuring, while the Minnesota policy was created

with environmental benefits in mind and was meant to encourage the growth of a "green economy" in the state.[40]

Though Texas and Minnesota were among the US states that had the greatest potential for wind energy development, their efforts to deploy this technology led to substantially different results. Despite Minnesota's advantages, Texas greatly outpaced Minnesota in the deployment of wind energy (see Figure 2). Texas had but 41 megawatts (MWs) of capacity in 1999, while Minnesota had 135 MWs. Yet, by 2007, Texas was far ahead of Minnesota, with Texas having 4356 MWs of wind capacity and Minnesota having just 1299 MW.

The costs of Texas' success were levied upon all ratepayers, but economic development from a growing wind sector was concentrated to outlying regions of the state. Nolan County, in West Texas, became one of the largest wind producing regions in the US. By 2008, it produced more wind power than all of California with over $5 billion of investment into the county and the nearby region.[41] Nolan County was helped by a number of factors, including county commissioners who offered tax abatements to wind farm developers, a lucrative CREZ subsidies program, and favorable siting rules. As a result, Nolan County achieved a significant drop in its unemployment rate from 5.9% in 1999 to 3.8% in 2015 and was

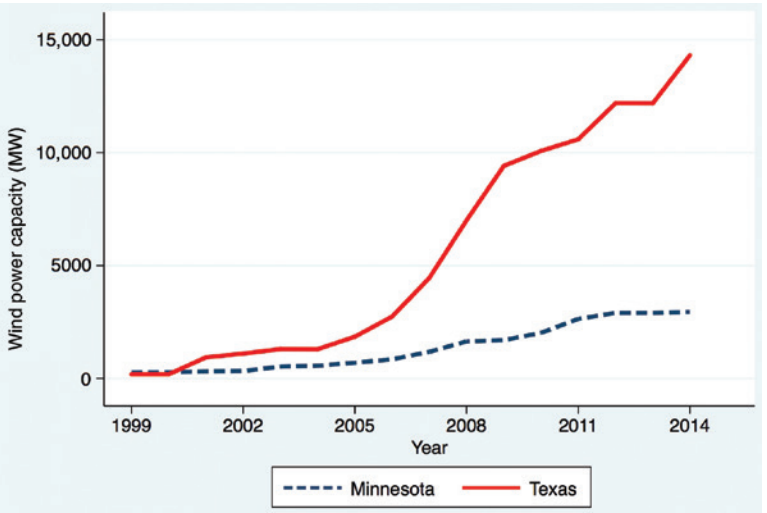

Figure 2: Wind power capacity in Minnesota and Texas, 1999–2014.
Source: SNL Unlimited

40 Schek (2007).
41 Reed (2008).

able to stabilize its labor force after experiencing an 8% annual decrease from 1990 to 1999.[42]

Jepson, Brannstrom, and Persons (2012) highlight how the wind sector invigorated the local Nolan County economy.[43] Slattery, Lantz, and Johnson (2011) validate the economic benefits to the Nolan County region with the application of a modeling approach to assess the economic gains.[44] These gains were in contrast to the experience of Pipestone County, Minnesota that was supposed to be the epicenter for the sector's growth in western region of the state. Pipestone County saw some early success with an investment by an Indian turbine blade manufacturer, but growth never materialized as necessary transmission upgrades were delayed and employers shuttered.[45] The unemployment rate in Pipestone County rose from 2.9% in 1999 to 3.8% in 2015, with its labor force declining in the time period.[46]

As the task facing Texas and Minnesota was implementation and not innovation, overcoming the obstacles needed for the deployment of wind energy called for an approach that emphasized exclusivity and concentration of power as Wilson suggested. Despite Minnesota's many other advantages, governance in Texas and the rules that undergird it were a better fit. This structure of governance and rules in Texas facilitated solutions for the deployment of wind power that worked towards overcoming the problem associated with regional economic development and environmental sustainability, whereas the system of governance and rules in Minnesota did not have the same influence in surmounting this barrier.

4.1 Governance systems in Texas and Minnesota

The governance systems for wind energy deployment had different origins in the two states. On the one hand, they both arose because of widespread reforms in the US electric utility industry. By the mid-1990s, most US states had abandoned the supremacy of large vertically integrated utilities and rate-of-return regulation and at least considered, if not adopted, restructuring. Federal regulators encouraged open access to transmission for independent power producers beginning with FERC Orders 888 and 2000 in 1996 and 1999, while state regulators at Public

42 U.S. Bureau of Labor Statistics (2015).
43 Jepson, Brannstrom, and Persons (2012).
44 Slattery, Lantz, and Johnson (2011).
45 Shaffer (2010).
46 U.S. Bureau of Labor Statistics (2015).

Utility Commissions stimulated the divestment of generating plants by incumbents and provided "avoided cost" pricing schemes that invited independent power producers' alternative energy developments. The impact of these reforms was increased with the introduction of RPS policies by state legislatures that set statutory supply targets for the provision of renewable power that utility firms had to meet over time. By 2014, 29 states had such policies, with their intensities varying widely across states and, in some cases, varying within a state. Such policies had extra-jurisdictional effects as utility firms sought renewable power from across state lines to meet statutory or anticipated policy demands.[47]

This dynamic environment was built upon the belief that open access to still monopoly-owned transmission was a prerequisite for a functioning and liberalized electricity marketplace. However, efforts to encourage liberalization did not sufficiently consider challenges that lay ahead as new organizations were invited to participate in the system and began to play increasingly important roles.[48] Restructuring resulted in blurred boundaries, less certain allocation rules, and conflict. To make matters worse, there were few options available for modifying the rules of newly formed institutions established as part of the reforms.

In Texas, these structural reforms were embraced, but with efforts to maintain the incumbent structure. The state's utility regulator was empowered by the legislature to introduce reforms that allowed for retail competition, independent power production, and growth in wind power capacity. State action, however, was concurrent with large electric utilities continuing to wield significant influence in all aspects of the value chain and in their role on the Board of Directors of ERCOT, the state's transmission operator. The clear lines of communication between key actors helped ensure that the issue of deploying wind power could be easily addressed. The governance structure reinforced the maintenance of interests for the provision of a public good that provided environmental and economic benefits with costs covered by significant public financial support.

In Minnesota, the governance structure took a different direction in response to the reforms, following the more prominent inclusive and participatory bottom-up approach adopted in other states. Coalitions of aligned interests were transitory and fragmented at critical moments and no dominant organization emerged to act as leader. Furthermore, the policy making process within both the state administration and the RTO aspired toward the inclusivity of many actors.[49] Several players active in Minnesota had the potential to solve this problem but

47 Fremeth and Shaver (2014).

48 Michaels (1999).

49 Olson (1965) observes that this leads to sub-optimal results when trying to reach resolution to public good provision.

did not take the lead. Leadership could have emanated from government policy makers, environmentalists, and the dominant utility firms in the state.[50] However, without this leadership, the state was unable to take advantage of its significant wind resource and experienced a failure when trying to coordinate the activities of the many actors whose behavior needed to be synchronized within a bottom-up structure.

The problem with the governance structure in Minnesota reflects what Olson (1965) has identified as the tendency for actors with the most at stake to sit on the sidelines if they are expected to bear the greatest costs of organizing the collectivity. In Minnesota, there was lack of leadership from such actors – the public administrator charged with wind power development, the leading environmental organization, and the state's major electric utility company.

First, the public administrator charged with wind power development at the Office of Energy Security (OES) within the Minnesota Department of Commerce did not see his mission as one of forging a coalition to make wind power development possible but rather to "hang loose" and create an "ambiguous working environment".[51] His approach to wind was distant and without additional powers or resources his involvement in forging consensus among actors was minimal.

Second, the Izaak Walton League, a key environmental organization, which had played an important role in brokering the state's passage of the RPS, chose a pragmatic route upon implementation as it was anxious about its status with other environmental groups that did not share its view that new transmission lines were needed to bring wind-power online. In the face of such opposition amongst its ranks, the Izaak Walton League was unwilling to take on a coordinating role.

Finally, given the public equivocation, the leaders of the state's major utility company, Xcel Energy, also were not at ease in trying to solve Minnesota's dilemmas in deploying wind energy and contributing to the provision of public goods. Xcel's role in state fits well with Olson's classic depiction of a highly fitting key actor failing to become involved. Xcel executives were willing to call for and to take small steps towards wind deployment but feared antagonizing other participants, including wind energy developers and rural land owners, whose support they relied on for other projects. The executives wanted neither controversy, nor negative public relations. As a result, Minnesota's governance structure did not stimulate the leadership needed to resolve the issue, but rather it reinforced existing stalemate and created additional obstacles to deployment.

50 Mahoney, McGahan, and Pitelis (2009).

51 Ed Garvey, Minnesota Office of Energy Security, personal communication, May 2008.

4.2 The blurring of boundaries

Newly formed RTOs were particularly important in the case of wind power deployment due to growing attention being paid to transmission upgrades and interconnections. This meant that RTOs became the forums whereby various actors in the utility sector were supposed to come together and coordinate activities to ensure reliability of the system, while introducing necessary investments to bring wind power onto the grid. However, the partitioning of generation, transmission, and distribution of electricity blurred the boundaries for inclusion and introduced new entities that had not previously held a role in the sector and exacerbated the problem.

FERC wanted the RTOs to supplant the power pools that in many states had exclusive top-down governance structures that favored major utilities in ensuring electricity reliability. It directed the players in the system to adopt RTOs, but stopped short of mandating that they participate, leaving the details of implementation open for negotiation. Stakeholders set up workgroups to bring together firms, government agencies, and non-governmental organizations that had a stake in how electricity system would be governed. Ultimately, six RTOs came into being, with each having a different form of governance and each engaging in a different set of activities. Most of the RTOs spanned many states and even Canadian provinces. The governance systems evolved after years of negotiation and often involved a complex set of voting rights distributed among boards of diverse stakeholders.[52] Membership was voluntary and defection always possible. Boundary rules were vague as members could come and go without much notice or resistance, the lone exception being Texas.

A major difference between Texas and Minnesota was their boundary rules for participation in decisions for transmission planning and investment. Most transmission markets were multi-state in nature and RTOs managed the transmission assets of many utilities facing differing state policy frameworks. In Texas, ERCOT was a centralized authority with jurisdiction over nearly the whole state, including its major urban centers and the southernmost portion of its windy panhandle. Such authority was lacking in Minnesota. Due to ERCOT's intrastate nature, it was subject only to state authority and state legislation. Therefore, it avoided both a host of federal regulations and the need to deal with policies established in other states.[53] Furthermore, the political framework that had empowered ERCOT to deploy transmission to meet the state's RPS policy had significant insulation

52 Koch (2000).
53 Fleisher (2008).

from external pressure.[54] The enabling bill had bi-partisan support and sustained more than 25 attempts to derail it after 1999.[55] Such autonomy reinforced boundary rules for participation and ensured that ERCOT had the support of investor-owned utilities that both held positions on its Board of Directors and participated in the deployment of wind energy technology.

In contrast, the RTO in Minnesota, the Midwest Independent Transmission System Operator (MISO), was responsible not only for managing the transmission grid in Minnesota but also for managing and coordinating the transmission grids in 12 other Midwest states and the Canadian province of Manitoba. Before MISO could make a decision, it needed to take into account the interests of these 13 other parties that may or may not have had RPS policies of varying stringencies. Due to the vast geographical space that comprised its membership, the burden of decision-making was large. Representatives of each state and the province of Manitoba needed to be consulted before a decision was made. MISO needed to take into account the divergent interests and policy directions of more than 30 transmission owners, 45 power marketers, 27 independent power producers, 17 municipal and cooperative utilities, four large-scale consumers, eight environmental groups, 15 state regulatory groups, and 12 public consumer groups.

4.3 Cost and benefit allocation

Changes in government rules altered how cost and benefit allocation was carried out. The incumbent decision maker for approving additions or modifications to transmission networks had been a state's public utility commission (PUC). Under the reformed market a PUC still could approve contracts between wind generators and purchasers, but it was just one of many interested parties that allocated costs for needed transmission upgrades to satisfy wind power needs. Because transmission networks were interstate, RTOs had primary responsibility for determining new investment costs and benefits. However, as we show below, the rules for allocating costs and benefits were not well laid out. RTOs were established with significant technical expertise with respect to transmission reliability, engineering, and market pricing. But they did not generally possess rules to build new transmission to service a decentralized system. The rules to determine who would bear the costs of transmission upgrades and where priorities would be placed on interconnections were open questions.

54 Sibley (2002).
55 Holburn (2012).

Under the previous governance model, incumbent transmission owners were the main drivers of transmission expansion and bore the financial costs. However, under the new RTO model, any interest could seek to intervene and participate in the market.[56] RTOs were meant to manage open access to the grid, despite incumbent utilities continuing to own the transmission facilities. The RTOs' effectiveness depended on the participation of different transmission-owning members, yet transmission owners could decide to leave the RTOs if they wished.

Texas was distinguished from Minnesota in that it had unique rules that allowed for greater ease in allocating the costs and benefits among the players. The Public Utility Commission of Texas (PUCT), unlike the Minnesota Public Utility Commission (MPUC), had considerable authority provided to it from the 2005 amendment to the RPS to ensure grid expansion in a timely fashion.[57] Similarly, the allocation rules on which ERCOT relied permitted wind energy developers to enter the market without being charged a fee for the use of transmission facilities. ERCOT also had the authority to allocate significant amounts of money to alleviate the costs and benefits needed to bring about timely construction of new transmission. It had nearly $7 billion in ratepayer-funded incentives to distribute for the purpose of transmission line construction. These subsidies went a long way toward solving issues in the allocation of the costs and benefits of wind energy deployment. As a result of all these factors, according to a major renewable energy developer, "the relative ease with which wind energy companies can compete within ERCOT was one of the driving forces behind the development of wind energy in Texas."[58]

This situation was very different in Minnesota where no authority existed to make decisions by fiat. As in Texas, the highest wind potential in Minnesota was along its western and southwestern borders, far from the state's large cities. New wind projects in these areas therefore required construction of transmission lines for the transport of the electricity. To this end, 11 transmission-owning utilities, including Xcel Energy, formed a joint initiative named CapX2020, which had project proposals pending, dependent on the approval of the MPUC. However, because the MPUC lacked effective authority in allocating the costs and benefits of new transmission construction and did not have large-scale subsidies as in Texas to hand out, the process of approval was exceedingly slow. Unfortunately, unlike the situation in Texas, Minnesota's RPS failed to set a mandate for construction of additional transmission lines beyond CapX2020, requiring utilities

56 Puga and Lesser (2009).
57 Texas State Legislature (2005).
58 Holburn (2012).

only to make a good faith effort. It did not have the capacity to allocate costs and benefits in a way that would achieve this result.

4.4 Conflict management

Increased participation in the utility sector in Minnesota by local consumer groups, environmentalists, and independent energy developers of varying size created conflict where little conflict previously existed. The RTO's unique governance structure provided a forum for these parties to engage with one another, incumbent utilities, and state-level regulators; yet the RTO had little authority to manage the conflict among these groups. This conflict generally resulted from renewable energy developers entering generation markets and seeking an interconnection with the grid. Their desire to obtain interconnection conflicted with transmission-owning incumbents and strained the grid's technical capacity and the system's reliability.

In the case of regional transmission markets encompassing many states, RTOs managed the interconnection queue to bring a wind development online, yet FERC allowed the RTOs to choose how to manage such conflicts.[59] To whom the RTOs should be accountable was never clear. Was it to FERC, transmission owners, generators, non-asset owning stakeholders, state governments, or ratepayers?[60] The mandate FERC gave the RTOs was to be independent but responsive, stable but flexible, and limited in their exercise of authority – but substantial in their impact.[61] Without adequate rules, the RTOs had a difficult time adjudicating conflicts and supporting the deployment of wind projects.

Texas' rules for wind energy development had been fashioned with the anticipation of such conflict and, therefore, provided more effective means for conflict resolution. The enabling 1999 legislation gave the PUCT all sorts of new powers to manage the restructured market of which renewables was a part. For instance, it empowered the PUCT to resolve conflicts by fiat with input from various stakeholders. A particular concern in the deployment of wind energy is the distribution of dispatch rights between wind and non-wind generators and the conflict that may ensue between these groups. Dispatch rights determine which electricity generators will be providing the electricity to meet market demands; any preferential treatment provided to a particular generator or technology type can distort the market and create concerns over equitable treatment. The governance

59 Koch (2000); Greenfield and Kwoka (2011).
60 Dworkin and Goldwasser (2007).
61 Hogan, Hitt, and Schmidt (1996).

structure in Texas enabled the PUCT to enforce its top-down authority to resolve such conflicts where particular generators felt discriminated by priorities in the dispatch queue. The PUCT recognized its authority in the final order on the RPS policy, stating that it made final decisions after considering the views of the other interests.[62]

These rules, which allowed Texas to efficiently meet its initial RPS target by 2005, were then modified to ensure conflicts could be resolved under the revised RPS policy. Specifically, Texas law ordered the PUCT to designate CREZs, as the best areas for wind energy development. Once the CREZs were selected, the commission automatically had the right to expand the transmission grid to these areas with publicly subsidized funds, thereby mitigating any conflict that might prevent adequate capacity. In 2008, the PUCT selected five areas as CREZs, two in the Panhandle and three in West Texas, and assigned billions of dollars to transmission projects. Once the CREZs were designated by the PUCT, conflict about the construction of transmission was curtailed. In addition, ERCOT took a hands-off approach on much of the permitting required by the renewable energy developers, leaving the locations of the wind farms to local interests. Local authorities, in turn, had a permissive attitude based on its long history of sharing surface rights with other forms of energy development.[63]

In Minnesota, on the other hand, the sequence of events differed substantially after the passage of the RPS, which initially had a very positive impact. No approach to conflict resolution had been considered and the complex decision making process at MISO prevented a fiat-like approach. The RPS spurred a nearly five-fold increase in proposed wind projects in the state and created serious concerns for the interconnection queue that MISO would need to manage. If realized, these proposals would have exceeded the ultimate mandated amount of wind power generation by 340 percent. Unfortunately, none of these proposals got off the ground quickly. Hindering this effort were conflicts that erupted because of stakeholder opposition to grid expansion.

In Texas, the rules anticipated this conflict and provided a way to resolve it; in Minnesota, no one had direct authority to deal with such conflicts. The construction of additional transmission lines spread discord among Minnesota stakeholders, with environmental groups and citizens opposing new transmission lines based on their fear of the detrimental effects on wildlife and private property. In

62 The PUCT order stated: "The rule reflects the work products of the task force and working groups, incorporating numerous compromises reached by parties in the technical workshops conducted in this proceeding. Where consensus could not be reached, staff considered all views presented in the workshops and in written comments in drafting the proposed rule."
63 Galbraith (2009).

2007, a diverse coalition had formed, consisting of environmental groups, citizens, utilities, and regulators, advocating for the passage of Minnesota's RPS. Although they had collaborated successfully for passage of the RPS, this coalition unraveled because of conflicts that arose during implementation. The fragmented collective that had coalesced in Minnesota during policy formulation did not carry through to implementation because of lack of conversion to a governance structure that would more effectively manage conflict and implement policy.

4.5 Rules to adjust the rules

Another difference between Texas and Minnesota was in the two states' respective ability to adjust the rules. Texas adjusted them as needed, whereas the Minnesota legislature did not anticipate bottlenecks and did not act to overcome them.

In Texas, where ERCOT's jurisdiction overlapped with that of the PUCT, the two organizations had a long history of cooperation and discourse with the state legislature. Over time, this collaboration between ERCOT and the PUCT resulted in the fine-tuning of Texas's renewable energy policies, contributing to the steady and rapid deployment of wind power technologies in Texas, as evidenced by the state's rapid growth in wind power capacity. Texas was able to collaborate and coordinate its spheres of influence and authority to adjust the rules. Puga and Lesser (2009) document its ability to do so by the reforms in 2005 that allowed for the state to overcome the "chicken-or-egg" problem: no further wind projects could be developed without transmission and no transmission projects could be constructed without further wind projects.[64] The legislature reinforced the state's top-down governance structure and modified the rules with Senate Bill 20, which provided ERCOT and the PUCT with additional authority to quickly move forward with planned renewable energy projects. This bill was heralded for its foresight by wind energy developers, transmission firms, and environmentalists.[65] It ultimately led to the ratepayer-funded CREZs in wind-rich regions that provided transmission capacity for 18,456 MWs of wind generation, sufficient to power 3.7 million homes on a hot day. Establishing an approach to modify the rules helped to avoid further delay as the costs of organizing the collective was borne by the key central institutions (PUCT and ERCOT), albeit with a significant public subsidy.

In contrast, Minnesota faced continued delays as its firms and the MPUC had to work with the multi-state MISO. Minnesota, therefore, faced a lengthy backlog of projects awaiting MISO's approval; attempts to adjust the rules failed to occur

64 Puga and Lesser (2009).

65 Zones to Encourage Wind (2006).

in a timely fashion and thus materially affected the situation. Rule change took time because the players needed to resolve conflict were not stable and self-contained within one state. Interference from FERC exacerbated the problem. On 25 August 2008, FERC approved a plan submitted by MISO to reform the management of the backlog by moving from a "first come, first serve" basis to prioritizing projects based on their likelihood of approval and adding a "fast track" option.[66] However, this change did not result in an immediate dent in the long queue. The entrance of FERC simply added to the rule confusion. Further outside interference took place in 2008, when the US Department of Energy released a report, 20% Wind Energy by 2030, that included a plan for transmission grid expansion in Minnesota that failed to align with the plan proposed by the parties in Minnesota. Rather than the rules being adjusted in a regular and predictable pattern among parties who were used to working with one another, as they were in Texas, the rules were adjusted in an erratic and ineffective way in Minnesota, as new players – stakeholders and other government bodies – entered the system.

5 Discussion

Governance and rules for the deployment of complex technologies such as wind energy do not emerge spontaneously; rather, according to Ostrom, they evolve incrementally through alterations and extensions of existing structures and rules.[67] Nearly all recurring situations involve an existing governance system and status quo rules that act as springboards for change, as newer governance systems and rules merge with those that preceded them. Through the two case studies presented above, we have demonstrated how the governance system and the set of rules for effective governance developed in Texas provided for the concentration of power in the hands of an exclusive set of public and private entities that were willing to coalesce around wind energy development. The result was a burgeoning wind energy industry that ultimately furnished public goods in the form of rural economic development and environmentally responsible energy system that would otherwise not be available. On the other hand, the Minnesotan experience with a more inclusive governance system faced significant challenges in adopting such rules. As a result, despite the many natural advantages of the state and desire of key actors to support the provision of a similar set of public goods, their efforts were underwhelming.

66 FERC (2008).
67 Ostrom (1990).

The evidence we have demonstrated advance Wilson's dichotomies of governance structures by integrating them with Ostrom's key insight on the role played by implicit or explicit rules. Organizations or public entities that are seeking solutions must not only consider the degree of hierarchy in decision making but also the processes that underlie how decisions are made.

Dichotomies of top-down or bottom-up governance schemes found in existing academic literature and public practice tend to simplify the spectrum of choices. The degree of hierarchy and rules that accompany governance systems depend upon an initiative's objectives. Hence, it is important to provide caveats and place boundary conditions on our findings and consider hybrids between the Texas and Minnesota ideal types.

5.1 Hybrid governance structures

Given the significant opportunities in Minnesota, the role of hybrid governance models are worth considering. Indeed, the question that scholars ought to explore is, to what extent is it feasible to merge new governance system and rules with the incumbent structure? While a complete reversal from an inclusive governance structure to a more exclusive and concentrated approach is unlikely, the academic literature has proposed hybrid systems that borrow from both and that may allow organizations in the state to meet their wind power potential and overcome public goods problems.[68] A hybrid approach to regional economic development, for example, might have a hub-and-spoke arrangement to provide structure from above and dense, decentralized networks below. We therefore consider some of the alternatives and assess the feasibility of these approaches to regional governance for renewable energy deployment. At least four different proposals have emerged for how to move from Minnesota's present bottom-up system for the governance of wind energy to a hybrid approach.[69]

First, there is the possibility of complete federal preemption. While this option presents the quickest reform it is not clear how effective it would be without a similar change to Ostrom's rules that underlie it. The model here is the way interstate natural gas pipelines have been implemented. In this domain, the federal government, under the 1938 Natural Gas Act, has had primary top-down authority for more than 60 years. It manages conflict and makes cost and benefit allocations unilaterally by providing interstate pipeline owners with certificates of convenience and necessity that give them eminent domain. This system has been

68 Marshall (1920); Powell and Grodal, (2005); Mesquita and Lazzarini (2008).
69 Klass and Wilson (2012); Osofsky and Wiseman (2012).

remarkably successful in allowing for the deployment of an advanced natural gas infrastructure in the United States. However, while this may prove beneficial to jurisdictions like Minnesota it may not be universally beneficial, especially to well-performing states like Texas where the various rules have evolved to support a thriving wind energy sector.

A related yet less ambitious option would be to focus on federal process preemption. This would modify the rules for conflict management and the rules for changing the rules while maintaining the authority of the state regulators and RTOs. Congress adopted this model in the 1996 Telecommunications Act, when it left siting authority for new telecommunication lines in the hands of local officials; however, those denied project approval were provided with explicit and user-friendly federal remedies, such as appealing local decisions to Federal courts and obtaining expedited rulings. This governance approach has been successful in bringing about the rapid deployment of a modern national telecommunications network in the United States, but may face challenges in implementation.

Rather than altering allocation and conflict management rules, another option would be to encourage state compacts that modify boundary rules and the rules for changing the rules. Such changes would mean top-down structures at the regional level via interstate compacts. Indeed, the 2005 amendments to the 1938 Natural Gas Law has authorized three or more contiguous states to create interstate compacts, subject to Congressional approval. The purpose was to centralize authority for approval of deployment of electricity technologies and infrastructure on which these technologies relied. Contiguous states, for instance, could set up a single electric transmission-siting authority within their jurisdiction to review, certify, and permit facilities that passed through US government owned properties. They could have uniform and central authority to permit electric transmission facilities within states subject to the compact. However, no states have so far banded together to try to take up this option.

A final approach would be to target the most contentious issue in wind energy deployment and establish a system within RTOs that better manage the rules for allocating costs and benefits. Recent innovations in such governance structures have focused on establishing a streamlined design for project evaluation, costing, and approval within an RTO. MISO's multi-value project (MVP) evaluation is such an initiative that goes beyond the historical approach to consider state and regional policy goals and the long-term benefits of deploying renewable energy. This plan has opened up additional transmission construction in MISO's jurisdiction that otherwise might not have been constructed, representing an important breakthrough in getting beyond the prior logjam that was slowing the deployment of wind energy. Nonetheless, the new cost allocation plan lacks clear rules for conflict management and rule change that would allow it to evolve and

sustain legal challenges. An opinion of the Seventh Circuit Court in Illinois has suggested that the attenuation of costs within the multi-value project program across different states and customers are not necessarily commensurate with benefit and that utilities are free to leave the RTO should they disagree with the cost allocation rules.[70] A cost-allocation rule, however innovative, that stands by itself without complementary rules cannot fully succeed when dealing with the barriers to the deployment of a complex technology.

5.2 Limitations

The evidence provided here highlights the experience of but two jurisdictions and their effort to deploy wind power in the US. The lessons gleaned are context specific and generalizations must be made cautiously. While Texas outperformed Minnesota it is not necessarily the case that top-down structures, where power and resources are concentrated, will be universally successful in addressing approaches that ultimately solve public goods problems. For instance, had the initial 1999 deregulatory legislation in Texas not included any mention of wind power generation and received further political insulation it is unlikely that efforts would have coalesced around its robust deployment.

Furthermore, governance settings that concentrate power in the hands of few and possess less democratic features may be more apt at mobilizing deployment, but not necessarily in the direction preferred by most, or in a way that fully addresses public good problems. Certainly, China's economic growth over the past four decades applying a top-down governance structure that has prioritized resources to industrialization and urbanization has come at a cost to the provision of public goods like the natural environmental. Therefore, while top-down governance approaches could bring efficiency in implementation, success in meeting expectations for the provision of public goods relies upon how such governance is applied.

6 Conclusion

In this article, we have focused on the importance of governance structures and rules that underlie their design for overcoming the collective problem that affects

70 Seventh Circuit (2009).

wind energy development. Our approach sheds an alternative yet overlooked lens upon a topic that has received growing attention. Relying on this approach has allowed us to assess a variety of options for inducing greater deployment of wind energy. We argue that without consideration of the appropriate governance systems that are backed by well-crafted boundary rules, allocation rules, conflict management rules, and rules for adjusting the rules, complex technologies such as wind energy are unlikely to achieve their full potential.[71] As we demonstrate, the lack of such governance and rules led Minnesota to lag behind Texas, despite the former's natural advantages.[72]

In Minnesota, compared with Texas, authority was weak, the boundaries for participation less clear, and the means for allocating the costs and benefits, managing conflict, and revising the rules not as developed, which meant that Minnesota was not up to the task of deploying wind energy technologies as quickly as Texas. Without such governance and rules, the transactions needed for a vibrant wind energy industry to advance in Minnesota did not reliably happen. Instead, Minnesota experienced delay and inaction. The state failed to fulfill the forecasts for wind power adoption and the resulting economic and environmental benefits.

Governance and rules apply to any form of collective activity, yet the functions they play must be better understood. In too many instances, efforts to deploy complex technologies and create regional economic development become enmeshed in institutional voids and fail to reach their potential because of the lack of effective governance. Our story is about concentration of power and authority in the hands of a few dominant public and private elites. They were empowered to coordinate their actions and induce cooperation by fiat and subsidy. We contrast this method to a bottom-up approach that relied more heavily on broad participation and an inclusive governance design where power was fragmented. Concentration of power and authority led to more wind energy in Texas than in Minnesota, but of course it also can lead to less benign collective goods. Future research should move in the direction of making it clearer when and under what conditions top-down authority can deliver collective goods in the public interest, when such authority can be abused, what checks can be put into place against such possible abuses, and when top-down authority should be used to overcome stalemate, resolve collective action problems, and bring about needed and essential economic and environmental progress.

71 Tallman et al. (2004).

72 Fremeth and Marcus (2011).

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