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Mobilizing smart grid experiments: Policy mobilities and urban energy governance

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Abstract
Cities across the US have been looking to urban experiments as a way to demonstrate potential pathways for carbon control, economic development, and resilience. On their own, these experiments are often small in scale and highly localized, embodying a piecemeal approach to urban development and climate governance. In this paper, I examine the relationship between urban experimentation and policy mobilities to understand how these projects have broader significance for climate governance and urban development. Drawing together empirical data from a multi-sited case study of smart grid experiments in Austin, Texas; Boulder, Colorado; and Chicago, Illinois, I show how governmental rationalities are mobilized, mutated, and transmitted in the processes of urban learning, extrospection, and consultation. While the imperative of cities to respond to climate change is ever more central to urban politics and governance, I find that the logics of experimentation are tied to specific governmental rationalities and norms of conduct that embed limited notions of citizen involvement and engagement in policy. The paper outlines how three elements of an Austin smart grid model – users as test-bed, test-bed as platform, and test-bed as epistemology – reinforce these logics and rationalities. The implications for urban climate and energy governance are outlined stressing three synergies between urban experiments and policy mobilities approaches.

Keywords: smart grid; urban governance; experimentation; policy mobilities; test-bed

1 Governing climate change in the experimental city

Cities have increasingly become central to governing climate change. Local governments have taken the task of addressing climate mitigation and adaptation in the face of inaction at state and federal levels (Bulkeley, 2010, 2015, Bulkeley & Betsill, 2005, 2013). International organizations, such as ICLEI and C40 Cities, share resources, policy ideas, and best practices linking cities across the globe and reposition them as central to governing the climate (Hughes, 2016; McGuirk, Dowling, & Bulkeley, 2014). Strategies as diverse as building codes and technology pilots for energy efficiency, carbon footprinting and urban food production, and a variety of urban infrastructure interventions have been proposed to help cities mitigate climate change and adapt to a climate-changed future. These new projects, programs, and policies, or "climate change experiments" (Bulkeley & Castán Broto, 2013b; Hoffmann, 2011), have become ever more central to the landscape of contemporary climate governance. A wealth of literature has considered how these climate change experiments position the city as an experimental space for testing low-carbon technologies and new ways of addressing climate change (Bulkeley & Castán Broto, 2013b, 2013a; Bulkeley, Castán Broto, & Edwards, 2014; Evans, 2011; Evans, Karvonen, & Raven, 2016). More than mere rhetoric, these urban experiments have increasingly gained salience as they facilitate urban development, knowledge production, and demonstrate new ways of making cities sustainable and economically appealing for high tech companies (Caprotti & Cowley, 2016; Evans, 2016; Karvonen, Evans, & van Heur, 2013). As urban experiments proliferate, there is a critical need to interrogate their impact on urban climate governance and policymaking more broadly. In particular, the mobilities of policy knowledge and models facilitated, adopted, and reconfigured in urban experiments demands attention.

This paper builds on the policy mobilities approach (McCann, 2011a; McCann & Ward, 2011; Temenos & McCann, 2013) to understand the changing landscape of urban climate and energy governance experimentation. Utilizing relational comparative case-study methods (Cook & Ward, 2012; McCann & Ward, 2012b; Ward, 2010) this paper analyzes how knowledge and models for a particular climate change experiment—urban smart grid projects—circulate between cities and influence urban governance. The policy mobilities approach understands policy as assemblage, or "sets of bundles of expertise, learning, and knowledge codified in one way or another" (Cook and Ward 2012, 779), which is produced and circulated with impacts not only for policy and policy making, but for more diffuse forms of governing through socio-material relations. Drawing from multiple forms of evidence (document review, in-depth interviews, observation), this paper analyzes three urban smart grid experiments *and* the networks that link them together (Peck & Theodore, 2010a, 2012). The data for this research was collected between August 2014 and May 2016, including 33 semi-structured interviews with public officials, engineers, and non-profit environmental advocates in Austin, Texas; Boulder, Colorado; and Oak Park, Illinois. During the course of this fieldwork I attended regulatory, city council, and community meetings, technology demonstrations, and industry conferences. Guided by methodological prescriptions of policy mobility scholars, I analyzed how "various 'local' and 'extra-local' urban actors—consultants, planners, politicians, and practitioners—have used comparison as a strategy to underscore the importance" of developing urban smart grid projects in a particular way (Cook and Ward 2012, 778).

The paper proceeds by briefly reviewing the literature on urban experimentation and policy mobilities. Then, I present the "Austin model" for urban smart grid development and analyze how it influenced the development of urban smart grid projects in Boulder and Oak Park. A confluence of forces impacted the development of each of these projects and associated policies, but the circulation of Austin's exceptional model became an anchoring example for broader emulation through a variety of policy channels. The paper highlights how the Austin test-bed model was mobilized and mutated, but also how the contingencies of each city shaped the import and localization/territorialization of the model. In the concluding section, I show three policy logics of these forms of experimentation—users as test-bed, test-bed as platform, and test-bed as epistemology—have important implications for urban climate governance.

2 Mobilizing experiments

The "policy assemblages, mobilities, and mutations" approach "is characterized by a concern for the actors, practices, and representations that affect the (re)production, adoption and travel of policies and best practice models across space and time" (Temenos & McCann, 2013, p. 345). Studies of policy mobilities investigate how "assemblages" of urban policy circulate and mutate via processes of inter-city learning and referencing (via conferences, formal partnerships, collaborations through non-governmental organizations, policy shopping, policy tourism, extrospection, and more) (McCann, 2011a; Temenos & McCann, 2012, 2013). This approach captures the multiple channels of influence, flows of knowledge, and power relations related to the development of urban policies and projects ranging from, for example, harm reduction, sustainability, and economic development and the corresponding spaces of safe injection sites, municipal planning offices, and waterfront redevelopments (Cook & Ward, 2012; McCann, 2008; Temenos & McCann, 2012).

Experimental urban projects and programs for responding to climate change have proliferated and emerged as key feature of contemporary climate governance (Bulkeley & Castán Broto, 2013a, 2013b; Bulkeley et al., 2014; Eadson, 2016; Haarstad, 2016; Rohracher & Späth, 2013). These urban experiments are loosely defined at the confluence of policy experimentation (building on political science and governance literatures), sociotechnical experiments (building on STS and innovation literatures), and living laboratories (a budding literature within urban studies) (Bulkeley & Castán Broto, 2013b, 2013a; Bulkeley et al., 2014). Experiments are often projects explicitly set up as "urban laboratories" (Karvonen and van Heur 2014) to foster learning and broader innovation, positioning particular places as leaders in the transition towards more sustainable and innovative cities. The literature on urban policy mobilities has provided critical analyses of these types of flows of knowledge (McCann, 2008, 2011a; J. D. Robinson, 2011; Temenos & Baker, 2015). The export of codified and standardized lessons, best practices, and guidelines for urban development derived from exemplary places have been widely critiqued for their "quick fix" approaches (Theodore & Peck, 2001), limited applicability to different urban contexts (Patel, Greyling, Parnell, & Pirie, 2015), and their historical development within particular relations of power (such as conforming to the norms and values of powerful development interests) (S. Moore, 2013). Despite the common concern for knowledge production and dissemination, the connections between urban experiments and the mobilization of particular urban policies has been underexplored.

Bringing the policy mobilities approach to the study of climate change experiments highlights three important areas for scholarship on urban energy and climate governance. First, both approaches highlight the need to move beyond institutional accounts of urban governance to one that understands governing more broadly as a process including a wider set of practices and actors. As city government agencies, mayors, local community groups, universities, and non-profit organizations have taken responsibility to act on climate change, there has been an important scalar shift in the governance of carbon and climate (Aylett, 2013; Bulkeley, 2010; Bulkeley & Betsill, 2005, 2013; Mcguirk, Dowling, Brennan, & Bulkeley, 2015; Rutland & Aylett, 2008). Instead of national or state level initiatives, work on multi-level governance of climate change has highlighted how city governments, and increasingly non-governmental actors, are central to climate mitigation and adaptation (Bulkeley & Betsill, 2005). From a policy mobilities approach, the spaces and actions outside of institutions place an important role in understanding the relationships between scales (McCann & Ward, 2013). McCann (2011a, p. 113) suggests the importance of studying the "processes, meanings, and contexts of a single research site, and the governmentality of certain microspaces within it, to investigate the mutually constitutive relationships, forces, and imaginaries that tie it to other scales." This is both methodologically and theoretically significant as it helps provide connections between scales of governance and for comparison between different cities (Peck & Theodore, 2012; Temenos & McCann, 2013). For example, the practice of making comparable itself is a way to mobilize particular knowledges, and in the process, normalize or stabilize through particular rationalities, logics and discourses, a way of seeing and acting in the world that legitimizes action and practice (Larner & Heron, 2002, 2005; McCann, 2011a). This paper operationalizes these ideas to analyze the construction of governmental rationalities (i.e. underlying logics governing subjects and space) and their circulation through normalizing or disciplining techniques, discourses, and practices (e.g. energy pricing schemes, discourses of choice, and promotion of resposinble energy use) (Bulkeley & Castán Broto, 2013b; Bulkeley et al., 2014).

Secondly, the focus on the geographies of knowledge production and expertise in both policy mobilities and urban experimentation approaches suggests that further work is needed on the emplacement of knowledge production and the channels of policy movement. Policy mobilities brings an explicit attention to the socio-spatial aspects of learning, inter-referencing, mutation, and emulation. In general, the mobilities approach adds the dimension of knowledge transfer, not just knowledge generation, through analyses of processes of learning, adaptation, and mutation (Affolderbach & Schulz, 2016). It also brings a critical relational perspective on inter-urban referencing and learning in the context of urban infrastructural change and low-carbon urbanism. This paper analyzes circuits of policy knowledge related to smart grid experiments that are composed of epistemic communities who transfer, emplace, and utilize certain forms of knowledge as part of their practice (McCann, 2008, 2011a). This means institutional legacies, ideologies, and frames of reference, and issues such as political-economic restructuring, are vitally important to policy movement and adoption, and often means that the “easiest, fastest, and most politically feasible transfers” are sought (McCann, 2011a, p. 109; Peck & Theodore, 2010a, 2015).

Lastly, there is a need to focus on the materiality of particular policy assemblages. Urban experiments are more that discourses, but manifestations of policy in urban built environments. While policy mobilities advance the idea of policy assemblages, which “indicates a perspective focused on the detailed qualitative and ethnographic study of the practice of assembling some form of coherence, such as a policy... [or] a scale like the ‘local’” (McCann & Ward, 2012b, 2013, p. 8), it also considers the materiality of policy including the objects and things that are part of policymaking and implementation (Lovell, 2016). Thus, this paper analyzes the assemblages of different actors, institutions, capacities, forms of expertise, models, technologies, techniques that come to configure a particular form of urban (energy) governance (McCann, 2011b; McCann & Ward, 2011, 2012a; McGuirk, Bulkeley, & Dowling, 2016). This is important as concerns over low-carbon transitions are conceptualized as much broader processes of re-ordering and reconfiguring urban infrastructures and practices of everyday life (J. Rutherford & Coutard, 2014; J. Rutherford & Jaglin, 2015).

The next section unpacks these analytical categories derived from the synergy of policy mobilities and urban experimentation literatures to understand the Austin test-bed model of smart grid experimentation, and in the following sections, how this model has been selectively mobilized and circulated with (differentiated) material impacts on smart grid experiments in Oak Park and Boulder.

3 Assembling an exemplar: Austin’s test-bed model

Austin, Texas, a city known for its “creative” population, has been a leader in the growing clean tech and green energy economy (Long, 2009). The City has a record of environmental leadership with one of the first green building standards and climate action plans in the US (S. A. Moore, 2007). Austin Energy, the City’s municipal utility, is highly progressive, often claimed to be one of the leading “green” utilities in the country. Austin Energy began developing a smart grid in the early 2000s, well before the Federal Energy Independence and Security Act of 2007 defined the smart grid as a national goal in the US. Former CIO of Austin Energy, Andres Carvallo, began discussions about an “advanced” smart grid that would expand beyond the contemporary focus on metering infrastructure around 2003. This vision included private electric vehicles, distributed energy resources, and smart appliances (Carvallo & Cooper, 2015, pp. 83–84). By incorporating a broader vision and facilitating Austin's own smart grid infrastructure and network development, Austin Energy was able to help initiate an experimental smart grid project and gain $10 million in funding from the US Department of Energy's (DOE) Smart Grid Demonstration Program (SGDP) in 2010.

The urban smart grid experiment, known locally as the Pecan Street Project (PSP), was developed as an "urban living laboratory" to demonstrate and learn from various sociotechnical interventions fulfilling, in part, Austin Energy's advanced smart grid vision (Levenda, 2017). Fueled by local political leaders, a private-public partnership, and the DOE SGDP, the Pecan Street Project was promoted as "the most innovative neighborhood" in the United States providing the "world's largest database on customer energy use" (Frangoul, 2015). By engaging environmentally concerned and/or technologically savvy residents of Austin's Mueller neighborhood (and beyond) with incentives to adopt electric vehicles, solar panels, home energy management systems (HEMS) and numerous other smart technologies, Pecan Street—the organization which runs the PSP and conducts other research on smart technologies—was able to get considerable participation and access to collect fine-grained data on energy usage and the performance of different smart technologies. This enabled a form of testing that positioned the PSP as a smart grid "test-bed" entailing three interrelated rationalities: *users as test-bed, test-bed as platform*, and *test-bed as epistemology*.

Users as Test-Bed

The Pecan Street Project was developed by a large group of researchers, political leaders, and utility executives on a volunteer basis. The notion of a "testbed" became central to its appeal to technology companies and Austin Energy because of the potential for testing innovations in both smart home applications and utility business models. As one of Pecan Street's data scientists explains:

> "We have a unique opportunity that if someone approaches us, and this happens all the time, these incubator companies will come up to us and say, 'I have this product, I need to get it field tested.' We have three hundred volunteers in this neighborhood who will let us install it in their house. And, I would say, more than half of them want it in there, and the other half you usually have to convince a little bit with a

> financial incentive [...] but more than half will jump to become a test-bed. So I would wholeheartedly agree with that synopsis of Mueller [as a living laboratory]. It's a really great test-bed of people that are early-adopters. (Pecan Street representative, Interview, October 2015)

Users, or "early-adopters," are an integral part of the definition of the test-bed model, serving as participants in studies and demonstrations of smart technologies. Similar to volunteered forms of geographic data or data collected via surveillance technologies (Goodchild, 2007; Lyon, 2002), in the PSP, citizens actions become important elements of sensing, monitoring, and knowledge production. For example, data has been collected on particular responses to time-of-use pricing pilots for electricity, charging patterns for electric vehicles, usage behaviors for appliances, and overall consumption habits for both energy and water (Fares & Webber, 2015; Harris & Webber, 2014; Rhodes et al., 2014; Rhodes, Gorman, Upshaw, & Webber, 2015; Upshaw, Rhodes, & Webber, 2015). These data inform the "success" of certain smart grid interventions. These modes of testing and experimentation offer Austin Energy and technology companies an opportunity to test different products and business models in "real-world" settings.

"Users as test-bed" also implies the production of a user subjectivity. The production of "data-subjects" has been proposed to describe the characterization and attribution of particular characteristics, and the production of subjectivities, tied to the immense amount and variety of data about people and their behavior (Lemov, 2016; Lyon, 2002). More provocatively, Lemov (2016) claims that "big data is people," describing how much of the big data world is actually personal data tied to our most mundane actions. Importantly, however, this action of data collection and description is also a process of producing knowledge that gets bundled into broader policy assemblages carrying the rationalities, techniques, and subjects that together constitute specific governmentalities (Dean, 2010).

Test-Bed as Platform

The demands of the PSP smart grid experiment required physical infrastructure that was suitable for advanced smart grid applications, including the development of Austin Energy's smart grid platform (Carvallo and Cooper 2015), new green-built homes in the redeveloped Mueller Neighborhood, and Pecan Street's own information and communications network. The Mueller Neighborhood is a public-private partnership between the City of Austin and a private developer, lauded as a new urbanist, LEED Certified project (Ross, 2013). Mueller was as an ideal location for the smart grid experiment because it was a "clean slate" for infrastructure development and the new community populating the development were easy to recruit as research participants when they moved in. As one of the engineering studies based on the project describes it: "Mueller was selected as the *test-bed* for this research project because of its location, the relative uniformity of new homes, and the developer's requirement to build energy efficient homes and buildings" (Rhodes et al., 2014: 463).

More broadly, the city was described as an entrepreneurial platform which could utilize Pecan Street to attract high-tech capital. In Austin, the Chamber of Commerce has a specific strategy to attract startups with potential to receive venture capital for growing their companies. The Austin Chamber of Commerce boasts Austin Energy's commitment to renewable power, the Pecan Street's research potential, and the Texas electricity grid operator's (ERCOT) willingness to integrate clean energy companies into their network as drawing points for energy companies. Supportive of these efforts is the University of Texas (UT) Austin Technology Incubator, the Clean TX cluster development organization, and the significant clean tech industry located in Austin. But the city more largely is thought of as an experimental space for these companies, nurtured by the various resources the city offers to creative employees and "talent". As one Chamber of Commerce representative explained:

> There are a lot of software engineers here, there are a lot of people who know how to analyze data. Austin is a good fit for those companies. This is a natural place for them to be. [...] Austin is very good at software, and there is an incredible quality of life. You've got the Pecan Street Project where companies can test their sensors. You've got a very progressive utility, who is more or less open to adopting new things and trying new things, and they're changing their generation mix to look very green. (Chamber of Commerce Representative, Interview, November 2015)

Austin's position as a quirky and creative city with a knowledge and software industry is pitched in tandem with its move towards environmentalism and clean tech. The city is positioned as a platform that companies can use to hire software experts and generate new products while enjoying cultural amenities like live-music venues and historic barbecue joints. As McLean, Bulkeley, and Crang (2015, p. 15) describe it, "the Pecan Street Project (in line with many smart grid projects) acts as a new form of Harvey's urban entrepreneurialism, with the city experimenting in ways to attract investment through research-led public–private partnerships." As the new urban politics is cast in terms of carbon control (Jonas, Gibbs, & While, 2011; While, Jonas, & Gibbs, 2010), a form of smart and green entrepreneurialism promulgates a revised version of the 'sustainability fix' (Long, 2016; Temenos & McCann, 2012; While, Jonas, & Gibbs, 2004) that is captured *and* circulated in the idea of the urban test-bed.

Test-bed as Epistemology

Test-bed as epistemology suggests that test-beds are performative, enacting particular types of urban futures, and they are able to produce transferrable models of urban management (Halpern, LeCavalier, Calvillo, & Pietsch, 2013). In the context of the PSP, demonstration and precedent-setting was key to its formulation and promotion. As the Environmental Defense Fund (2014) describes: "The Mueller neighborhood, the locus of Pecan Street, is a laboratory of ideas and technologies that will move the nation's $1.3 trillion electricity market toward a future in which energy is cheap, abundant and clean. If Pecan Street is successful, every neighborhood in America will look like it in 20 years." The discourse of the "living laboratory" circulates with the Austin model suggesting it focuses on openness, learning, and knowledge production. Data collected through intelligent infrastructures in the PSP is made available to universities and technology companies for analysis. As one Pecan Street representative explained, "My job is to make sure we can get as much data as possible to give to people, so they can utilize it and learn from it" (Pecan Street representative, Interview, October 2015). Here, the test-bed is an epistemological frame, a "theatre of proof" (Simakova, 2010; Smith, 2009) for sociotechnical configurations of smart technologies in urban space. This mirrors contemporary practices of the product "launch" in high-tech industries and public demonstrations of science technology (Laurent, 2011; Marres, 2011; Marres & Lezaun, 2011; Rosental, 2014) where an organization "offers a 'novel' product to 'the market'" (Simakova 2010: 549). The PSP is not only a place of knowledge production, but a mediator between possible sociotechnical futures and the public.

4 Have test-bed, will travel?

How were these logics of the Austin model integrated, emulated, adopted, and/or transformed in travels to other cities? My analysis shows that these three interrelating elements of the test-bed model were central: (1) *user as test-bed*, including logics and processes for engaging customers/citizens; (2) *test-bed as platform,* a way to utilize experiments as opportunities for economic investment and technological testing, often with ideas for particular technologies, such as particular smart meters, software packages, and different PV technologies, and techno-utopian visions of what these technologies allow (vast renewable integration, carbon offsetting, etc.); (3) *test-bed as epistemology,* a way to frame the experiments as reproducible forms of urban management for carbon control. I illustrate these points through the cases of Oak Park and Boulder.

Seductive visions: Oak Park's SmartCityUSA project

In 2014, press releases from the Chicago suburb of Oak Park, Illinois, explained how the Village was working with Austin's Pecan Street on a "project to demonstrate the potential cost savings of electric smart grid technologies" and made progress on the project through "hiring an organization credited with creating the national model for smart grid project planning, implementation, and management" (Village of Oak Park, 2014b). The Village Manager noted that:

> Smart grid technology is new territory for communities such as ours, but its promise for energy savings and efficiency is real. Oak Park already has made great strides toward setting up a demonstration project. With Pecan Street's help, we can begin the journey from an idea to a working model." (Village of Oak Park, 2014b)

With rapid development of smart grid technologies, Oak Park was looking for models to implement smart grid solutions. Oak Park's officials worked with Pecan Street to enable the quick implementation of an "off-the-shelf" policy model. The expertise of an organization like Pecan Street, as the Village Manager explained to me, is "to really give us sort of the playlist of how we can do smart city. [...] they have done and exceptional job and delivered to the Village really the kind of project ready to go" (Interview, October 2015). While Oak Park had participated in a smart meter pilot program in 2010 initiated by the incumbent investor-owned utility, ComEd, but didn't see any customer-side benefits (Village Manager, Interview, October 2015). As Oak Park's sustainability director described it at the 2013 summer meeting of the Mayors Innovation Project:

> The Village of Oak Park kept putting itself out there as a test-bed, we wanted to bring some of these new technologies to Oak Park and we kept inviting new companies and utilities to try their projects here in Oak Park, and someone finally took us up on it.

This outward looking strategy that Oak Park deployed encapsulates two elements of Austin's model – *users as test-bed*, and *test-bed as platform*. Yet, as the quote describes above, these logics were also "arrived-at" locally (Robinson, 2015).

As Oak Park's project idea progressed, they began to seek international support and collaboration. The Illinois Citizen's Utility Board and other groups had facilitated contact of Oak Park officials with the Korean Smart Grid Institute who had developed an internationally recognized smart grid test-bed on Jeju Island. The Jeju Island project was implemented by the South Korean state-run transmission operator, Korea Electric Power Corporation (KEPCO), and has positioned South Korea as a leader in smart grid technology development (Kanellos, 2010; Kaye, 2011; Tweed, 2011; Woods, 2014). The State of Illinois and South Korea established a partnership in 2010 to facilitate the development and testing of smart grid models, with South Korea wanting to take the "island model to the city" (Woods, 2014). After several meetings with delegations from the Korean Smart Grid Institute, Oak Park was eventually chosen, out of 288 surveyed communities, as the place to implement the project. Together with favorable state funding and state legislation, Oak Park's project was being set up as a community demonstration project that could "showcase the technological, financial, and policy investments communities can make right now" (Hamilton, Chae, Summy, Cutler, & Kolata, 2011, p. 37).

In 2013, Oak Park hosted the Mayors Innovation Project's summer meeting, which brought together city officials from around the Midwest, consultants, and non-profit organizations to discuss early childhood education, promoting walkable urbanism, promoting diverse communities, and benefiting from smart meters and grids. Oak Park's Sustainability Director discussed the SmartCityUSA project alongside executives of Pecan Street, and the Mayor of Tallahassee, Florida. Oak Park's plan lacked specificity for project implementation, the Korean Smart Grid Institute stopped actively participating in Oak Park's plans and did not continue to fund the project, and in August 2014, the Village Board had determined they needed outside support for successful implementation. As a result of a request for proposals, Pecan Street was brought on board to work with Oak Park to develop and implement the project, taking their experience in Austin as an example for emulation. In March of 2015, Pecan Street presented a plan to Oak Park's board which explained the various parts of the SmartCityUSA project. Pecan Street depicted SmartCityUSA as the "creation of a nationally known research test-bed [...] basically setting up a framework for doing all the smart grid research programs you want " (Village of Oak Park, 2015).

The SmartCityUSA project was positioned as a way to bring ground-breaking research and testing to Oak Park.

The Village officials identified the benefits of the project through an environmental lens. The Village President explained:

> Having the demonstrated knowledge, experience and expertise in getting smart grid projects up and running is a major step toward achieving our goal of keeping Oak Park a leader in environmental initiatives. [...] With Pecan Street's assistance, we can move closer to implementing a project that will underscore the Village's commitment to environmental sustainability. (Village of Oak Park, 2014a)

However, the impacts of the project beyond contribution to local goals for sustainability were predicated around assumed changes to consumer behavior. As the Village Manager explained, "Oak Park would like to create a program for homeowners and renters to participate so we can analyze the utilization of home energy management systems, solar panels, and battery backup systems to determine the viability of that type of program within an urban community, how technologies can integrate into the grid, and how we can really make homeowners, I guess, our new favorite word is prosumers, like producers and consumers of electricity" (Interview, October 2015). While the logic of providing the ability of citizens to be more active consumers, Oak Park found distributed energy, storage, and smart technologies to be essential technological components for enabling a "smarter" energy consumer and an environmentally-minded citizen. In this respect, the governance of carbon could be enacted through the practices of Oak Park's citizens, with the local government facilitating more environmentally friendly energy conduct.

Additionally, the Village Manager saw the role of cities as an important intermediary to bring "community awareness" of smart grid solutions to environmental problems. In Oak Park, the Village Manager explained that the SmartCityUSA project was explicitly about vision the city projected and opportunities for intercity learning:

> I think it might be more about helping other cities understand that there is municipal role, possibly, in facilitating this. I have worked in Iowa, Nebraska, and Illinois, and every state has different, both Nebraska and Iowa were both public power systems, and each municipality has a different perspective on what roles and responsibilities they play in their relationship to the electrical supplier, and so I think a demonstration project, if we can help municipalities understand what the

> benefits are of being a facilitator between the resident as an individual and the public power supplier or the private power supplier to facilitate more community based goals, it's an important role for a municipality to play. (Interview, October 2015)

Oak Park saw the benefits of the SmartCityUSA project not just for their own citizens, but for a wider policy audience of municipalities across the country. This illustrates a point which McCann (2013) describes as policy boosterism and extrospection. Policy boosterism plays an important role in the mobilization of polices, models, visions, and knowledge. Similarly, extrospection refers to "the various ways in which policy actors in the city are tied to a range of national and global policymaking communities and institutions as well as to various cities elsewhere as they teach and/or learn about innovative policies" (McCann, 2013, p. 7). The case of Oak Park—although only a small municipality of only 52,000 people and overshadowed in many ways by the adjacent City of Chicago—shows how cities engage in these practices of policy boosterism and extrospection. It is also important to note that the SmartCityUSA project has not yet been implemented.

Take the power back? Boulder's SmartGridCity and municipalization

The City of Boulder has a long history of environmental activism and energy action. From early green building ordinances to a first-of-its-kind carbon tax, Boulder has often been at the "vanguard" of municipal climate action. When the incumbent, investor-owned electric utility, Xcel Energy, proposed a pilot project for the smart grid, the City utilized the opportunity to bargain for increased renewables, customer-oriented technology, and no extra costs to ratepayers. Xcel described the SmartGridCity project as a technology pilot "to explore smart-grid tools in a real-world setting" (XcelEnergy, 2016). Boulder's city officials were at first quite enthusiastic about the project's potential to boost the local research-centered economy, with a diverse set of industries tied to aerospace, bioscience, clean-tech, IT, and outdoor recreation, includes companies (Boulder Economic Council, 2016). Building on the SmartGridCity project, city officials worked with IBM's Smarter Cities Challenge to help meet goals laid out in the City's Climate Action Plan (CAP), but upon consultation with various groups, IBM's team noted disagreement about what benefits the smart grid could offer, and friction between the utility, the City, and its citizens (IBM, 2011).

Three elements are important to the context of Boulder's smart grid experiment and municipalization efforts. Firstly, spatially explicit, legal and political economic considerations of infrastructure ownership and decision-making meant the City had little influence over energy supply in the existing configurations of energy governance. When Xcel brought online a new coal-fired power plant in 2010, the City of Boulder's carbon emissions achievements were negated. As Boulder's Sustainability Manager explained to me, "that's when we went to our council and said we really ought to strongly consider municipalization at this point. (Interview, November 2015). Secondly, the SmartGridCity project did not produce public benefits visible to Boulder's residents or city officials, and therefore the private, investor-owned utility failed to generate public trust and legitimacy. While Xcel tried to show the benefits of the newly installed smart metering and fiber optic infrastructure through demonstration projects on the University of Colorado-Boulder's campus and at the Chancellor's house, the City had a much different vision (Boulder Sustainability Manager, Interview, November 2015). Lastly, the City developed an extrospective gaze towards existing municipal utilities, such as Austin Energy, to provide lessons, best practices, and examples for their own municipal utility and potential smart grid and smart city projects that could help the City meet its climate goals.

In the City's attempts to create a customer-facing smart grid and reduce carbon emissions, they began building the Community Power Partnership (CPP)—a program developed in partnership Austin's Pecan Street that installed smart meters in 48 homes and 14 businesses in Boulder. The City described the project as a way to harness the power of data:

> We all know that information is power. [...] To this end, the City of Boulder, in partnership with the Pecan Street Research Institute of Austin, Texas, is collaborating with residents [...] as well as local businesses on a research pilot project [...] to understand how electricity is being used in Boulder [...]; and to understand what tools and information homeowners, renters and businesses need to better manage their resource use and contribute to innovative community solutions.

Boulder's program aimed to implement a replica of the Austin-based project by using the same smart meter and user interface technology and importing Austin Energy's expertise. As Boulder's Sustainability Director explained:

> We had been in contact with them to try to understand how Pecan Street functions as an actual smart grid project and [ask] could we apply some of those learnings as

> we were negotiating with Xcel early on. We started communicating with them early on, and then, our director, came from Austin. [Boulder's Director of Energy Strategy and Electricity Utility Development] came from Austin Energy. And so, she is good colleagues with those guys. As we were talking about where we needed to go next, she I think saw, or I think [Pecan Street's President and CEO] reached out to us and said, 'Hey maybe we should talk about trying to do something and maybe we can help.' (Interview, November 2015)

Through these unofficial channels, Boulder imported "learnings" from the Austin experience. The focus on *users as test-bed* was thought to convey a type of mobile model (*test-bed as epistemology*) for engaging citizens in the smart grid. Given the context of Austin's municipal utility, and the strategic intermediary role that Pecan Street has played in community involvement and technological testing, the knowledge generated in the Austin context was thought to be transferable to Boulder. Professional connections, in the way of the new hire and subsequent consultations with Pecan Street, were able to facilitate this movement of policy models and knowledge.

The CPP claimed to "empower" consumers to reduce their electricity consumption through access to information. But at the same time, the ingrained practices that create energy demand are difficult to change, and the City had yet to identify types of services that residents needed. As Boulder's Environmental Action Manager explained:

> What kind of services do people want? Unless we start now trying to figure out what people want, on day one of the utility, we won't know. [...] We want to find out what's useful and what isn't before we end up investing $50 million or whatever Xcel invested in SmartGridCity. If it doesn't help people, then it's not a good investment (Meltzer, 2014).

While the CPP did not conclusively help consumers in a direct way, the availability of real-time information, aided by the model and consultancy of Pecan Street, helped address some of Boulder's smart grid concerns over the lack of customer-facing technologies. While the CPP included elements shared a similar discourse, problem framing, and forms of civic engagement, including looking for community 'ambassadors' to advocate for participation in smart grid experiments, it did not provide the insights the City hoped it would for planning their municipal utility. As the Sustainability Manager (Interview, November 2015) explained regarding the smart grid pilot, "they have their data, but what is it really telling us? And that's what we were looking for [Pecan Street] to kind of dissect for us, but without the ability to contrast that to some other neighborhoods, and get that information, it wasn't really helpful." The small-scale experiment was successful for the few households that participated, but it was too limited by the lack of cooperation with the incumbent utility to produce any comparative insights or broader implementation.

Boulder illustrates how the *users as test-bed* and the *test-bed as epistemology* logics encountered tensions in territorializing the Austin model. The case of Boulder highlights the limitations of inter-city learning and referencing of policies in the local context and power relations that shape the efficacy of policy transfer and adoption, especially under pressures of time and financing (Peck & Theodore, 2010b). While tensions with the incumbent utility encouraged the City to look for model municipal utilities and smart grid projects, the Austin model seemed to be a "quick-fix" for addressing smart grid failures locally.

Whereas the Austin model was formulated around three interconnected logics, some elements were less pronounced in different cases. This is indicative of the selective mobilization of policy logics and rationalities in different urban contexts. In the case of Oak Park, the element of test-bed as epistemology was not deemed as important for "greasing the tracks" of policy movement because local officials were not as interested in the impacts of experimentation for *informing future policy*; they were already convinced and were looking for the fastest and most feasible route to bring a smart grid experiment to the Village. In the case of Boulder, the element of test-bed as platform was deemed not as important due to the pronounced role of knowledge production for the project partners, including the US Department of Energy. In both cases, however, users as test-bed were central elements because the interventions of the smart grid almost always assume some sort of consumer behavior change. This is problematic because smart grid interventions have questionable impacts on consumption habits and behavior; however, it is indicative of the future trends in the big-data-driven policy world where users are essential elements in data collection and production.

5 Learning, experimentation, and urban governance

In this paper, I have demonstrated how three logics of an exemplary model for smart grid experiments were produced and circulated. These experiments shape and were shaped by relational aspects of knowledge of policy models: practices of inter-city referencing, the work of "traveling technocrats," and the creation of best practices. The case studies presented here support a synthesis between urban experimentation and policy mobilities, as discussed earlier, suggesting three important dimensions for future analysis of urban climate and energy governance.

First, practices of governing are diffused throughout society (Li, 2007; Rose & Miller, 1992; S. Rutherford, 2007). In the cases described above, a dominant perspective of energy governance is linked to individual choice and behavior, which suggests the circulating policy logic of *users as test-bed* plays an important role in how urban energy governance is configured. In their analyses of urban sustainability programs, Temenos and McCann (2012, 1391) describe this process as "the 'education of attention' through the practical training of a wide range of residents." In Oak Park, the Village Manager explained that the SmartCityUSA project was interested in data acquisition because they wanted to understand how to change behavior: "I think it's the connection between what energy utilization looks like when people don't have information about it, in terms of pricing, and if you give people information about pricing, will people change their behavior (Interview, October 2015). In Boulder's project, the City encountered limitations to smart grid programs and policies, ultimately finding that the main benefit wasn't behavior change, but renewable integration to offset "unsustainable practices." But, even then, the excitement around the possibility of entrepreneurial activity for customer-facing apps and smart grid technologies enticed a similar governmental logic of behavior change, just better suited to the "21st century, active consumer."

Secondly, the focus on knowledge production and mobilization is best articulated in the policy logic of *test-bed as epistemology* and *test-bed as platform*. This offers insight into how governance experiments are constructed and maintained relationally across space by the flows and circulations of knowledge and expertise, of models and notions of best practice, and of norms and conventions, but also how experiments are centers of knowledge creation and mobilization. In other words, it is essential to connect the "work" of climate change experimentation with the "work" of constructing and maintaining these spaces through networks of policy knowledge, models, and expertise. Both Boulder and Oak Park's projects had been constructed in relation to the Austin exemplar. In the case of Oak Park, Pecan Street served as a direct consultant and project manager for the smart grid experiment offering "four years of lessons of failures from Austin." In Boulder, Pecan Street became an important part of their Community Power Partnership to reconfigure the urban smart grid to make it more palatable for Boulder's citizens after the relative failure of Xcel's SmartGridCity project. As Pecan Street helped circulate their "model" project, they did so based on the presumption of reproducibility and performativity. As cities seek to intervene in energy systems for climate mitigation and adaptation, the role of experiments and the lessons learned from their perceived success or failure will play an important role in policy implementation and adoption.

Lastly, I suggest that the synthesis between experimentation and mobilities emphasizes a need for analyzing materiality. The infrastructures, technologies, and artifacts of smart grid experiments constitute, in part, the material fabric of the city, facilitating the flows of electricity into, across, and between cities, enabling the everyday activities of lighting, cooling, heating, computing, etc. Here, *test-bed as platform* implies that city becomes a space for experimentation, embedded with the infrastructures for analyzing the success of sociotechnical changes. In Oak Park, the installation of smart meters and smart substations allowed for the incumbent utility to create an "innovation corridor" placing Oak Park at its center. While these infrastructural changes did not represent a part of the SmartCityUSA project, they created the conditions under which a smart grid experiment could be facilitated by providing the necessary background infrastructure. The case of Boulder, similarly, shows how the reconfiguration of the electric grid to make it "smart" was catered towards the incumbent utilities needs and desires. While, like in each case examined here, the infrastructure provided a platform for possible smart grid applications to help the cities meet their goals (for carbon reduction or reducing peak demand), the actual implementation of the projects was shaped largely by existing power relations, institutional and regulatory models, and societal norms. In many ways, the city itself becomes an object of improvement as it becomes measured, known, and calculated through smart grid infrastructures (Bulkeley, McGuirk, and Dowling 2016). The possible sociotechnical changes offered by smart grid experiments in these cities are shaped by the infrastructures in place and, critically, by who has control and access to those infrastructures.

Highlighting the context of different smart grid experiments and the travels of an exemplary model shows how governmental logics are mobilized in different settings. The process of governing is structured by the material environment's obduracy, the dynamics and needs of everyday experiences, and the cultural values and beliefs that support particular sociotechnical visions. Through examination of urban smart grid experiments in three US cities, this paper has highlighted the relational nature and the differentiated and selective territorialization of policy models and knowledge.

Future scholarship at the intersection of policy mobilities and urban experimentation would benefit from further case studies exploring the three synergies I discussed: circulating governmentalities, geographies of knowledge production and expertise, and the materiality of policy experimentation. Yet, there is considerable room for advancing this scholarship through relational analyses of the scales and spaces of flows of policy models and knowledge, and the power relations shaping these flows; through a focus on expert communities and networks (cf. Larner & Heron 2002, 2005) using embedded approaches; and through mapping out the contested terrains of circulating policy knowledge where non-expert communities share knowledge and models to actively promote low-carbon transitions through more grassroots efforts. Here questions relating to control and governance points to the need for further empirical research with siginicant opportunities to advance our understandings of the different spaces of policy knowledge production and cirulation, the subjects of this circulation, and the differential impacts of mobile policies.

References

Affolderbach, J., & Schulz, C. (2016). Mobile transitions: Exploring synergies for urban sustainability research. *Urban Studies*, *53*(9), 1942–1957.

Aylett, A. (2013). Networked Urban Climate Governance: Neighborhood-Scale Residential Solar Energy Systems and the Example of Solarize Portland. *Environment and Planning C: Government and Policy*, *31*(5), 858–875.

Boulder Economic Council. (2016). *Boulder Market Profile: April 2016*. Boulder, CO: Boulder Economc Council. Retrieved from http://bouldereconomiccouncil.org/bec_publications/market-profile-april-2016/

Bulkeley, H. (2010). Cities and the Governing of Climate Change. *Annual Review of Environment and Resources*, *35*(1), 229–253.

Bulkeley, H. (2015). Can cities realise their climate potential? Reflections on COP21 Paris and beyond. *Local Environment*, *20*(11), 1405–1409.

Bulkeley, H., & Betsill, M. (2005). Rethinking Sustainable Cities: Multilevel Governance and the "Urban" Politics of Climate Change. *Environmental Politics*, *14*(1), 42–63.

Bulkeley, H., & Betsill, M. M. (2013). Revisiting the urban politics of climate change. *Environmental Politics*, *22*(1), 136–154.

Bulkeley, H., & Castán Broto, V. (2013a). A survey of urban climate change experiments in 100 cities, *23*, 92–102.

Bulkeley, H., & Castán Broto, V. (2013b). Government by experiment? Global cities and the governing of climate change. *Transactions of the Institute of British Geographers*, *38*(3), 361–375.

Bulkeley, H., Castán Broto, V., & Edwards, G. A. S. (2014). *An Urban Politics of Climate Change: Experimentation and the Governing of Socio-Technical Transitions*. Routledge.

Bulkeley, H., McGuirk, P. M., & Dowling, R. (2016). Making a smart city for the smart grid? The urban material politics of actualising smart electricity networks. *Environment and Planning A*.

Bulkeley, H., Powells, G., & Bell, S. (2016). Smart grids and the constitution of solar electricity conduct. *Environment and Planning A*, *48*(1), 7–23.

Caprotti, F., & Cowley, R. (2016). Interrogating urban experiments. *Urban Geography*, 1–10.

Carvallo, A., & Cooper, J. (2015). *The Advanced Smart Grid: Edge Power Driving Sustainability, Second Edition*. Artech House.

Cook, I. R., & Ward, K. (2012). Relational Comparisons: The Assembling of Cleveland's Waterfront Plan. *Urban Geography*, *33*(6), 774–795.

Dean, M. (2010). *Governmentality: Power and Rule in Modern Society*. SAGE Publications.

Eadson, W. (2016). State enrolment and energy-carbon transitions: Syndromic experimentation and atomisation in England. *Environment and Planning C: Government and Policy*,.

Evans, J. P. (2011). Resilience, ecology and adaptation in the experimental city. *Transactions of the Institute of British Geographers*, *36*(2), 223–237.

Evans, James, Karvonen, A., & Raven, R. (2016). *The Experimental City*. Routledge.

Evans, Joshua. (2016). Trials and Tribulations: Problematizing the City through/as Urban Experimentation. *Geography Compass*, *10*(10), 429–443.

Fares, R. L., & Webber, M. E. (2015). Combining a dynamic battery model with high-resolution smart grid data to assess microgrid islanding lifetime. *Applied Energy*, *137*, 482–489.

Frangoul, A. (2015). Pecan Street Inc. | Is This the World's Most Innovative Neighborhood? Retrieved January 30, 2016, from http://www.pecanstreet.org/2015/03/is-this-the-worlds-most-innovative-neighborhood/

Goodchild, M. F. (2007). Citizens as sensors: the world of volunteered geography. *GeoJournal*, *69*(4), 211–221.

Haarstad, H. (2016). Where are urban energy transitions governed? Conceptualizing the complex governance arrangements for low-carbon mobility in Europe. *Cities*, *54*, 4–10.

Halpern, O., LeCavalier, J., Calvillo, N., & Pietsch, W. (2013). Test-Bed Urbanism. *Public Culture*, *25*(2 70), 272–306.\

Hamilton, B., Chae, Y. J., Summy, M., Cutler, J., & Kolata, D. (2011). Illinois and South Korea: A Model Partnership for Smart Grid Collaboration. *IEEE Power and Energy Magazine*, *9*(1), 1–1.

Harris, C. B., & Webber, M. E. (2014). An empirically-validated methodology to simulate electricity demand for electric vehicle charging. *Applied Energy*, *126*, 172–181.

Hoffmann, M. J. (2011). *Climate Governance at the Crossroads: Experimenting with a Global Response after Kyoto*. Oxford University Press.

Hughes, S. (2016). The Politics of Urban Climate Change Policy Toward a Research Agenda. *Urban Affairs Review*, 1078087416649756.

IBM. (2011). *IBM's Smarter Cities Challenge Boulder Report*. Retrieved from https://www-static.bouldercolorado.gov/docs/IBM_SmrtCity_SGC_Report-1-201306171551.pdf
Jonas, A. E. G., Gibbs, D., & While, A. (2011). The New Urban Politics as a Politics of Carbon Control. *Urban Studies*, *48*(12), 2537–2554.
Kanellos, K. T., Michael. (2010, March 16). South Korea Guns for Smart Grid Finish Line. Retrieved August 15, 2016, from http://www.greentechmedia.com/articles/read/south-korea-guns-for-smart-grid-finish-line
Karvonen, A., Evans, J., & van Heur, B. (2013). The Politics of Urban Experiments: Radical Change or Business as Usual? In M. Hodson & S. Marvin (Eds.), *After Sustainable Cities?* (pp. 104–115). Routledge: London, UK.
Karvonen, A., & van Heur, B. (2014). Urban Laboratories: Experiments in Reworking Cities. *International Journal of Urban and Regional Research*, *38*(2), 379–392.
Kaye, L. (2011, September 5). Pushing the low carbon boundaries: South Korea's smart grid initiative. *The Guardian*. Retrieved from https://www.theguardian.com/sustainable-business/south-korea-smart-grid-low-carbon
Larner, W., & Heron, R. L. (2002). The Spaces and Subjects of a Globalising Economy: A Situated Exploration of Method. *Environment and Planning D: Society and Space*, *20*(6), 753–774.
Larner, W., & Heron, R. L. (2005). Neo-liberalizing Spaces and Subjectivities: Reinventing New Zealand Universities. *Organization*, *12*(6), 843–862.
Laurent, B. (2011). Technologies of democracy: experiments and demonstrations. *Science and Engineering Ethics*, *17*(4), 649–666.
Lemov, R. (2016, June 16). Big Data is People. *Aeon*. Retrieved from https://aeon.co/essays/why-big-data-is-actually-small-personal-and-very-human
Li, T. M. (2007). Governmentality. *Anthropologica*, *49*(2), 275–281.
Long, J. (2009). Sustaining creativity in the creative archetype: The case of Austin, Texas. *Cities*, *26*(4), 210–219.
Long, J. (2016). Constructing the narrative of the sustainability fix: Sustainability, social justice and representation in Austin, TX. *Urban Studies*, *53*(1), 149–172.
Lovell, H. (2016). The Role of International Policy Transfer Within the Multiple Streams Approach: The Case of Smart Electricity Metering in Australia. *Public Administration*, n/a-n/a.
Lyon, D. (2002). Everyday Surveillance: Personal data and social classifications. *Information, Communication & Society*, *5*(2), 242–257.
Marres, N. (2011). The costs of public involvement: everyday devices of carbon accounting and the materialization of participation. *Economy and Society*, *40*(4), 510–533.
Marres, N., & Lezaun, J. (2011). Materials and devices of the public: an introduction. *Economy and Society*, *40*(4), 489–509.
McCann, Eugene. (2008). Expertise, Truth, and Urban Policy Mobilities: Global Circuits of Knowledge in the Development of Vancouver, Canada's 'four Pillar' Drug Strategy. *Environment and Planning A*, *40*(4), 885–904.
McCann, Eugene. (2011a). Urban Policy Mobilities and Global Circuits of Knowledge: Toward a Research Agenda. *Annals of the Association of American Geographers*, *101*(1), 107–130.
McCann, Eugene. (2011b). Veritable inventions: cities, policies and assemblage. *Area*, *43*(2), 143–147.
McCann, Eugene. (2013). Policy Boosterism, Policy Mobilities, and the Extrospective City. *Urban Geography*, *34*(1), 5–29.
McCann, Eugene, & Ward, K. (2011). *Mobile Urbanism: Cities and Policymaking in the Global Age*. U of Minnesota Press.
McCann, Eugene, & Ward, K. (2012a). Assembling urbanism: following policies and 'studying through' the sites and situations of policy making. *Environment and Planning A*, *44*(1), 42–51.
McCann, Eugene, & Ward, K. (2012b). Policy Assemblages, Mobilities and Mutations: Toward a Multidisciplinary Conversation. *Political Studies Review*, *10*(3), 325–332.
McCann, Eugene, & Ward, K. (2013). A multi-disciplinary approach to policy transfer research: geographies, assemblages, mobilities and mutations. *Policy Studies*, *34*(1), 2–18.
Mcguirk, P., Dowling, R., Brennan, C., & Bulkeley, H. (2015). Urban Carbon Governance Experiments: The Role of Australian Local Governments. *Geographical Research*, *53*(1), 39–52.
McGuirk, P., Dowling, R., & Bulkeley, H. (2014). Repositioning urban governments? Energy efficiency and Australia's changing climate and energy governance regimes. *Urban Studies*, *51*(13), 2717–2734.
McGuirk, P. M., Bulkeley, H., & Dowling, R. (2016). Configuring Urban Carbon Governance: Insights from Sydney, Australia. *Annals of the American Association of Geographers*, *106*(1), 145–166.

McLean, A., Bulkeley, H., & Crang, M. (2015). Negotiating the urban smart grid: Socio-technical experimentation in the city of Austin. *Urban Studies*, 0042098015612984.

Meltzer, E. (2014, January 25). Boulder to track energy use in 50 homes, 25 businesses over next 2 years. *Daily Camera*. Retrieved from http://www.dailycamera.com/news/boulder/ci_24992390/boulder-seeks-energy-monitor-volunteers

Moore, S. (2013). What's Wrong with Best Practice? Questioning the Typification of New Urbanism. *Urban Studies*, *50*(11), 2371–2387.

Moore, S. A. (2007). *Alternative Routes to the Sustainable City: Austin, Curitiba, and Frankfurt*. Lexington Books.

Patel, Z., Greyling, S., Parnell, S., & Pirie, G. (2015). Co-producing urban knowledge: experimenting with alternatives to 'best practice' for Cape Town, South Africa. *International Development Planning Review*, *37*(2), 187–203.

Peck, J., & Theodore, N. (2010a). Mobilizing policy: Models, methods, and mutations. *Geoforum*, *41*(2), 169–174.

Peck, J., & Theodore, N. (2010b). Recombinant workfare, across the Americas: Transnationalizing "fast" social policy. *Geoforum*, *41*(2), 195–208.

Peck, J., & Theodore, N. (2012). Follow the Policy: A Distended Case Approach. *Environment and Planning A*, *44*(1), 21–30.

Peck, J., & Theodore, N. (2015). *Fast Policy: Experimental Statecraft at the Thresholds of Neoliberalism*. University of Minnesota Press.

Rhodes, J. D., Gorman, W. H., Upshaw, C. R., & Webber, M. E. (2015). Using BEopt (EnergyPlus) with energy audits and surveys to predict actual residential energy usage. *Energy and Buildings*, *86*, 808–816.

Rhodes, J. D., Upshaw, C. R., Harris, C. B., Meehan, C. M., Walling, D. A., Navrátil, P. A., … Webber, M. E. (2014). Experimental and data collection methods for a large-scale smart grid deployment: Methods and first results. *Energy*, *65*, 462–471.

Robinson, J. (2015). 'Arriving At' Urban Policies: The Topological Spaces of Urban Policy Mobility: DEBATES & DEVELOPMENTS. *International Journal of Urban and Regional Research*, n/a-n/a.

Robinson, J. D. (2011). The Spaces of Circulating Knowledge: City Strategies and Global Urban Governmentality. In E. McCann & K. Ward (Eds.), *Mobile Urbanism*. University of Minnesota Press. Retrieved from http://discovery.ucl.ac.uk/1361781/

Rohracher, H., & Späth, P. (2013). The Interplay of Urban Energy Policy and Socio-technical Transitions: The Eco-cities of Graz and Freiburg in Retrospect. *Urban Studies*, 0042098013500360.

Rose, N., & Miller, P. (1992). Political Power beyond the State: Problematics of Government. *The British Journal of Sociology*, *43*(2), 173–205.

Rosental, C. (2014). Toward a Sociology of Public Demonstrations. *Sociological Theory*, *31*(4), 343–365.

Ross, R. (2013, August 9). From Runways to Sidewalks: The Mueller neighborhood at midcourse. *Austin Chronicle*. Retrieved from http://www.austinchronicle.com/news/2013-08-09/from-runways-to-sidewalks/

Rutherford, J., & Coutard, O. (2014). Urban Energy Transitions: Places, Processes and Politics of Socio-technical Change. *Urban Studies*, *51*(7), 1353–1377.

Rutherford, J., & Jaglin, S. (2015). Introduction to the special issue – Urban energy governance: Local actions, capacities and politics. *Energy Policy*, *78*, 173–178.

Rutherford, S. (2007). Green governmentality: insights and opportunities in the study of nature's rule. *Progress in Human Geography*, *31*(3), 291–307.

Rutland, T., & Aylett, A. (2008). The work of policy: actor networks, governmentality, and local action on climate change in Portland, Oregon. *Environment and Planning D: Society and Space*, *26*(4), 627 – 646.

Simakova, E. (2010). RFID "Theatre of the proof": Product launch and technology demonstration as corporate practices. *Social Studies of Science*, *40*(4), 549–576.

Smith, W. (2009). Theatre of Use: A Frame Analysis of Information Technology Demonstrations. *Social Studies of Science*, *39*(3), 449–480.

Temenos, C., & Baker, T. (2015). Enriching Urban Policy Mobilities Research: DEBATES & DEVELOPMENTS. *International Journal of Urban and Regional Research*, n/a-n/a.

Temenos, C., & McCann, E. (2012). The local politics of policy mobility: learning, persuasion, and the production of a municipal sustainability fix. *Environment and Planning A*, *44*(6), 1389–1406.

Temenos, C., & McCann, E. (2013). Geographies of Policy Mobilities. *Geography Compass*, *7*(5), 344–357.

Theodore, N., & Peck, J. (2001). Searching for best practice in welfare-to-work: The means, the method and the message. *Policy & Politics*, *29*(1), 81–94.

Tweed, K. (2011, June 29). IBM Coordinates Smart Grid Data in South Korea. Retrieved August 15, 2016, from http://www.greentechmedia.com/articles/read/ibm-coordinates-smart-grid-data-in-korea

Upshaw, C. R., Rhodes, J. D., & Webber, M. E. (2015). Modeling peak load reduction and energy consumption enabled by an integrated thermal energy and water storage system for residential air conditioning systems in Austin, Texas. *Energy and Buildings*, *97*, 21–32.

Village of Oak Park. (2014a, April 25). Screenings begin for Smart City USA participants. Retrieved September 16, 2015, from http://www.oak-park.us/news/screenings-begin-smart-city-usa-participants

Village of Oak Park. (2014b, September 18). Pecan Street Inc. | Smart grid project moves closer toward implementation. Retrieved August 21, 2016, from http://www.pecanstreet.org/2014/09/oak-park-il-smart-grid-project-moves-closer-toward-implementation/

Village of Oak Park. (2015, March 9). Meeting of Village of Oak Park President and Board of Trustees on 2015-03-09 7:00 PM. Retrieved August 22, 2016, from http://oak-park.granicus.com/MediaPlayer.php?view_id=2&clip_id=588

Ward, K. (2010). Towards a relational comparative approach to the study of cities. *Progress in Human Geography*, *34*(4), 471–487.

While, A., Jonas, A. E. G., & Gibbs, D. (2004). The environment and the entrepreneurial city: searching for the urban ‘sustainability;fix’ in Manchester and Leeds. *International Journal of Urban and Regional Research*, *28*(3), 549–569.

While, A., Jonas, A. E. G., & Gibbs, D. (2010). From sustainable development to carbon control: eco-state restructuring and the politics of urban and regional development. *Transactions of the Institute of British Geographers*, *35*(1), 76–93.

Woods, E. (2014, November 12). South Korea Draws an Ambitious Roadmap for Smart Grids and Smart Cities. Retrieved August 15, 2016, from https://www.navigantresearch.com/blog/south-korea-draws-an-ambitious-roadmap-for-smart-grids-and-smart-cities

XcelEnergy. (2016). SmartGridCity. Retrieved August 22, 2016, from http://smartgridcity.xcelenergy.com/