

Smart Grids in the City

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This research project involved the study of the Pecan Street smart grid project in development in Austin, Texas. The aim of the project was to examine an international smart grid case study and make the learning available to UK smart grid communities. This project investigated the socio-economic conditions that exist within an urban area that allow a smart grid to emerge. A key question to answer was why does the development of a smart grid have a higher chance of success in Austin than it does in other cities around the world? Rather than examine how the projects themselves differ – such as in the technologies that are being used, the different forms of consumer interfaces or cost differentials between energy prices – the focus was on the base conditions of the urban environments themselves that (could) allow a smart grid to evolve and to succeed.

The Pecan Street Project

The Pecan Street Project (PSP), created in 2008, is a non-profit public-private partnership that has the “very modest goals of reinventing the energy system of the United States”. Based in Austin, the organisation is not only rolling out smart meters, electric vehicles, solar PVs and home energy management systems in a bid to reduce energy consumption and improve customer experience, but it is also using the scheme to encourage the development of a clean energy industry within the city, attracting international private finance as part of a state-led economic development strategy,

while investigating future business models that could work in a decentralised energy marketplace. Focused on a volunteer group of 1,000 residents and 75 commercial businesses, the partner organisations see the PSP more as a way to “get things understood, experiments set up, information out into the public domain about what’s good, what’s bad and so forth.” There is no target to roll out smart meters to every home or any stringent yardstick on how to determine if the project will be a success. Instead the idea is to provide the private sector with the space to develop smart products that consumers will be willing to buy themselves, and then voluntarily participate in the smart grid. There are a number of factors that have allowed the Pecan Street Project to emerge in Austin, which are briefly outlined below.

The Prevailing Energy Discourse of Texas

In Texas the discourse surrounding energy is focused on resource extraction as part of an energy-based economic development. Oil and gas are seen as resources to be extracted and exploited, and the development of wind power in the state follows the same logic. Wind is a resource that should (and is) being exploited. Instead of framing wind power as necessary to fight climate change – a difficult task in a state that is opposed to most environmental regulations enacted by the federal government – wind is framed in terms of economic development. This has enabled a huge explosion in the development of wind power. Texas has more than 12,000MW of installed wind capacity –

some 25 per cent of all energy consumed in the state. The Roscoe Wind Farm, with 627 turbines, is one of the largest developments in the world. Renewable power is not seen as an environmental benefit but a new form of energy resource that needs to be exploited, for economic reasons and to provide energy independence.



The Roscoe Wind Farm, Texas. With 627 turbines and a capacity of 781.5 MW, at completion it was the largest in the world

The Availability of an “Experimental Lab”

A second key component of the PSP is the availability of a physical and regulatory space that allows experimentation. This applies to Texas as a whole and to the Mueller urban district within Austin. The unique setup of the Texas electricity grid – isolated from the rest of the US grid – allows for experimentation both with state regulations and with new technologies. Companies and utilities do not have to worry about inter-state federal oversight of the energy grid. Being wholly within Texas the ERCOT (Electricity Reliability Council of Texas) model allows for tweaks or large-scale transitions relatively easily compared to the cross-border negotiations needed elsewhere in the US. One reason why wind power has been so successful is because of the highly deregulated mar-

ket and the ability to experiment. Texas as a whole offers an excellent sandbox for energy researchers. Combined with this, while the wider regulatory landscape of the Texas electricity market allows for experimentation it is the Mueller district within Austin that provides the PSP with its physical space. Mueller is a redevelopment site on a former airport and offers an excellent test bed for new technologies. The homes are generally the same age, it is largely isolated from wider Austin and there are a large proportion of early adopters who purchased homes within the development before they were built.

The Public and Private Mix.

A third component is the linkups that exist between the public and private sector. Austin is an example of what some researchers have labelled a “technopolis” – “techno”, reflecting the emphasis on technology, and “polis”, the Greek work for city-state, reflecting the balance between public and private in spurring economic development and promoting technology diversification. This describes the linkup between a strong research-intensive university (The University of Texas), the spinoff of new high-tech companies, the attraction of major technology firms (Sony, Motorola) and the fact that Austin is the state capital of Texas, offering access to lawmakers and public officials. This mix creates a magnet for federal and private sector funding providing a further boost for economic development. Austin also has past experience in public-private development projects, with MCC and Sematech used to kickstart the semiconductor industry in the 1980s and 1990s.

A Neoliberal Economic Model.

Fourthly there is the role that the political economy has in the development of the PSP. Many officials within the City of Austin want to create a distinct competitive advantage to attract international private finance from elsewhere. This is a key *raison d’être* for the PSP. The project is not about the publically-owned utility gaining or keeping control of the energy network. A large driver is the

motivation to attract multi-national companies from elsewhere. It is to provide a space for international finance to invest in Austin, for companies to create jobs and increase the tax take of the city. The desire to attract and create a highly skilled workforce has allowed the City of Austin its state to use public-private partnerships to *create* markets under the banner of neoliberalism, rather than rolling back the state and allowing markets to evolve naturally. The state, it is believed, cannot develop the technologies and gadgets itself (such as electric cars or solar panels). This has to be left to the free market and then consumers can pick and choose the green technologies they want. The state creates the markets and private interests then take up their positions within them.

An Initial Catalyst.

A final condition that has allowed the PSP to emerge in Austin is the initial funding boost from the federal government. All of the above conditions were in place within the city before the PSP began, but what the smart grid needed to get started was an initial external boost. This came in November 2009 in the form of a \$10.4 million grant from the US Department of Energy. This was the catalyst for the project. The money was not the most important component, as one respondent outlined – “If anything I don’t think we have received as much funding as some as other projects” – but what it offered was the chance to get the PSP up and running. It provided the window of opportunity that was needed to allow the smart grid to develop.

Lessons from the Pecan Street Project.

The conditions above are features that were already in existence within Texas and Austin before the PSP was created. No single component was itself responsible for the emergence of the PSP, but the combination of the five factors outlined above created an ideal environment for a smart grid to emerge. It is too early to say if the PSP

has been a success and will become a permanent part of the socio-technical landscape. It could be argued that the PSP is a unique project in a specific location and it is debateable whether other groups can attempt to deliver the same goals by using the same methods elsewhere. However it is still useful to compare Austin with what is happening in the UK. One advantage that Texas has compared to the UK is the strength of local city governance. The UK does not have anything comparable to Austin Energy – an energy utility wholly owned by the city. The UK’s power structure is also too centralised towards central government, leaving local authorities with few mechanisms to deliver economic development strategies in the way Austin has. Another unique feature about Texas is the mix between free markets and public mandates. The deregulation of the energy market has been so successful because of the mix of public and private involvement. Public utilities were mandated by law to buy power from small renewable companies, immediately creating a demand and boosting the renewable industry. Public utilities were also prevented from undercutting competitors, leading to large numbers of consumers to switch rapidly to lower-cost suppliers. This does not happen in the UK marketplace. Yet there are lessons to be learned from the PSP.

It is Not Just About the Technologies

One early result from the PSP was the lack of effectiveness in differentiation between the various smart products. While viewing the test home used by the private partners to develop new technologies, there were seven different types of connector in development to charge an electric vehicle, all offering different interfaces and feedback information. What became clear was that the differences were all minor – a plug socket is a plug socket. It doesn’t matter how many flashing lights or how shiny it is, it essentially does one task for the consumer, and that is charge the electric vehicle. Residents also quickly became bored with the various internet-based interfaces offering a myriad of ways to view individual energy consumption.

One respondent claimed that residents would spend a few hours early on in the project rating the use of each individual appliance in the home, and then quickly become bored of all the information being offered. The differences between the various products appear to be minor. What are important are the tasks they allow the consumer to do overall.

The Consumer Has To See Some Benefit.

Many smart grid tools being discussed in the literature revolve around how to lower energy consumption to reduce climate change emissions, to lower the load on the network or to save the energy utility money. Very rarely is there any discussion of how the consumer can benefit. As one interviewee to this project said:

“...one thing we have a feeling is not going to work for a consumer, because frankly nobody is going to sign up for it, is “I’m going to sign up for a rate programme that somehow makes me hotter and charges me more”. Well, sign me up” But you see a lot of these articles and if you really read between the lines of demand response, it’s kind of how it works out. I’m not going to do it. No way am I going to do it. There is no way I would sign up for an Austin Energy thermostat, radio controlled to turn off my AC. But if they said I would pay less? Sure” (Interview, PSP board member).

For consumers to fully engage with the smart grid they have to see some of the benefits. The consumer must see a difference in their energy bills, or in the longevity of their appliances if they are willing to change how they consume energy. Connecting an electric vehicle to a home to be used as an energy storage device may appear beneficial, but if the consumer is going to lose money by reducing the battery life, they are not going to participate. However if the consumer receives a big enough rebate from the power they are generating and saving themselves, or if they can gain a discount on the cost of a new battery, or if the new technologies make their lives easier, then that might persuade them to sign up.

Leave Product Design and Development to the Market.

A key advantage of the PSP, which falls nicely into the neoliberal economic theory, is that the public sector is taking on very little risk. Nearly all of the product design and testing is being carried out by private companies – Sony, Best Buy, Motorola etc. They want to design and sell the products that consumers will eventually buy, and they are prepared to take on the risk for doing so. The public sector – the university and in Austin’s case the energy utility – are merely providing the space for this to happen. The public sector will not be left with a bill for designing a product that no one wants to buy. Yet the university is able to gain from researching how people are willing to change their lives. The risk is contracted to the private sector, yet the benefits accrue to all partners.

In conclusion, one respondent himself outlined the conditions that he felt were necessary for a smart grid project to succeed:

“...some moments of good timing, some pay off or idealistic volunteer work, a couple of flashes of brilliance associated with organisation and approach, and I guess at some point sort of political will – little ‘p’ political will – between the leadership of the utility and the leadership of the city, although to be honest with you I think those are derivative of community will. Get yourself a world class tier-one university, if you can get one I would say get yourself an urban infill development, I would say get yourself 10 to 15 million dollars of federal, or you know sort of grant support to start. I’d say give yourself two or three years to incubate it in terms of building up the attention and the concepts, and you can have one too” (Interview, Austin Energy executive).

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