

Are Community Energy Systems the Solution for Growing Urban Energy Demand?

BY PALLAVI ROY AND PHILIP R. WALSH

Cities, the drivers of economic growth, are also major consumers of energy. Urban regions of the world hold over half the population of the earth and account for two-thirds of the primary energy demand.¹ Almost none of this energy is produced anywhere in or near the city but with technological advancements in renewable energy generation, the potential exists to meet some of this demand. As the price of modular and small-scale energy technologies fall, urban renewable energy options have increasingly become cost competitive with traditional sources such as centrally-generated electricity, natural gas, coal and diesel. According to the International Energy Agency, buildings in urban areas can provide space for local generation utilising solar photovoltaic (PV) arrays with the technical potential to provide up to 32% of urban electricity demand.² However, this sector is in a nascent stage and needs a further push for wide-scale adoption in urban environments. For urban consumers of electricity, the norm has been to rely on the provision of energy services by large energy companies and public utilities. This reliance has meant that most city dwellers are unaware and unsure of adopting renewable energy technology as an option for supplying their electricity needs. The concept of community energy systems, and the various models that have been developed for these systems, may be the answer for urban adoption of renewable energy.

With community energy, the idea is to create sustainable energy systems that improve economic, social and environmental conditions. These objectives can be achieved by involving more people in the profit sharing and empowering them to be involved from an early point in projects. Projects that do involve community ownership—through financial investment or managerial control by or on behalf of groups of ‘members of the public’—have achieved this to different degrees and in different ways, mostly in the developed areas of the world. Some advantages of community energy projects include:

- New sources of capital in the local economy
- Energy costs that are locally spent, strengthening the local economy and creating jobs
- Less NIMBYism for renewable energy projects
- Promotion of community engagement and social interaction
- Reduction of greenhouse gas emissions from the use of energy from fossil fuels

In this article, we identify various motivators for community involvement and provide some examples of community energy projects with collaborative decision-making at various levels of active participation. Community energy projects empower participants

not just to be consumers anymore but be prosumers, by generating their own energy and even selling to the grid or other adjacent communities. A number of European countries have been supporting the community and locally owned energy concept for some time now. Scotland set a target of 500 Megawatts (MW) of community-owned energy production³ that was achieved in 2015 and in that same year Germany had over 770 energy co-operatives producing renewable energy.⁴ The co-operative approach can be a solution to the challenges of financing renewable energy projects by presenting a reasonable business model that raises capital from private individuals and provides a return on that investment. However, return on investment alone may not drive adoption of community energy projects and it is important to recognize that other factors can motivate people to adopt local community generation. Table 1 summarizes the motivations that are important in encouraging positive attitudes and participation in community energy projects.

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Motivation	Description
Financial	Reduce energy bills, make money from selling energy, increase of property value
Environmental	Be more green, reduce GHGs
Security of supply	Not facing outages, future high costs of electricity and be more energy independent
Uncertainty and trust	Use of an innovative or high end technology leading to trust
Social norms	Following others' examples as well as being sensitive to the opinion of others

Table 1 Motivations for participation in community energy projects (after Dóci and Vasileiadou, 2015)

involved from an early point in projects. Projects that do involve community ownership—through financial investment or managerial control by residents of the community or on behalf of those residents—have achieved this to different degrees and in different ways. The legal and financial models of ownership fall into three broad categories of community ownership; developer or municipally-owned with citizen participation in the form of investors (Community Direct Investments), community organizations in partnership with a private party that owns and manages development (Joint Ventures), and energy projects owned and managed by the community (Community-Owned and Managed). Figure 1 provides

Philip Walsh is a Professor in the Center for Urban Energy, at Ryerson University, Toronto, Canada. **Pallavi Roy** is a student at the university. Dr Walsh can be reached at prwalsh@ryerson.ca

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a visual representation of the spectrum of citizen participation in community energy projects.

Table 2 provides examples of different types of

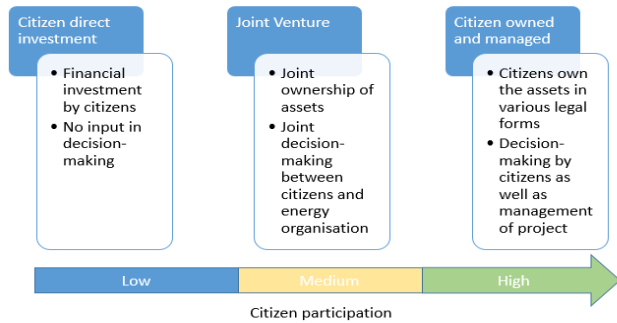


Figure 1 Spectrum of citizen participation in community energy

community-owned renewable energy projects and we will focus on one example from each.

Example of Community Owned and Managed

Project type	Project	Country	Project description
Community-owned and managed	Jühnde bioenergy village	Germany	Community-owned. Energy utilized to heat the village.
	Glimminge Vind	Sweden	Real estate commune
	Amsterdam Zuid	The Netherlands	Community owned solar collective
	Brooklyn Microgrid (pilot)	US	Individual ownership of resources who then supply to other peers
Joint venture	Middelgrunden Wind Cooperative	Denmark	50% owned by the 10,000 investors in the Middelgrunden Wind Turbine Cooperative, and 50% by the municipal utility company. Energy sold to the grid.
	Earlburn Wind Farm	Scotland	Joint venture between company created by the community and the developer.
	Neilston Community Windfarm	Scotland	This is a 4 turbine, 10 MW joint venture between the Neilston Development Trust and Carbon Free Developments Ltd. The trust owns a 28% stake, that can be increased to 49.9%.
Community Direct Investment	Sacramento Municipal Utility District (SMUD): SolarShares Program	US	Utility owned, community members buy shares.
	Solar community energy project in Recklinghausen	Germany	Small company ownership structure with shares owned by investors. Energy sold to the grid.
	Frieamt	Germany	Village of nearly 4300 residents which owns many different types of generation technology. Private company ownership structure with over 200 shareholders.

Table 2 Examples of different community owned project

The Amsterdam Zuid project is a leading example of an urban community energy project, led, managed and owned by citizens themselves. A community located in the south of Amsterdam, this is a floating community consisting of about 80 houseboats, some of whom have been resident in the area since the 60s. With the government launching a solar subsidies program in 2008, a few of the houseboat owners were interested in purchasing solar photo-voltaic (PV) panels for their personal use. They set about recruiting others with the help of the local association. Social networks played a key role in getting more individuals to join the

project. Policies were the key drivers for the investment decision by individuals, these included a tax exemption program called *Saldering* (meaning *balancing in Dutch*) that guaranteed that up to 5000 kWh/year the behind-the-meter produced electricity is exempt from VAT and energy tax.⁵

Example of a Joint Venture

While community owned and managed systems are exciting, not everyone is interested in managing projects. The joint venture approach allows for a community organisation to partner with a developer who then manages the project on behalf of the community. The Middelgrunden wind farm in Denmark is an example of a community-developer energy project. At the time of construction, it was the largest offshore wind farm consisting of 20 turbines at 2 megawatts (MW) each providing approximately 3% of Copenhagen's electricity needs. The Middelgrunden Wind Turbine Cooperative, with roughly 10,000 members, owns ten turbines, while the remaining ten turbines are owned by Ørsted A/S, a Danish energy company and project operator.

Example of Community Direct Investment

With the direct community investment model citizens are investors only in the community energy project with no involvement in the day to day running of the project. A good example is that of the solar community energy project in Recklinghausen, Germany where it was recognized that public roof surfaces in cities could be easily used for the generation of electricity and heat. The citizens of Recklinghausen decided to exploit this potential with a community power project that, since July 2011, has fed electricity from three solar photovoltaic (PV) systems into the power grid. The plant produces approximately 195,000 kWh of electricity per year. The city of Recklinghausen supports the initiative by the lease of the roof surfaces for the PV facilities with an invested cost of approximately €250,000. The project was 100% financed by the local community with participation starting at a minimum investment of €500 and an average investment of €3,300. In total three GbRs (Gesellschaft bürgerlichen Rechts – Companies of Civil Law) were established to own and notionally manage the project put it was the establishment of a union (Verein) SolaRE e.V. that was responsible for the construction and operation of the PV systems for the benefit of the three GbRs, each containing 70-80 citizens who provided the financing and receive the produced electricity.

The future?

While examples exist of successful community energy projects, it needs to be recognized that regulatory and institutional support is crucial and that the multiplicity of jurisdictional governance

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