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What can city governments do to increase the amount of electricity generated from renewable sources? The City Toolbox: Financing Renewable Energy

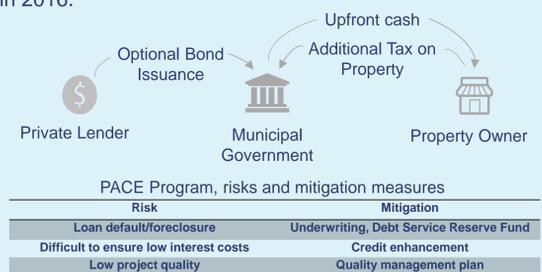
The Rise of Green Municipal Bonds

- Usually tax-exempt, newly issued municipal bonds totaled US\$ 472 billion in 2017.
- Green municipal bonds have experienced steady growth since 2013 with the highest annual issuance reaching US\$ 11 billion in 2017 (EMMA, 2018).
- The type of capital project that qualifies as environmentally beneficial is highly variable across green bonds.
- Debates continue regarding the validity of the green designation and the environmental impact of the investment.



Property Assessed Clean Energy (PACE)

- In the U.S., cities can designate certain areas as special assessment districts that allow for additional taxes.
- District bonds – issued based on the tax revenue – can then be used to finance infrastructure upgrades.
- Special assessment taxes for energy infrastructure enables individual property owners to make solar or energy efficiency retrofits.
- Despite regulatory risks and the need for better consumer protection, PACE bond securitizations passed US\$ 1 billion in 2016.



Shared Investment Costs

- Both public-private partnerships and community partnerships offer shared financing arrangement for distributed generation (DG) and microgrids.
- Community solar projects, enabled through state net-metering laws, are most often a partnership between individuals, utilities, non-profits, and business entities.
- Innovative financing arrangements have supported the installation of over 100 MW of community solar throughout the U.S. (SEIA, 2018).
- Public-private partnerships are also increasingly used to develop microgrids using various financing arrangements including direct ownership, vendor financing, energy service contracts, power purchase agreements, leasing, debt financing, bonds, Green Banks, and build-operate-transfer agreements.
- Microgrids can include various power generating sources including combined heat and power, wind, solar, biomass, fuel cells, and battery systems. Total U.S. investment in microgrids has passed US\$ 12 billion.



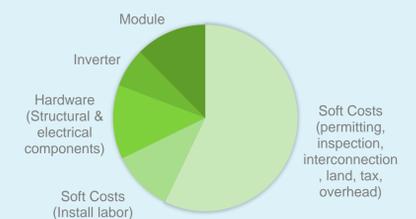
Fees and Taxes

- The U.S. price per watt for residential solar is among the highest in the world due to differences in wages, taxes, permitting fees and hardware.



- Although lower module cost and greater competition has reduced total system capital cost, "soft" costs (labor and overhead) account for over 68% of residential system costs.
- Fee reductions, permitting waivers, and streamlined services can help reduce costs.

Residential PV System Cost (2.8 (\$/Wdc), 2017 (NREL))



- Bonuses to promote a particular type of development have also been used to promote new construction that incorporates DG or energy efficiency.
- Tax strategies for renewable energy, such as the Production Tax Credit and the Investment Tax Credit, are more common at the federal and state levels. However, tax abatement strategies for renewable energy are also used at the municipal level.
- By taking advantage of federal, state, and local tax incentives, including tax-equity financing for larger projects, developers can significantly reduce financial risk and improve return on investment.
- The tax-exempt status of government-owned utilities is also contributing to a renewed interest in municipal utilities.
- Without payments to shareholders, many municipal utilities can offer better rates and more reliable service, but regulatory hurdles often impede the ability of new companies to enter the market.

References

- Municipal Securities Rulemaking Board, Electronic Municipal Market Access (EMMA)
- Clean Energy Group
- National Renewable Energy Laboratory (NREL)
- Solar Energy Industries Association (SEIA)
- Van Vliet, Michelle T. H., David Wiberg, Sylvain Leduc, and Keywan Riahi. 2016. "Power-Generation System Vulnerability and Adaptation to Changes in Climate and Water Resources." *Nature Climate Change* 6 (4): 375–80.



What are the implications for cities that promote capital projects for distributed energy resources (DERs) and microgrids?

New Institutional Capacity for Strategic Energy Planning

- Ecologically modern urban energy systems face challenges in the adoption and integration of new modes of energy generation, distribution, management, and regulation.
- Municipal Energy Departments are needed to ensure system coherence, to evaluate and inspect new projects, and minimize risks and negative externalities.

The Resiliency Imperative: Identifying Synergies

- Disaster response teams require power for critical urban functions such as health services, water and sanitation infrastructure, and public safety.
- Current strategies to address electrical system vulnerability include redundant DG systems, plug-in electric vehicles as alternative home power sources, and microgrids (Clean Energy Group, 2016).
- The PACE program can finance improvements for resistance to wind, flooding, tornados, and seismic activity.
- Power plants are vulnerable to storm events and sea level rise. Additionally, climate change induced water scarcity could impact the ability to cool thermoelectric plants. Globally, water scarcity could result in reductions in usable capacity of 81–86% of thermoelectric plants (van Vliet et al., 2016).



What are the research gaps and new trends in the integration of urban energy systems with DERs and microgrids? Tracking the Transition

Blockchain and Cryptocurrency

- At the urban level, blockchain technology – using a network of computers to maintain an encrypted ledger – has the potential to reduce transaction costs and facilitate a local energy marketplace with more producers and consumers than centralized systems.
- Although the technology may have greater potential in utility scale markets and virtual power plants, application in microgrid or DG projects will likely improve as new solutions to verification and accounting challenges are developed.
- Increasingly, specific cryptocurrencies for energy trading are available. Blockchain-based currencies, backed by units of renewable energy, are new to the market and vary in terms of measurable output and contribution to emissions reduction.
- The trend is likely to continue as more specific data is used to back green cryptocurrencies.

Real Estate Valuation and New Market Dynamics

- Real estate developers have sufficient access to capital to develop DG and microgrid projects and may value long-term energy independence.
- As they seek increasing use-values and stacked value streams, they are well positioned to take advantage of market openings that occur as utility companies begin to lose control.
- One aspect of DG and microgrid development that is still poorly understood is the impact of on-site energy assets on property value as well as the monetary value of avoided loss.
- Research suggests residential and commercial purchasers of DG technologies may increase the value of their properties.
- Establishing institutional structures for collaboration and conflict resolution will help safeguard the unique status of the energy system as a public good in a new market.