Deep Dive on Microgrid Financing

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Introduction

Microgrids have the potential to play a significant and positive role in promoting a cleaner, more resilient energy infrastructure. Microgrids’ proximity to customers makes them less susceptible to distribution grid failures. In the wake of Hurricanes Sandy and Irene, several microgrids continued to supply electricity and thermal energy without interruption. By enabling the use of locally sited renewable energy resources such as solar, biogas and geothermal energy, microgrids may diversify a customer’s or microgrid owner’s energy portfolio, mitigating price volatility and potentially reducing its environmental footprint. Microgrids may also lower a customer’s total cost of energy.

Growing awareness of these benefits has galvanized considerable interest in deploying microgrids as a primary or supplemental source of heat and power. This is the second eBrief in a three-part series on microgrids. This eBrief describes several key considerations for evaluating the potential economic benefits and financial structures of a microgrid. In most cases, the decision to invest in a microgrid is based upon a two-part evaluation process. The first part evaluates the bankability or financial viability of a microgrid project by (1) conducting a rigorous analysis of applicable utility rates and (2) developing an investment pro forma based on the rate analysis. The second part of the investment process involves selecting an ownership model and a financing structure for implementing the project. This process should be executed before detailed technical designs are developed to ensure the project is financially viable.
Bankability

Microgrids almost always require an initial capital investment. The amount of capital required can vary widely depending on the specific circumstances of a microgrid project. Similarly, the source of the capital may also vary for different projects. In some instances, third-parties may provide the capital needed to construct the microgrid. In other cases, the customer may provide the capital. The capital may be provided by more than one source.

Microgrids are considered to be financially viable or “bankable” when they yield an acceptable return on this investment. “Bankability” of a microgrid project means it creates sufficient energy cost savings and/or generate revenues to carry financing costs typically over a period of time. In practical terms, microgrids create financial value by reducing a customer’s total cost of energy and/or create additional revenue streams. A robust analysis of the cost savings and/or incomes created by a microgrid is essential to estimating the project’s return on investment.

The rate of return (ROR) expectation could vary for different investors. Depending on the risk profile, large corporations are unlikely to commit funds to support early-stage investments with RORs below 12%. Third-party equity investors typically expect a ROR of at least 15% or more, depending again on the project risk profile. Lower returns are acceptable for investments made later in the development cycle of a project when the project is much more matured and the risks have been substantially mitigated.

Microgrid customers will typically pay for electric service based on a different rate for grid-sourced power than the rate they otherwise would pay.

Several financing vehicles are available for funding a microgrid. An investment feasibility analysis is a critical part of evaluating the advantages and disadvantages of these financing options for an investment in a microgrid.

The financial Analysis is an essential step to understand a microgrid’s “bankability”. Equipped with the results,
the customer will be able to make informed decisions about the tradeoffs of different financing options for funding a microgrid project.

The Financial Analysis consists of two principal steps. The first step is to analyze how utility rates are likely to affect a customer's total cost of energy in the future. This exercise estimates the cost savings created by a microgrid. In some cases, the calculations need to consider how much income a microgrid can generate. The second step involves selecting an ownership structure based on the customer's risk preferences.

Utility Rate Analysis
Most microgrid customers are unlikely to disconnect completely from the electric grid. In most cases, microgrid customers use the grid to supplement power produced by the microgrid during periods of peak demand or use the grid as backup when the microgrid is unavailable (e.g., due to maintenance). Microgrid customers will typically pay for electric service based on a different rate for grid-sourced power than the rate they otherwise would pay.

Because utility rates can significantly affect the economics of a microgrid, potential investors in a microgrid project commonly conduct a rigorous analysis of utility rates as part of their due diligence. This analysis is highly technical and requires financial expertise as well as experience with utility tariffs.¹

Microgrids interconnected with the conventional grid may be required to pay standby rates to the local distribution utility similar to the stand-by rates that apply to baseload generators. Standby rates are designed to capture the distribution utility's cost of supplying services to users. These users consume power provided by the conventional grid for supplemental power such as when an on-site generator or microgrid is offline for scheduled or un-scheduled maintenance. The term "standby rate" is often used as shorthand to describe various rate structures designed for customers with onsite, non-emergency generation.

The services provided under standby rates include one or more of the following:

- **Backup service**: serves a customer load that would otherwise be served by onsite generation during unscheduled outages of the onsite generation

- **Supplemental service**: customers whose onsite generation does not meet all of their needs, typically provided under otherwise applicable full service tariff

- **Scheduled maintenance service**: price of grid-sourced power used by microgrid customers during scheduled maintenance outages

- **Economic replacement power**: electricity at times when the cost of producing and delivering it are less than that of the onsite source

Standby rates include three distinct charges: customer charges, contract demand charges and daily-as-used demand charges. The customer charge is designed to
recover certain fixed costs (e.g., metering expenses) that do not vary with energy use and shows up on the customer’s bill as a fixed monthly charge. The contract demand charge is designed to recover variable costs associated with providing electric service to the customer and only applies when the customer’s consumption of power from the conventional grid exceeds some pre-determined threshold during a given time period. When consumers exceed their demand threshold, they are subject to penalties in the form of a surcharge equal to between 12 to 24 times the monthly demand charges for all excess usage. The daily-as-used demand charge is designed to recover the costs of distribution infrastructure required to serve the system’s peak demand. The daily-as-used demand charge is based on the customer’s daily maximum metered demand during peak-hour periods on the macro system.

Standby rates are different in each utility territory and may make the economic case for a Microgrid prohibitively expensive. For example, “demand ratchets” can have adverse financial consequences for onsite generators. A thorough financial analysis should be completed using anticipated demand data to understand what expenses may be occurred during Microgrid operation.

**Preparing Project Pro Forma**
Developing an investment-grade project pro forma comes after the initial financial analysis as it requires a robust understanding of utility rates and reliable historical data on customer's demand profiles. In addition, the pro forma should take into account of operating profiles, local and state incentives, fuel costs, service costs, depreciation, taxes and several other relevant inputs.

Unlike energy efficiency or distributed generations projects, evaluating the economics of a microgrid project poses several unique challenges. For example, in most states, government incentives are generally designed for individual generators and individual customers. Microgrids link one or more generators to multiple users. Similarly, incentives are typically structured for specific market segments – e.g., municipal, commercial or residential. For example, net-energy metering may be available for residential customers but not commercial customers. Microgrids may serve customers in more than one market segment simultaneously. This level of complexity is exactly why investment grade project pro-forma is required when planning and developing a microgrid project.

**Financing Issues Vary By Market Segment: Hospital Example**
It is important to point out here that not all market segments face the same financing challenges. Take hospitals as an example. Hospitals are among most energy-intensive facilities in the United States, consuming about 2.5 more energy than the average commercial building every year. The cost is staggering. Hospitals spend over $10 billion on energy annually and often accounts for about 2% of a typical hospital’s operating budget. So are the environmental...
consequences. A 2007 study estimated that health care accounted for 8% of all U.S. greenhouse gas emissions.

Capital budgeting decisions made at hospitals oftentimes constrain efforts to reduce energy costs and greenhouse gas emission. Energy investments rarely make the “A” list of capital projects undertaken at a hospital. Traditionally, hospitals have financed energy efficiency projects as on-balance sheet capital projects with the proceeds of conventional taxable and tax-exempt debt structures such as bank loans, financing leases and bond financing. Such structures impair hospitals’ debt financing capacity and are included by rating agencies and lenders in their credit scoring criteria. Given a choice between capital projects for revenue producing patient care assets and projects that may create energy savings, hospitals are less inclined to pursue the latter. There are, however, still other financial options available could be considered more favorable when financing a microgrid project at hospitals. For example, transaction structures that eliminate debt capacity and address credit evaluation concerns may increase the likelihood of energy efficiency projects being pursued at hospitals.

It is imperative to recognize the market segment a microgrid is serving. This way, it can be ensured that financial issues facing this specific market segment are taken into account during the microgrid project “bankability” due diligent process.


2 A “ratchet” clause sets peak demand charges based on the highest average peak demand in one demand interval during the past year. Ratchet clauses can affect an entire year of utility bills based on a single 15-minute period of high demand.
Ownership Models and Financing Vehicles

After developing a robust financial pro forma, customers can begin evaluating the advantages and disadvantages of different ownership structures and financing vehicles. Decisions about ownership and financing arrangements frequently affect the project’s underlying economics. In many cases, ownership and financing structures may significantly strengthen a microgrid’s return on investment. For this reason, it is critical to consider multiple options before making a final choice.

Ownership Models

• **Direct Ownership**: Retain control over all aspects including financing, build, own, operate and maintain. Offers greatest potential return, but also creates largest risk for owner.

• **Joint Ownership**: Retain ownership, but only finance the project. Third party agrees to develop and operate microgrid. Transfers share of returns from owner to third party in exchange for third-party assuming some of the risk.

• **Third-Party Ownership**: Outsources financing, development, O&M and ownership. Significant risk transfer from customer to third-party, but latter also gets primary share of potential returns.

At minimum, the following factors should influence customers’ selection of an ownership structure:

- Risk tolerance
- Required rate of return
- Access to low-cost capital
- In-house technical expertise
- Business strategies
- Institutional objectives – e.g., sustainability goals
- Accounting treatment
- Tax implications

Financing Vehicles

A growing number of financing options are available for developing a microgrid project. The basic mechanics for a few of the more common financing options are discussed below. However, financing is an especially dynamic part of the microgrids industry. New and innovative financing vehicles are constantly emerging in the marketplace, making it even more critical for customers considering a microgrid project to select qualified partners.
Like most things, decisions about ownership and financing almost always entail tradeoffs. The advantages and disadvantages of each ownership model and financing vehicle are likely to vary in significance for differently situated customers.

**Power Purchase Agreements (PPA)**
Under a Power Purchase Agreement (or, PPA), the customer agrees to buy all or a portion of the electricity generated by the microgrid for a specified term. Under the PPA model, a third-party developer either owns or leases (from its investors) the microgrid and is responsible for operating and maintaining it for the duration of the PPA term. In addition to shifting the O&M responsibilities from the customer to a third party, a key advantage of the PPA structure is that the third-party owner is on the hook if the microgrid fails to perform as expected. The typical PPA only requires customers to pay for power if it is actually generated. If the microgrid does not produce power, the customer will pay nothing.

At least initially, the price customers pay for electricity purchased under the terms of the PPA is typically the same or less than the price the customer would otherwise pay the utility for regular service. Over time, however, the PPA price commonly increases by anywhere from 1% to 5% annually over what is typically a 20-year contract term. Because PPAs shift performance risk and maintenance responsibilities from customers to a third party entity, the PPA is a commonly used financing options for distributed generation projects as well as microgrid projects.

**Leases**
In this third-party-ownership structure, a leasing company owns the microgrid and leases it to the customer (the lessee) over a period of years. During the term of the lease term, the customer is responsible for operating and maintaining the microgrid and is allowed to consume all of the electricity it generates. In exchange for this use of the system, the lessee makes a series of recurring lease payments to the lessor (these
payments must be made regardless of how well the microgrid performs). Two types of lease structures are used to finance energy generation projects, namely capital leases and operating leases. The accounting and tax implications are different for each type of lease.

In addition to the two basic types of lease agreements, leasing structures have also been developed for specific customer segments. For example, an Enhanced Use Lease (EUL) is a financing vehicle designed for customers in the public sector. An EUL allows state or local government entities like a public hospital to lease underutilized assets like a cogeneration plant to a third-party developer in exchange for cash or in-kind consideration. In the event of an emergency, an EUL agreement temporarily returns control of the asset to the government entity as necessary.

Energy Savings Performance Contracts (ESPC)
An Energy Savings Performance Contract (ESPC) addresses the first-cost barrier to microgrids. The ESPC requires no upfront capital from the customer. The contractor provides the capital needed to implement the project. The contractor only recovers their capital investment if the project generates cost savings. As a result, an ESPC is designed to be cash-flow neutral. In other words, the amount of monthly energy savings is supposed to be at minimum equal to the monthly payment needed to finance the improvements. Customers are more likely to consider an ESPC if they have capital constraints or limited available cash. In addition, customers that lack in-house technical expertise may prefer to outsource the operations and maintenance of the system to a qualified third-party. Finally, many ESPCs guarantee the projected energy savings. If the savings are less than initially projected, the contractor will reimburse the customer for the difference.

Summary
Decisions about ownership and financing are frequently among the most complex customers must make in the microgrid development process. Making the right decisions is critical to the success of a microgrid project. The due diligence process described in this other eBrief is essential to selecting the optimal microgrid financing vehicle for a specific customer or group of customers.

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