RePower Humboldt

Humboldt RESCO Task 3 Memo:

Renewable Energy Development, Ownership & Financing Options

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1.1 Introduction

Below we identify and discuss a host of different business and organizational structures, financing mechanisms, and ownership models that can be used to develop or encourage development of local renewable energy projects. These include:

Development/Ownership Models

- Investor-owned utility (IOU)
- Independent power producer (IPP)
- Public power – Community Choice Aggregation and Municipal Utilities
- Public/private partnerships
- Community renewable energy models

Financing Options for Renewable Energy Generation

- Equity financing
- Loan financing
- Bond financing
- Community renewable energy, flip structures
- Grants, rebates and tax credits
- Environmental assets
- Residential and small commercial financing

These various models are considered because they can each potentially have a significant effect on the successful implementation of the Humboldt RESCO vision. In particular, they can affect 1) the community's ability to implement the RESCO vision, 2) the benefits accrued by the local community from these renewable energy projects and programs, and 3) the potential risks associated with project and program development.

It must be noted that models listed below may be applicable for variously sized renewable energy projects, but not all models are applicable at all scales. For example, some models are applicable only for large or medium scale renewable energy projects that feed wholesale power to the local grid for distribution and retail sale. Other models, however, might be applicable only for small, distributed generation projects that are located at retail customer facilities and may predominantly meet retail customer load. Most of the models discussed below are focused on large to medium scale projects that sell power wholesale to the grid. However, where appropriate, models appropriate to facility level distributed generation projects are also identified and discussed.

1.2 Project Development and Ownership

Development of a medium- to large-scale renewable energy project typically includes the following stages: feasibility study, execution of a power purchase agreement, environmental review, permitting/licensing, interconnection and transmission studies and agreements, financing, final engineering design, construction bidding and contracting, project construction, operation and maintenance, decommissioning. A project developer sees that these tasks are completed. The project developer may be a full or partial owner of the project. Potential project developers and owners are listed and described below.

Existing power plant developers and owners in Humboldt County include our local investor-owned utility, Pacific Gas and Electric Company (PG&E), and various independent power producers. PG&E developed, owns and operates the Humboldt Bay Generation Station. There are also numerous power plants that have been developed and are owned and operated by IPPs. These include the Fairhaven, Blue Lake and Scotia biomass power plants. Fairhaven and Scotia sell their power to PG&E, whereas Blue Lake sells to San Diego Gas and Electric Company. There are also numerous small hydroelectric generators (25 kW to 5 MW in capacity) that are owned and operated by IPPs, with the power sold wholesale to PG&E. Finally, there are many small, distributed renewable generators (predominately solar PV) that are installed on the customer side of the meter and deliver power to the grid via net metering.

At the state level, IOUs generate approximately 25% of California's electricity, municipal utilities generate about 17%, and private-sector companies competing in a wholesale electricity market provide the remaining 58% (IEPA, 2008). In addition to their own generating capacity, IOUs and municipal utilities buy from IPPs either through power purchase agreements or on the spot market. The California Public Utilities Commission regulates IOUs and local governing boards regulate municipal utilities.

1.2.1 Investor Owned Utility

Investor Owned Utilities (IOUs) are the leading electricity providers in the United States. IOUs serve 73% of US electricity customers, own 47% of electricity generation, 77% of transmission lines, and 48% of distribution systems (National Rural Electric Cooperative Association, 2006). Large economies of scale and innovations in energy generation technologies have led to consolidation of these utilities and the formation of natural monopolies. Under state and federal regulations, IOUs have historically provided customers with the generation, transmission, and distribution of electricity in exchange for revenues that attempt to recover costs and optimize the return on shareholder investments. State public utility commissions regulate the retail rates IOUs are allowed to charge their customers. In some states, such as California, revenues have been decoupled from electricity sales so that IOUs do not have a disincentive to promote energy efficiency and conservation.

Most investor owned utilities are vertically integrated operating companies that provide basic services for the generation, transmission and distribution of electricity. As such, IOUs bear the responsibility of building and maintaining the infrastructure for their operations, including power plants, transmission lines, and distribution systems. IOUs are also responsible for the delivery of energy, metering, billing, operations, and customer services. IOUs determine the load requirements of service areas and must provide customers with adequate, reliable, and consistent energy.

As private, for-profit companies, the primary objective of investor owned utilities is to maximize shareholder profits through revenue generated from customer sales. This revenue must cover all of the IOU's cost-of-service expenses, including operating, maintenance, and capital costs, fuel, power purchases, and income taxes. This revenue must also provide the highest allowable rate of return on shareholder investments. Energy rates charged to customers are obtained by determining the average price of energy. This price is customized by customer class and may fluctuate according to changes in sales volumes and the levels and patterns of consumption.

Traditional electric utilities serve distinct geographic regions composed of different consumer classes. Each utility has the authority to categorize its own customers into classes for the purpose of assessing energy sales and revenue requirements, electric rates, and for planning load growth and demand quantities. Classes of service include residential, commercial, industrial and transportation sectors. Although customers may be within the same class, they can still vary in energy consumption levels. Multiple rate schedules are therefore applied to each class in order to compensate for the utility's cost of service. For example, residents who use electric space heating may have a different rate schedule than residents who do not. IOUs will periodically reevaluate the classes of service in order to update rate schedules and to reflect any changes in variables such as demand levels and patterns of peak use.

Investor owned utilities offer several advantages in serving electricity consumers. They have been in the electricity business for many years and have amassed a tremendous amount of experience and a very high level of technical expertise. This enables them to provide reliable service and to design, implement and maintain increasingly complex systems of energy production and supply. They are typically large companies serving a large number of customers. This allows them to achieve economies of scale in both their physical and organizational infrastructure. Also, because they are large companies with substantial financial resources they are typically capable of financing significant upgrades to the electrical infrastructure.

Investor owned utilities also pose disadvantages. Because they have historically been vertically integrated entities (they have owned a large share of the generation, transmission and distribution infrastructure), they are often "natural" monopolies. State and federal laws have attempted to protect consumers from abuses of power by regulating these natural monopolies and ensuring that customer rates are based upon cost-of service expenses and by guaranteeing that IOUs supply quality service at reasonable, regulated rates to all classes of customers. In recent years there have been efforts to deregulate the electric utility industry in an effort to lower retail prices, and these efforts have met with mixed results. Nonetheless, the industry is changing and the IOUs will need to adapt to regulatory and market reform and respond to competition in order to remain viable. As IOUs face the risks of competition, they sometimes use their substantial financial and political influence to fight their competitors. This was recently seen in PG&E's financial backing of California's Proposition 16 initiative in June of 2010, an initiative that sought to make it more difficult for communities to establish public power options. PG&E has also aggressively fought efforts to establish community choice aggregation in California communities. These types of strong-arm tactics to fight competition have eroded community support for investor owned utilities in some locations.

1.2.2 Independent Power Producers

According to the Energy Information Administration (EIA), an independent power producer (IPP) is "[a] corporation, person, agency, authority, or other legal entity or instrumentality that owns or operates facilities for the generation of electricity for use primarily by the public, and that is not an electric utility," (EIA, 2010). These non-utility entities generate electric power for wholesale to utilities or other entities that serve retail customers. IPPs do not typically own their own transmission lines and thus rely on utilities or other providers to sell, transmit, and distribute electricity to end users.

The independent power sector was established in 1978 with the passage of the Public Utilities Regulatory Policy Act (PURPA). This law required utilities to purchase renewable or co-generated power from independent producers at utility avoided costs and was originally intended to help industrial facilities capable of cogeneration. However, a guaranteed market and favorable pricing quickly attracted renewable energy entrepreneurs who began building facilities for the sole purpose of generating and selling electricity to utilities (Russo, 2001).

Independent power producers can be privately owned, community owned, or joint ventures between public and private partners. Each of these ownership structures has its own advantages and challenges. Many IPPs are operationally distinct subsidiaries of IOUs that have purchased divested generation capacity from other IOUs. One of the primary motivations for electric power restructuring was the belief that by opening the market to competition, the most efficient producers would replace inefficient generators. Indeed, there is some evidence to suggest that IOUs with the lowest O&M costs have been more likely to form IPPs and that these IPPs have purchased large amounts of divested generation capacity from IOUs with higher costs, leading to gains in economic efficiency (Ishii, 2006; Wolfram, 2003).

The establishment of utility scale renewable energy projects by independent power producers is also becoming more common. Since PURPA, varying regulatory structures and pricing incentives have historically made for an uncertain market potential for renewable IPPs. However, general concerns over climate change and energy security as well as specific new mandates for Renewable Portfolio Standards (RPS) have led to a resurgence of IPP renewable energy projects.

IPP projects of this type can be beneficial to both utilities purchasing on the wholesale market and retail end users. Many renewable energy technologies are immature and intermittent, making them a risky investment as compared to conventional fossil fuel fired power plants. By purchasing renewable electricity from an independent power producer, utilities limit their own risk and thereby the risk of rate increases for their customers. These types of arrangements are dependent upon Power Purchase Agreements (PPAs) in which the IPP enters into a long-term contract (typically 5-25 years) with the utility and the utility agrees to buy some or all of the energy produced at a set or escalating price. Because of the risky nature of these investments, securing a PPA is often a crucial prerequisite for obtaining IPP project financing. In addition to shifting risk away from utilities and ratepayers, competition among IPPs to obtain Power Purchase Agreements in a wholesale market should promote innovation in renewable energy projects, ultimately increasing efficiency and decreasing price.

1.2.3 Public Power

Public power options in California include municipal utilities and community choice aggregators. Each of these options is considered below.

1.2.3.1 Community Choice Aggregation

Community Choice Aggregation (CCA) presents communities served by an investor owned utility with an innovative and empowering energy service option. Communities represented by a city, county, or a joint powers authority, are able to aggregate their electric loads for the purpose of purchasing electricity. This allows communities to choose their electricity suppliers and to find a provider best suited to meet the specific energy requirements and goals of their community. Additional benefits include the ability to develop sustainable energy supply strategies, set energy rates, reduce environmental impact, and promote energy conservation and efficiency.

The CCA is responsible for securing the generation component of electrical power supply services. This can include purchase of power from a supplier (such as an IPP) and/or the CCA can develop its own generation capacity. CCAs are not accountable for distribution, transmission, metering, billing, operations or maintenance. The existing utility continues to provide these services.

The CCA becomes the default electric power provider for customers within its service area, though residents that prefer the original utility can "opt-out." CCA customers will not experience any change in electricity service other than cost and appearance of their bill. They will continue to receive a single bill from the utility, which will include the power generation costs of the CCA, and the distribution, metering, and other operational and administrative costs of the utility.

For communities desiring greater control over how they get their electricity, CCAs can offer many advantages. Communities are able to choose their electricity supplier, and with that choice determine what type of power they will use and what price they will pay for it. This allows communities to choose energy resources that are more environmentally sustainable, such as renewable and low carbon sources of electricity. CCAs are also able to establish retail rates for the electricity generation component of their customer's bills. By establishing strategic rates, CCAs can encourage energy conservation and distributed generation amongst their customers, or offer incentives to attract new businesses or retain existing ones. CCA's can invest in local generation of electricity and thereby stimulate their local economy.

CCA's can potentially achieve comparable or even lower rates than those of the existing utility by using public financing to build new generation facilities. According to a pilot project funded by the California Energy Commission, "private financing costs are more than twice those of a CCA. CCA capital costs were about 5.5%, compared to 12.9% for IOUs" (Local Government Commission, 2006). CCAs can also potentially achieve lower rates because they don't need to make a profit.

However, establishing a CCA is not without risk. CCA's typically will not have the experience and expertise necessary to get themselves established. They will need to hire outside contractors to provide services, and these start-up costs can be significant. Start-up tasks will likely include feasibility studies, economic and risk analyses, CCA formation, a detailed business plan, an implementation plan, power purchase contracts, legal and marketing activities, and outreach and education for residents and businesses. These start-up expenses must be recouped through revenues in the early years of a CCA, and may result in higher energy rates. As of July 1, 2012, Marin Clean Energy (MCE), a CCA serving Marin County has average residential rates that are about 4% higher than PG&E's rates for their Light Green service that provides 50% renewable power (Marin Clean Energy, 2012).

The success of a CCA depends in large part on interest and support from the community. Opposition from existing utilities, residents, and businesses may pose a significant obstacle for a fledgling CCA. Due to a utility's resistance to revenue loss, CCA's may face opposition from the incumbent utility, including aggressive marketing tactics and legal challenges. Customer outreach and education can be a powerful tool for addressing these obstacles. A CCA may hold stakeholder meetings, public forums, and voter referendums in order to gauge public opinion and build support. A successful public relations campaign must engage the community, highlight the benefits of forming a CCA, and address solutions to potential risks.

Overall there are significant risks that must be carefully considered before committing a community to what could be a lengthy, expensive, and complex process to form a CCA. However, as more communities adopt CCAs, various solutions, knowledge, and expertise will evolve that may lower some barriers. In addition, once a CCA has been established it is possible for additional communities to join the existing CCA, and this will likely involve significantly less effort, cost, and risk to the joining community. To date, eleven cities in California have initiated studies and programs of their own, with Marin County being the one community that has successfully established a CCA and begun providing energy services to their customers.

1.2.3.2 Municipal Utility

A municipal utility is another form of public power. It is more involved than community choice aggregation as it requires the public entity to act as a full service electric utility and provide electricity generation, transmission and distribution services to their customers. There are more than 2,000 community-owned electric utilities in the United States serving approximately 14% of the nation's electricity consumption and over 46 million people (American Public Power Association 2012). Publicly owned utilities provide approximately 25% of California's electricity. The largest, Los Angeles Department of Water and Power, serves 3.9 million customers, and the smallest, the City of Biggs, serves 1,800 (Anaheim Public Utilities 2012).

A municipal utility (muni) is a publically owned, non-profit electricity provider that is managed by the community's elected mayor, city council, or board of directors. Because voting members of the community elect these officials, they are in effect utility owners with a voice in energy policies affecting rates and services. A muni's responsibilities include acquisition, transmission, and distribution of energy, metering, billing, operations, and maintenance. Munis strive to optimize benefits for their customers while providing local control over energy supply.

The benefits of municipal utilities include: local control of energy policy and rate setting, direct public accountability to voters, transparent business practices that must follow public process (open meetings, open information and full disclosure, public bid requirements), a competitive edge for business customers, and more money stays in the local community. In addition, munis typically offer lower rates. For example, in 2009, municipal utilities in California provided electric power at an average rate that was 17% below the average IOU rate in the state, and 14% below PG&E's average rate (EIA 2009). While many munis are small to medium sized entities (potentially making them more accessible to their customers), they can still enjoy economies of scale made possible via aggregation through joint powers agencies. That is how a small city like Biggs (population 1,800) is able to provide complete electricity services to their residents.

While established municipal utilities offer many advantages, there are many barriers and risks associated with the start-up of a <u>new</u> municipal utility. These include exorbitant start-up costs and formidable opposition from incumbent investor owned utilities. Add to this the fact that the rates of new municipal utilities will likely not resemble those of a well-established muni, as older munis have had time to reduce their debt levels. Also, tax-exempt debts are prohibited for new munis by federal law, leading to higher costs.

The economic and technical feasibility of forming a municipal utility must be established in order to consider it as a viable power provider for a community. This is partly accomplished by conducting an official, state mandated feasibility study. A preliminary feasibility study examines the region's electric load growth, evaluates the projected cost-of-service from various wholesale electricity suppliers, and estimates the capital and operating costs of the new municipal utility. These expenses are then compared with the incumbent utility's projected cost of service. The feasibility study also assesses potential savings, benefits and risks, and recommends a course of action that is, based upon the findings of the feasibility study, the most appropriate course of action for the community. The ultimate operating costs and rates of a new municipal utility are influenced by several factors, including asset purchase price, start up costs, cost and development of energy infrastructure, debt incurred, and the power supply procurement strategy (Massachusettes Department of Energy Resources 2010).

When a municipal utility is established, it takes control of the existing electrical distribution infrastructure belonging to the incumbent utility, and the incumbent utility must be compensated for the transfer of this asset. Assets based valuation methods are used for determining the value of distribution system assets that must be acquired from the incumbent utility, and these methods vary according to state. Without support from the preexisting utility, asset value and determination of purchase price can become difficult. Extensive litigation may be required to formalize a purchase agreement, resulting in formidable expenses that will impact customer rates and even the final decision on whether to municipalize. A successful valuation process will lead to an election for authorizing the formation of the muni and the use of revenue bonds to fund the asset purchase. As voter approval and community engagement are critical, it is essential that muni proponents conduct an effective public relations campaign to educate constituents on the benefits of municipalization.

1.2.4 Community Renewable Energy Models

As the electricity industry evolves and opens itself to greater competition and innovation, new development and ownership models are emerging. These include community renewable energy models that allow community members to invest in renewable energy projects that provide them with power and/or financial benefit. To date, these community-based models have mostly been used to develop wind or solar electricity projects; however, they could very likely be adapted to support the development of other types of renewable energy resources as well.

The types of community-based models that have been employed include utility sponsored models, where the utility develops, owns or operates a project that is open to voluntary ratepayer participation, as well as various special purpose entity models in which individual investors join in a business enterprise to develop a community renewable energy project. Potential business entity types include general or limited partnerships, limited liability companies, corporations, and cooperatives. Each of these business types has various legal and taxation characteristics that must be considered.

Another distinction between various community renewable energy models is whether the power generated by the renewable energy project is sold at wholesale to the grid, or credited against participant's electric bills through some sort of net metering arrangement. Public-private partnerships are also a possibility. This could include collaborations between the local community and the incumbent investor owned utility or other private entities such as independent power producers, power marketers, energy service providers, and private investors. Numerous community renewable energy models are explored below.

1.2.4.1 Collaborative Partnership between the Community and IOU

One option for developing local renewable energy resources is to develop a collaborative partnership with the local investor owned utility, in our case Pacific Gas and Electric Company. In 2008, when Marin County was seriously considering establishing a CCA, they also considered an alternative approach to meeting their environmental and energy goals. The alternative approach was a plan proposed by PG&E called the "Marin County – PG&E Greenhouse Gas Reduction and Renewable Energy Program" (PG&E 2008). The main element of this plan was that PG&E and Marin were to collaboratively explore the financing, development and operation of solar electric (photovoltaic) and other desirable renewable energy projects at sites identified and approved by Marin. Electricity from these facilities would be sold to customers in Marin who voluntarily chose to participate. Marin customers would have first right to purchase this power. This essentially would have established a local "green tariff"[1] for Marin.

This is similar to the Sacramento Municipal Utility District's (SMUD) SolarShares program. In this program SMUD contracted with a solar developer to build, own, and maintain a 1-MW system. The developer sells the power to SMUD under a twenty-year power purchase agreement. The electricity from the system is fed directly into the grid and SMUD uses it as the

[1] A green tariff is a special electricity rate that allows customer to choose to purchase renewable energy at a premium price. This practice is common in the UK and Europe, and many utilities in the US offer green tariffs as well.

basis for its SolarShares program where customers pay a fixed monthly fee in exchange for kWh credits based on the output of their solar subscription.

1.2.4.2 Community Renewable Energy – Wholesale Power Sales

The bulk of the current literature regarding community-owned power generation focuses on wind power projects, but elements of the "community wind" model may be applicable to power projects involving other renewable resources as well (e.g., biomass, solar, wave, hydro). Indeed, "community solar" projects are also gaining interest.

The "community wind" concept refers to locally owned power generation projects consisting of utility-scale projects that are interconnected on either the customer or utility side of the meter (Bolinger et al., 2004). The "locally owned" element usually means that one or more community members have a significant direct financial stake in a project, and therefore a share of project net income flows into the local community. As described in greater detail below, local ownership can take many forms, though in all cases it must be more significant than local land lease and tax revenues that would occur regardless of how the generation plant is owned (Bolinger et al., 2004).

The term "utility-scale" refers to power plants larger than residential or facility scale generators that are designed to feed energy into a transmission and distribution grid. In a community wind context, Bolinger et al. define utility-scale as projects consisting of at least 600 kW in nameplate capacity.

The community wind concept is flexible, allowing projects to be developed using a variety of different organizational structures, each of which has unique advantages and challenges. Organizational structures that have successfully been used to develop community wind projects in the U.S. are described below, along with key issues and barriers to forming each structure.

Multiple Local Owner

A multiple local owner organizational structure consists of local landowners and investors with tax credit appetite, pooling their resources to own and operate a power project. Resulting power output is sold to the local utility. One key issue associated with the multiple local owner structure is the capacity of the community to provide sufficient quantities of equity investment capital, particularly if the project offers only a modest rate of return. Another issue is the ability of local investors to exploit federal and state tax incentives, preferential lending programs, and grants. Examples of such programs include the federal Production Tax Credit (PTC), accelerated depreciation, Section 9006 USDA grants, and state incentive programs. For example, if a multiple owner structure is set up as a not-for-profit organization, then the investors may not be able to harvest federal and state tax credits, thereby reducing the expected financial return on investment. Flip structures (described below) provide a mechanism for acquiring project finance when local investors cannot adequately exploit federal and state tax incentives. A third issue is the ability of the project proponents to successfully negotiate a power purchase agreement with a wholesale buyer.

As the multiple local owner structure usually requires formation of a limited liability company (LLC), in which local investors purchase shares, security registration with the SEC may be required.[2] An additional issue with a multiple local owner structure is that the administrative burden associated with the management of many investors may also be costly. Lastly, interactions between federal and state incentives (e.g., anti-double-dipping provisions) may limit the benefits of multiple incentives.

[2] The Internal Revenue Service (IRS) defines an LLC as a legal business structure, usually a partnership or sole proprietorship, where owners have limited liability for the debt and actions of the LLC and can take advantage of benefits such as pass-through taxation and flexible management structure.

A multiple local owner structure may help maximize local benefits. Studies suggest that community owned wind projects can have between 1.1 to 2.8 times the local employment impact as an average absentee or outside owned project (Lantz and Tegen, 2009). However, raising equity investment and utilizing tax benefits necessary for project financing may prove challenging to accomplish without some outside investment.

Flip Structures

A flip structure is generally a hybrid ownership model designed to allow local project developers the ability to obtain sufficient equity investment and sufficient tax liability so that tax incentives can be fully exploited. The structure features substantial outside ownership in the early years, and then "flipping" to majority local ownership in the latter project years. Two variations of this model, a "Minnesota-style" flip and a "Wisconsin-style" flip are described below.

A Minnesota-style flip structure was designed to provide local project ownership and to take advantage of the PTC. This ownership structure involves the development of a small wind project between a local landowner (typically the owner of a site with a renewable resource) with limited tax liability and a tax-motivated corporate equity partner (typically a C-corporation). An LLC is formed and the corporate partner owns the majority of the project (e.g., 99% corporate to 1% local owner) during the first 10 years. During this period, all cash flows and tax benefits are distributed based on the proportion of ownership, which tends highly in favor of the corporation in order to take full advantage of available tax benefits. After 10 years, the PTC expires and ownership "flips" to the local landowner (e.g., 99% local owner to 1% corporate). Essentially, the corporate partner has capitalized on project income and tax benefits for the first 10 years, after which the local landowner inherits a debt-free wind project. This ownership structure was specifically created to successfully develop community wind projects in Minnesota.

The largest barrier to this structure is attracting a tax-motivated corporate partner willing to invest substantial equity for a potentially modest rate of return. The pool of large investors in wind power projects has been small and there has been a tendency for investors to pursue larger projects initiated by commercial developers (Harper et al., 2004). Another issue is the identification and negotiation of potential project revenue sources.

In contrast, a "Wisconsin-Style" flip structure seeks to separate a local owner's investment from equity ownership in a wind project. This is accomplished by organizing a group of local investors with limited tax liability into an LLC, which then provides debt financing to a project (e.g., 20% of total cost). The LLC loans this amount to a tax-motivated corporate partner who contributes toward project cost (e.g., 30% of total cost) in the form of equity. Remaining project costs (e.g., 50%) are borrowed from a commercial lender. The corporate partner owns 100% of the project during the first 10 years and thus fully captures project revenue and tax benefits, while also repaying the entire commercial loan and only interest on the loan from the LLC. After 10 years, project ownership does not technically flip, but rather local partners buy out the corporate partner's project share. The corporate partner retains the LLC's loan principal as payment and the LLC assumes 100% project ownership.

This structure faces the same issues encountered by the multiple local owner and Minnesota-style flip models. The presence of multiple local investors implicates a costly administrative process and potential security registration. Additionally, attracting a corporate equity partner and negotiation of a power purchase agreement are likely this structure's biggest barriers.

Municipally Owned

A town-owned structure consists of a power project financed and owned by a town or municipality. This does not refer to a conventional municipal utility, which provides power directly to its customers. Instead a town-owned project sells resulting power to a utility or other wholesale buyer to generate revenue for the town or municipal budget. Construction of a project on town-owned land may not be subject to land lease or property tax payments, and could potentially be financed through attractive municipal bonds.

The primary issue with this structure is the unclear legality of a town to own a power generation project other than for governmental use. In Oregon, Sherman County has been legally restricted from being an equity partner in a for-profit community wind project. This model is, however, being pursued by the Community Wind Collaborative in Massachusetts. Furthermore, because the project's power would be sold to a wholesale buyer, the sale would likely be deemed for private rather than government use. This could limit the use of tax-exempt municipal bonds for project financing since the bonds would technically be raising capital for a private business use. This structure would not be eligible for federal tax benefits.

1.2.4.3 Community Renewable Energy – Retail Consumption

Over the last several years many states have instituted policies that encourage innovative community renewable energy programs, primarily for solar photovoltaic energy systems. A common theme in these programs is that the solar array and group members must be in the same utility service territory. Other requirements might include a cap on the renewable energy system size, proof of partial ownership, or limits on the types of ratepayers that can participate. Billing methods can vary. Some offer one aggregate bill for the whole group and others assign a pro-rated monetary credit to each member's bill. Two mechanisms used for distributing the benefits of the community owned renewable energy system are group billing and virtual net metering (Coughlin, et.al. 2010). These approaches are described below, as is the simple behind-the-meter approach.

Group Billing

Group billing works similar to master metering in a multi-family or commercial facility. The landlord receives a bill for the total electricity use in the facility and then determines how to allocate electricity costs to individual tenants. Group billing works much the same way except that participants do not need to reside in the same building. The utility produces a bill that shows all participant's energy consumption and associated charges, and the output from the shared renewable energy system is netted against the group bill. Remaining costs are allocated according to an agreement between the participants. This system allows multiple geographically dispersed participants to receive net-metering credit from a single renewable energy system. One drawback with this system is that a single customer representative must act as the point of contact between the group and the utility. The State of Vermont allows group billing and their two largest utilities are serving over 20 groups. Vermont's program allows any eligible renewable resource, including wind, small hydro, biomethane, and solar.

Virtual Net Metering

Virtual net metering programs have been started in Massachusetts, California and Maine. Similar to group billing, a number of geographically dispersed participants enjoy the benefits of one centrally located renewable energy system. However, under virtual net metering there is no master group bill – instead, the credits show up on each individual customer's bill the same way they would with a traditional net billing program.

In California the virtual net metering program is only allowed in multi-family affordable housing complexes, where all tenants are located at a common facility. In contrast, Massachusetts has instituted a more ambitious virtual net metering program. Under their neighborhood net metering program, one renewable energy system can serve the energy needs of a group of ten residential customers within the neighborhood. An alternative program allows participating net-metered systems to allocate excess monthly generation to one or more customers within the utility's service territory.

California is considering legislation (SB 843 - Wolk) that would establish a communit-based renewable energy self-generation program (Environmental Entrepreneurs 2012). This program would allow electricity customers an option to own renewable energy generation in a shared facility. Participants would invest in the community facility and then would receive a credit on their bill for their portion of the energy generated by the facility.

1.3 Financing

Project financing is critical to the successful development of renewable energy projects. The types of financing mechanisms used can vary depending on the size of the project and the type of project developer/owner. For example, some financing mechanisms are suited to private entities, whereas others are applicable only to public entities.

Financing can primarily be categorized into two different types: equity financing and debt financing. Equity financing involves an exchange of money from the lender in return for a piece of ownership in the business, where as debt financing is a loan that is given in exchange for repayment with interest at some future date. Debt financing includes both standard loans, as well as bond financing.

1.3.1 Equity Financing

When a renewable energy project is funded through equity financing, investors support the project in exchange for partial ownership interests (stock). As such, they have a vested interest in the operations, management, and ultimate success of the venture. Equity financing is often used in the early stages of project development when the startup company does not have sufficient revenues, cash flow or hard assets to act as collateral for debt financing. Because equity financing is obtained through investments rather than loans, a project can become established without the burden of debt. Equity financing can also be used by an established entity that requires capital to expand. However, including outside investors in a project results in diluted ownership for the project developer and may require the developer to share management control.

1.3.2 Loan Financing

There are two primary ways to finance a power plant: project financing or corporate financing (Wiser and Pickle, 1998). These two financing structures differ primarily in how debt is structured. With project financing, lenders look primarily to the cash flow and assets of a specific project for repayment rather than to the assets or credit of the project developer. Independent power producers have generally relied on project financing. Because project financing relies on the cash flow and assets of the project, long-term power purchase agreements that guarantee a revenue stream are critical. The strength of the underlying contractual relationships is also an essential element in project financing.

With corporate financing, which is often called internal or balance sheet financing, lenders look to the entire corporate balance sheet of the borrower for repayment. Inherently, corporate financing lacks the same degree of asset-specificity found in project financing. Instead, the primary requirement made by lenders is a restriction on the issuing of debt beyond certain limits relative to a corporation's overall assets. Corporate financing is common practice with electric utility companies.

1.3.2.1 Bank and Private Sector Loans

One of the primary ways a renewable energy project can source capital is by borrowing it from a bank. The borrower receives a principal amount of money from a bank or other financial institution and is obligated to repay it over time with interest. Types of bank debt include corporate lending, project finance or limited recourse finance, mezzanine finance, and refinancing. A renewable energy project might best align with project finance or limited recourse finance. As described above, this refers to a loan made for a specific project, in which the loan amount is linked to the revenue the project will generate over a period of time as a means to repaying the debt (Justice, 2009). The debt amount is further adjusted to reflect inherent project risks, such as the ability to produce and sell power. For example, this might require an analysis of 12 months site-specific wind data for a wind power project. If the amount of bank debt accessible by a renewable energy project is insufficient, mezzanine finance may be sought. Mezzanine loans are usually of shorter duration and more expensive for borrowers since they carry more risk. This is because the repayment obligation of mezzanine loans is subordinate to most other forms of debt. For a renewable energy project, a mezzanine loan may be more economical than seeking additional equity in some cases (Justice, 2009).

1.3.2.2 Government Loan Guarantees

Federal loan guarantee programs include the US Department of Energy (DOE's) Loan Guarantee Program and the US Department of Agriculture (USDA) Rural Energy for America Program (REAP) Loan Guarantees. Through these loan guarantee programs the government guarantees debt associated with energy production or manufacturing facilities relevant to renewable and other energy technologies. The government guarantee lowers the risk on the debt and thereby lowers the required yield.

The DOE Loan Program includes the Section 1703 Program that supports clean energy projects employing a new or significantly improved technology that is not a commercial technology and that avoids, reduces or sequesters air pollutants or anthropogenic emissions.

The USDA REAP Guaranteed Loan Program encourages the commercial financing of renewable energy and energy efficiency projects. Under the program project developers work with local lenders who in turn apply to USDA Rural Development for a loan guarantee of up to 85 percent of the loan amount. Benefits to borrowers include higher loan amounts, stronger loan applications, lower interest rates and longer repayment terms that can assist businesses that may not qualify for conventional lender financing. All projects must be located in a rural area, must be technically feasible, and must be owned by the applicant.

1.3.3 Bond Financing

Bond financing is similar to loan financing except that with bond financing the capital is sourced from a group of investors (the bondholders) rather than a central institution (i.e., a bank). The borrower makes principal and interest payments to the bondholders through a corporate trustee (usually a bank), which handles all the record keeping and payment functions. The bond company underwrites the loan by first committing to purchase all of the bonds and then selling them to their investors.

Bonds are similar to stocks (equity finance) in that they are both securities. However, whereas stockholders have an equity stake in a company, bondholders have a creditor stake. The owner of the project is required to pay interest (coupons) to the bondholder. Bonds are typically issued for a set term, after which time the full value of the principal is repaid to the bondholder.

1.3.3.1 Corporate Bond Financing

Corporate bond financing is a method used by corporations to raise funds for general operations or a specific project. Debt securities are issued, usually at the price of $1,000 per bond, under the condition that the full amount of the bond will be repaid to the investor after a set number of years. The corporation is required to pay fully taxable interest to the buyer until the bond matures. Interest rates can be fixed or variable and are dependent on the duration and risk level of the bond. In general, long term and high-risk bonds will pay higher interest rates than short term and low risk bonds. The main risks associated with a corporate bond are if the corporation goes bankrupt or if they default on the loan. Because of this risk, corporate bonds typically pay higher interest rates than government bonds, which have a guaranteed payback (Fidelity Investments, 2010).

Financing renewable energy projects with corporate bonds may be difficult initially because investment in many renewable energy corporations is still considered risky. These corporations would likely have to offer prohibitively high interest rates in order to attract investors to these high yield bonds. In addition, Edwards et al. report that transaction costs increase with credit risk, adding to the difficulties of using of this type of financing for new renewable energy companies (2007). However, bond financing is a very important part of the U.S. economy and will likely be an important tool for well-established and high-performing renewable energy developers.

1.3.3.2 Public Bond Financing

Public bond financing can be used by state or local government entities to acquire capital for a renewable energy project. As with other bonds, the government must pay interest to the lender over the term of the bond, with the full principal being repaid when the bond reaches maturity. Public bonds typically pay a lower interest rate than corporate bonds because the government can raise taxes to repay the bonds, which usually makes them more secure than corporate bonds. Public bonds may also have a lower interest rate because bondholder interest income is often exempt from state and federal taxes. Public purpose energy projects such as gas and electric systems, district heating and cooling, and alternative energy projects typically qualify for tax exempt financing. Voters must approve state bonds in a majority election. Local bonds must be approved by a 2/3 majority of voters.

Public, or municipal, bonds can be either general obligation bonds or revenue bonds. General obligation bonds are secured by the full faith and credit of the municipality that issues them. They fund projects that do not produce income and provide benefits to the entire community. In contrast, revenue bonds are municipal bonds that fund income-producing projects. The income generated by these projects pays the interest and principal to revenue bondholders. Projects funded by revenue bonds serve only those in the community who pay for their services. Because they are not backed by the full faith and credit of a municipality, revenue bonds carry a somewhat higher default risk and therefore typically offer higher interest rates. Revenue bonds can be well suited to income producing renewable energy development projects. In addition, revenue bonds may be more palatable to a community because they don't burden the municipality's general fund.

Another type of municipal bond available for renewable energy projects has been the Clean Renewable Energy Bond, or CREB. CREBs are applicable to local, state and tribal governments, municipal utilities, and electric cooperatives. With CREBs, the federal government lowers the cost of debt by providing a tax credit to the bondholders in lieu of interest payments from the issuer. This tax credit can result in lower or potentially even zero interest rates. However, new applications for CREBs are not currently being accepted. In 2009 the US Congress appropriated $2.4 billion for CREBs. Applications for this round of funding were due in August of 2009, and it is uncertain whether additional appropriations will be made. In addition, the use of CREBs has proven to be time consuming and difficult to transact. Consequently, some recipients of CREBs have chosen to forgo their CREBs allocation in favor of traditional municipal bonds. Some drawbacks of CREBs are: the CREBs tax credit is itself taxable, transaction costs have often proven to be high relative to project costs, and the application process can be challenging.

A federal bond loan program similar to CREBs is the Qualified Energy Conservation Bonds, or QCEBs. QCEBs are applicable to local, state and tribal governments. Of the $3.2 billion allocated nationwide, $381 million has been allocated to the State of California. It is then to be allocated throughout the state based on population, which indicates that approximately $1.9 million will be allocated to Humboldt County. The QCEB is a "tax-credit bond" designed to provide the bond purchaser with a 70% interest subsidy in federal tax credits by the United States government. Funds can be used for energy efficiency and renewable energy project development, energy research facilities and grants, mass transit facilities that reduce energy use and pollution, energy demonstration projects and public education campaigns. Funds are administered through the California Alternative Energy and Advanced Transportation Financing Authority.

1.3.4 Hybrid Debt-Equity Financing

Project financing typically involves both debt and equity, and the debt-to-equity ratio is typically large (e.g., 70% debt to 30% equity) (Goldman, et.al. 2005.). Debt is used when available and when it is the least expensive form of financing, with equity still needed for credit worthiness.

1.3.5 Community Renewable Energy and Flip Structures

The community renewable energy flip structure arrangements discussed earlier provide a means for securing equity and accessing tax incentives in order to finance renewable energy projects.

1.3.6 Grants, Rebates and Tax Credits

Federal grant programs include Tribal Energy Program grants (for American Indian Tribes), USDA program grants, and USDOE program grants. State program grants include California Energy Commission grants. These grants are available at various times depending on appropriations and grant funding cycles.

California state rebates include energy efficiency rebates administered by utility companies, CA Solar Initiative rebates (for solar electric systems), Emerging Renewables Program rebates (for small wind turbines), and Self-Generation Incentive Program rebates (for wind turbines, fuel cells energy storage systems, waste heat to power and other distributed generation technologies). More information on these programs can be obtained from PG&E, the California Energy Commission, and/or the California Public Utilities Commission.

Federal Tax Credits include Investment Tax Credits, Production Tax Credits, and Accelerated Depreciation benefits. The investment tax credit (ITC) provides a tax credit for eligible commercial energy projects including solar, fuel cells, and small wind up to 30% of the project's qualifying costs and for geothermal, microturbine, and combined heat and power projects up to 10% of the project's qualifying costs. ITC eligible systems must be placed in service on or before December 31, 2016. The Production Tax Credit (PTC) provides a corporate tax credit for eligible energy technologies valued at 2.2¢/kWh for wind, geothermal, closed-loop biomass projects or 1.1¢/kWh for landfill gas, hydrokinetic, municipal solid waste, ocean thermal projects over the first 10 years of operation. PTC eligible systems must be paced in service on or before December 31, 2013.

The federal Renewable Energy Production Incentive (REPI) provides incentives to local government, state government, tribal government, municipal utilities, rural electric cooperatives, and Native Corporations. It was designed to complement the federal PTC, which is available only to businesses that pay federal corporate taxes. REPI provides incentive payments for electricity generated and sold by new qualifying renewable energy facilities (solar, landfill gas, wind, biomass, geothermal, anaerobic digestion, tidal energy, wave energy, and ocean thermal) that are operational on or before October 1, 2016. Qualifying systems are eligible for annual incentive payments of 2.2¢/kWh for the first 10-year period of their operation. However, this program is subject to annual congressional appropriations and it has not been funded since 2008.

1.3.7 Environmental Assets (Carbon Offsets, Renewable Energy Credits)

Environmental assets associated with renewable energy projects provide value above and beyond the generated energy. These assets can be sold in combination with the energy commodity, or they can be sold separately in the form of Renewable Energy Certificates (RECs) or carbon offsets. If the environmental assets are sold separately, they can be sold up-front and used as a means of raising capital to help finance the project.

1.3.8 Residential and Small Commercial Financing

A number of financing mechanisms for energy efficiency and facility scale distributed generation projects are now being utilized. Some of these models are discussed below.

1.3.8.1 Energy-Efficient Mortgages

Homeowners can take advantage of energy efficient mortgages to either finance energy efficiency and renewable energy improvements to existing homes, or to increase their home buying power with the purchase of a new energy efficient home. The U.S. federal government supports these loans by insuring them through the Federal Housing Authority or Veterans Affairs programs. This allows borrowers who might otherwise be denied loans to pursue energy efficiency and renewable energy projects. Energy efficient mortgages are also available that are not backed by a federal agency. Private lenders sell loans to Fannie Mae and Freddie Mac, which in turn allows homebuyers to borrow up to 15% of an existing home's appraised value for improvements documented by a Home Energy Rating. Fannie Mae also lends up to 5% for new Energy Star homes.

1.3.8.2 Property Assessed Clean Energy (PACE)

Property Assessed Clean Energy (PACE) is a local government initiative that helps property owners to finance energy efficiency and renewable energy projects for their homes and commercial buildings. Participants receive financing for improvements that is repaid through an assessment on their property taxes for up to 20 years. PACE financing spreads the cost of energy projects over the expected life of the measures and allows for the repayment obligation to transfer automatically to the next property owner if the property is sold.

Currently PACE programs for the residential sector are on hold because of concerns expressed by the Federal Housing Finance Agency (FHFA). In July of 2010 FHFA issued a statement that directed Fannie Mae and Freddie Mac not to underwrite mortgages for properties with a PACE assessment. This has suspended residential PACE program implementation, though efforts continue to resolve these issues. Many jurisdictions have established PACE programs for the commercial sector. In addition, the State of Vermont has passed legislation to move PACE assessments behind mortgages in payment priority, and federal authorities have approved this change. This has allowed Vermont to establish an active PACE program for the residential sector.

1.3.8.3 Leasing, Performance Contracting, Power Purchase Agreements

A number of financing mechanisms exist for distributed energy systems that provide on-site energy to meet customer loads and utilize net metering arrangements. Often the high first cost of these distributed energy systems presents a barrier to the customer, even though the life-cycle economics are favorable. A number of arrangements have been developed to overcome this first cost barrier, where the enduse customer allows a third party provider to install, own and operate a system on their premises. The enduse customer either leases the system from the third party, or pays a negotiated price for the energy generated by the system according to a power purchase agreement. Lease-to-own arrangements are also possible. Similar arrangements have been used to finance the installation of energy efficiency upgrades, where a third party installs the upgrades and is compensated over time based on the actual energy savings that are realized, referred to as performance contracting. In all these cases the third party vendor assumes the risk if the renewable energy system or energy efficiency upgrades do not perform as advertised.

1.3.8.4 On-Bill Financing

On-bill financing is a new financing model that is being implemented via utility companies in California. The utility provides customers with unsecured loans that cover 100% of eligible energy efficiency equipment and installation costs (net of rebates and incentives) at zero percent interest. Customers re-pay the loans via on-bill surcharges that are added onto their monthly utility bills. This program is currently limited to non-residential customers of the four large investor-owned utilities.

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