guidebook

Guide to Developing a Community Renewable Energy Project

in North America

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Commission for Environmental Cooperation

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For more information:

Commission for Environmental Cooperation
393, rue St-Jacques Ouest, Bureau 200
Montreal (Quebec) Canada H2Y 1N9
T 514.350.4300 F 514.350.4314
info@cec.org / www.cec.org

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1 Community Renewable Energy

1.1 Introduction

This Guide is meant to assist community and indigenous communities groups in the development of their own small-scale renewable energy projects. Commissioned by the Commission for Environmental Cooperation, it covers Canada, Mexico and the United States. While mainly focusing on the co-op business model, the information presented is equally applicable to other business models, such as small business or corporate structures.

The Guide covers all the stages of project development and provides guidance on how to approach each one. The project development process is slightly different for each technology, location and jurisdiction. This Guide should help you identify potential issues, identify additional information, contact the right people and authorities, and think through the whole process involved in making your project a success.

The Guide only concentrates on a few technologies, but its elements can be applied to other technologies as well. Wind, small hydro, solar and biomass cogeneration were the technologies selected for this Guide.

This Guide builds upon pre-existing work, such as the Ontario Sustainable Energy Association *Community Power Guidebook*, *Harvest the Wind: A Wind Energy Handbook for Illinois*, and *Community Wind: An Oregon Guidebook*. Links to relevant web sites and reports are provided for further information.

Although this is not a Guide to identifying funding sources, a section is dedicated to financing renewable energy projects. Funding options will vary greatly from one jurisdiction to another, and also from one project to another, since not all technologies or organizations are eligible for grants and loans. It is therefore necessary to research all the funding options available in your jurisdiction.

Two examples of business plans are included with this Guide to help you in preparing to seek funding for your project. Depending on whether your project is on-grid, off-grid or what the governmental support system for renewable energy is in your area, the economics of a project can be very different from one area to another.

You may also want consult other community groups that have developed a project, and learn from their experience. Many decisions have to be made before a project can proceed, such as the determining fuel availability, choosing a technology, determining project size and location, organizational structure, ownership and financing options. It frequently takes several years before a project becomes a reality. It is hoped that this Guide will help shorten the lead-time for your project.

1.2 What is Community Renewable Energy?

The term "community renewable energy" generally means locally owned, locally sited renewable energy (electricity and/or heat). In general, definitions of community energy or community renewable energy tend to include engagement or participation by the community that reaches beyond a simple investment or shareholding relation. It may also extend farther than the community benefit model sometimes used by developers where a small percentage of the income from a private development is devoted for a community benefit such as a new recreation center. Community energy tends to mean some form of control by community owners of the project, through a co-op or as landowners in a pool, as owners in a small enterprise, or as residents and homeowners who live with and work with the installation daily.

A community group may form a buying club to purchase solar panels for homeowner's roofs, reducing cost and negotiating together for installation packages, like the *RISE Cooperative* in Toronto, Canada. The *Wi Co-op* in Washington State also focuses on residential and farm-based wind installations, but provides the network, marketing and fundraising through a central community cooperative. "Locally owned" means that one or more members of the local community has a significant direct financial stake in the project other than through land lease payments, tax revenue, or other payments in lieu of taxes.

Finally, for the purposes of this guidebook, small-scale residential installations are also considered community energy.

1.3 Community Renewable Energy Benefits

A community renewable energy project may offer the following benefits:

Economic benefits[1]

- Help keep more energy dollars in the local economy[2]
- Create jobs
- Add new technical skills to community skillbase from financial management to renewable technology expertise
- Reduce the dependence on fossil and/or foreign fuels
- Help match generation to customer load
- Can help to connect generation and consumption, contributing to a conservation culture
- For many technologies, depends on straight-forward, not highly specialized, repair and maintenance skills
- Produce power when it is in highest demand (daytime, or sunny days in the case of solar)

Environmental benefits

- Helps reduce greenhouse gas emissions and potential climate change impacts
- Help reduce pollution related illnesses
- Help reduce power transmission losses, in grid-connected communities, when the community replaces central power with community energy
- May increase community awareness of energy use and its impacts
- May lead to greater conservation and sustainable energy behavior
- May reduce the need for extraction industries if it avoids the use of fossil fuels
- May reduce the need for large-scale hydro projects with associated effects of flooding and erosion
- Does not create challenging waste problems, such as nuclear or scrubber waste disposal
- Does not require large amounts of water for operation

Social benefits

- Provides opportunities for local participation and capacity building in local communities
- Builds capacity for future projects and initiatives
- Gives voice to people's enthusiasm and interest in renewable energy
- May build greater acceptance of new renewable energy technologies
- Offers skills training with work based in rural communities where it is needed
- Creates long-term, high quality jobs and skills
- May become a symbol of the community and a source of pride and identity[3]

1. See Amory B. Lovins, *Small is Profitable* (2002) for 207 economic benefits to community-scale power. **2.** Teresa Welsh (2005) of the Iowa Policy Project demonstrated that smaller (20 MW or less) locally owned wind projects keep over five times as much money in the community as do larger wind projects owned by out-of-state companies. **3.** A number of studies have provided statistics on community benefits of renewable energy development for specific areas. Many of these have focused on the economic benefits, and include a range of project size and ownership models. See Terry Flowers and Marguerite Kelly, 2005, "Wind Energy for Rural Economic Development" (NREL: US Department of Energy) http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/wpa/flowers_windpower_2005.pdf, and "Community Benefits from Wind Power" (2005) http://www.cse.org.uk/pdf/pub1049.pdf.

2 The Development Process in a Nutshell

2.1 Introduction

The first step in developing a community renewable energy project is to organize a community group. Community engagement is conducted differently in different venues depending on context, knowledge, interest and available resources. It is important to hold community meetings as early as possible and to allow everyone to provide input or ask questions. An ideal community engagement process should offer the tools and knowledge for a community to make an informed decision through a participatory process by which the community will decide whether to pursue a renewable energy project, and what project to pursue. As described in the community engagement section below, the community is a key asset to make renewable energy projects successful. Community engagement will begin in most cases with an informal community group, which may eventually form a community enterprise or co-operative to manage the project. In Mexico, it is necessary to constitute a society in order to pursue projects with an electrical generating capacity of 500 kW or more.

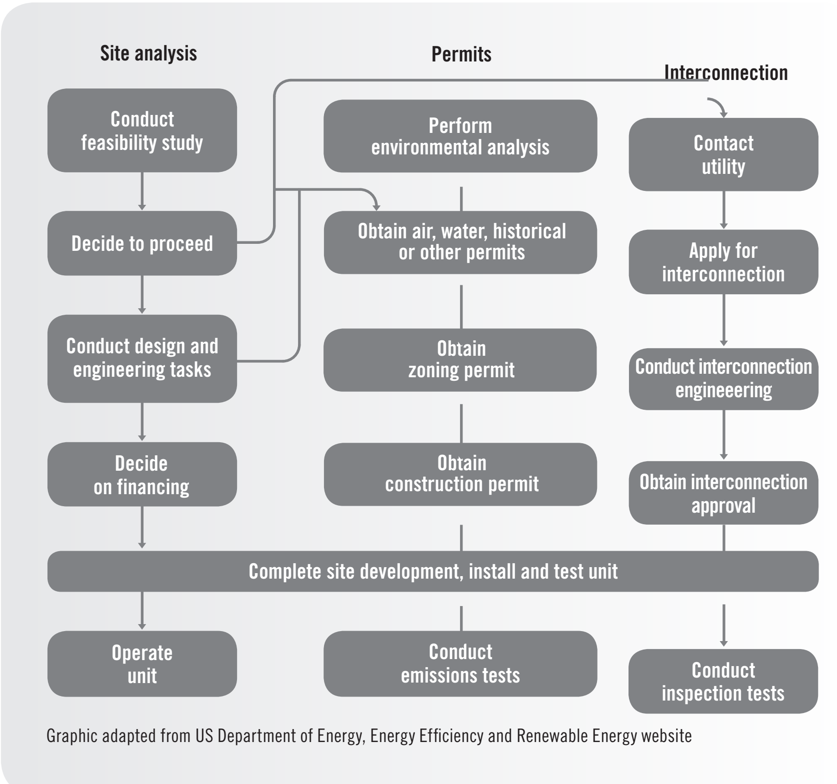
Community involvement includes of key steps that are addressed below in section 3. To summarize, a strong community engagement process will:

- Hold initial meetings
- Build appropriate relationships and trust in the community
- Raise community awareness of renewable energy potential in their area and how RE can potentially mitigate effects of climate change
- Offer sessions to answer questions and discuss concerns, interests, ideas, etc.
- Identify leadership and interest in community energy issues
- Help to identify the community best energy asset and prioritize potential projects
- Help to identify project "champions" for the priority opportunities

Also, identify federal or state Department of Environmental Protection, provincial and municipal regulatory agencies and meet with the local representatives. Let them know what type of project you are considering and ask them some basic questions like these:

- Has a similar technology or system obtained a permit before?
- If so, can the information from that project be made available?
- What are the emission standards for different technologies?
- Is there a minimum/maximum system size and are there any limitations to power output at any time?
- Is there a standard approval process or format for such projects?
- What specific information do you need to review an application?
- Who are the approval authorities for the various siting considerations?
- What approvals are required from the federal government for a project of this size?

Figure 2.1 Development of a Community RE Project



The permitting process and interconnection should run in parallel to financing and engineering tasks to shorten overall project development time. Note that community engagement is not part of this chart, but needs to be undertaken at the beginning and during the project development process.

To ensure a successful project, four key processes must occur simultaneously (see Figure 2.1):

- community engagement;
- technical development and financing;
- environmental siting evaluation, permits and approvals; and
- interconnection.

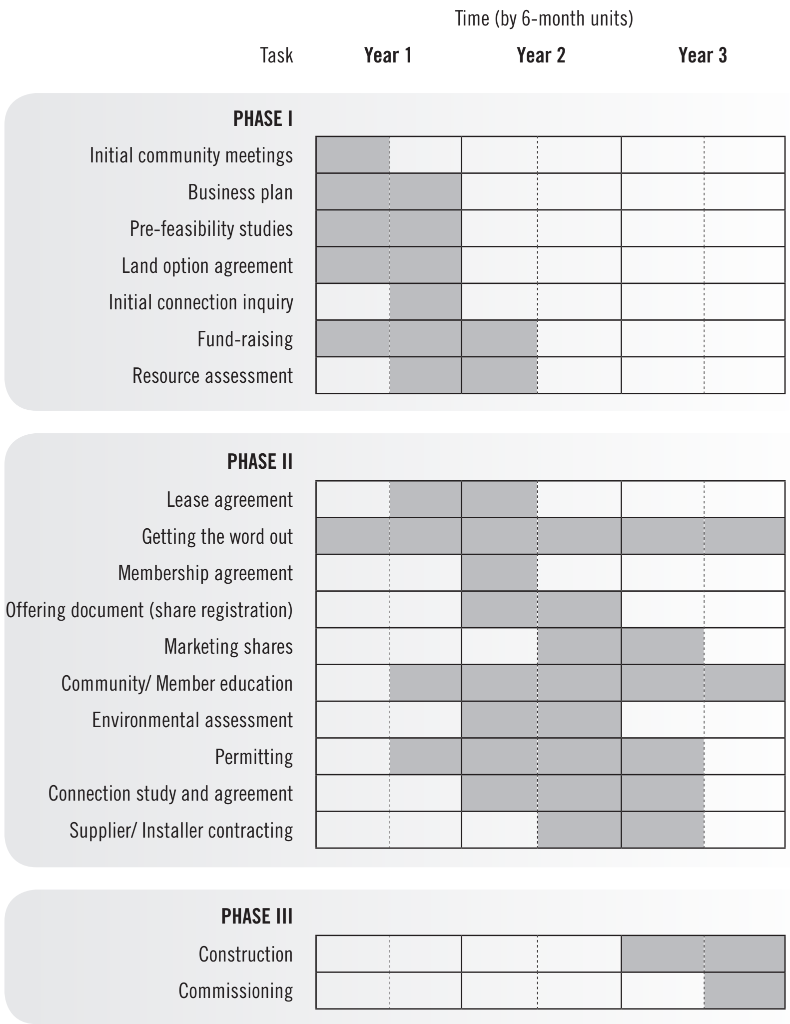
2.2 Planning for Your Renewable Energy System

This section provides planning charts for different technologies. The charts below focus on community-scale projects. Community energy projects are larger than household-size installations, but usually less than 20 MW. The estimates for the duration of the development process are approximate and vary by region and technology. These charts can act as templates for customizing planning for your own area. Note, however, that you must ensure that certain tasks are completed before others, particularly in stages such as the interconnection agreements or the permitting process. Poor timing can result in serious delays and redundancies as certain steps might need to be repeated.

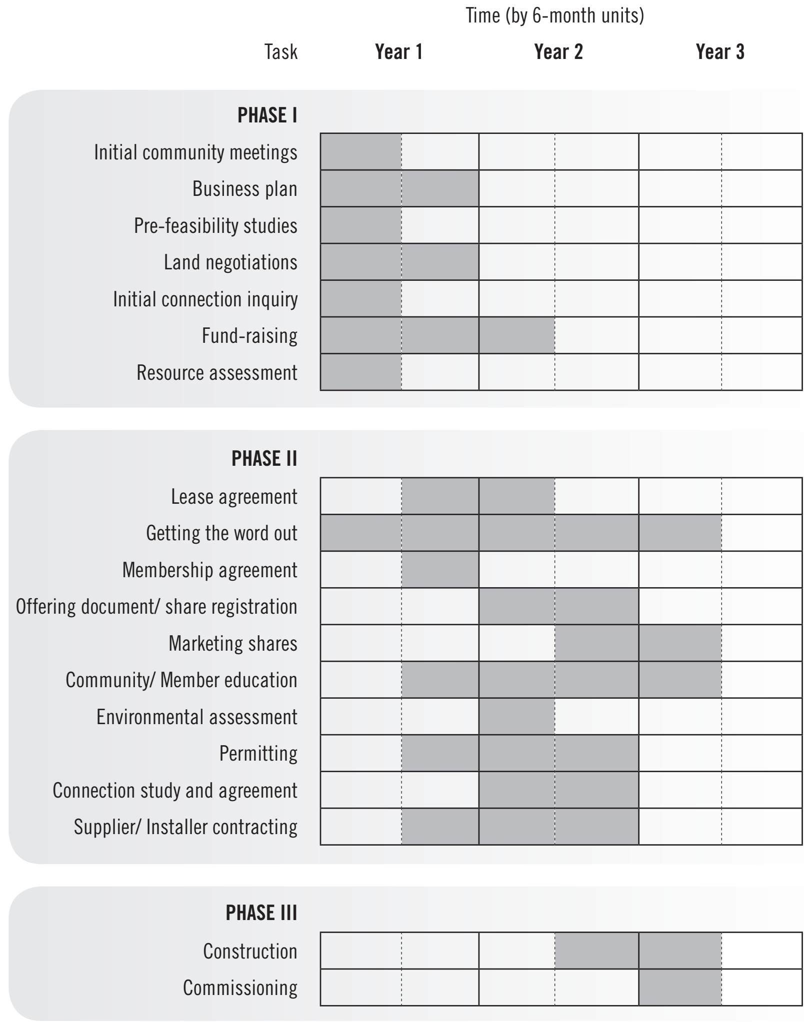
It is important when embarking on community energy to understand that communities are an asset to energy projects; they come with an astonishing array of skills and expertise. Local commitment to a project can streamline the planning; it can give the project access to knowledgeable entrepreneurs, accountants, lawyers, mechanics and engineers who would otherwise need to be imported at great expense and would not know the local jurisdiction. Local naturalists may be interested in doing some of the environmental assessment work—for instance, the bird study as part of an environmental assessment for a wind power project. The local capital of a community cannot be underestimated. It can ensure the difference between success and failure.

Later sections will describe more carefully how to work with community assets. In the planning sections below, community engagement and development are an important part of the overall plan.

2.3 Community Wind



2.4 Community Solar



2.5 Residential Solar

For simpler solar systems such as an installation on a home, use the following steps:

1. **Inform yourself.**
2. **Design, specify and price a system.**
   It is best to do this with your PV system provider.
3. **Get all approvals from:**
   - Neighborhood association (if needed)
   - Electric provider (send in completed interconnection application form)
   - Community building permit department
   - Insurance agent
4. **Apply for any available incentives.**
5. **Order and install system.**
6. **Complete interconnection agreement with your electricity provider, adjust the value of your insured property with your insurance company and send in paperwork for incentives.**

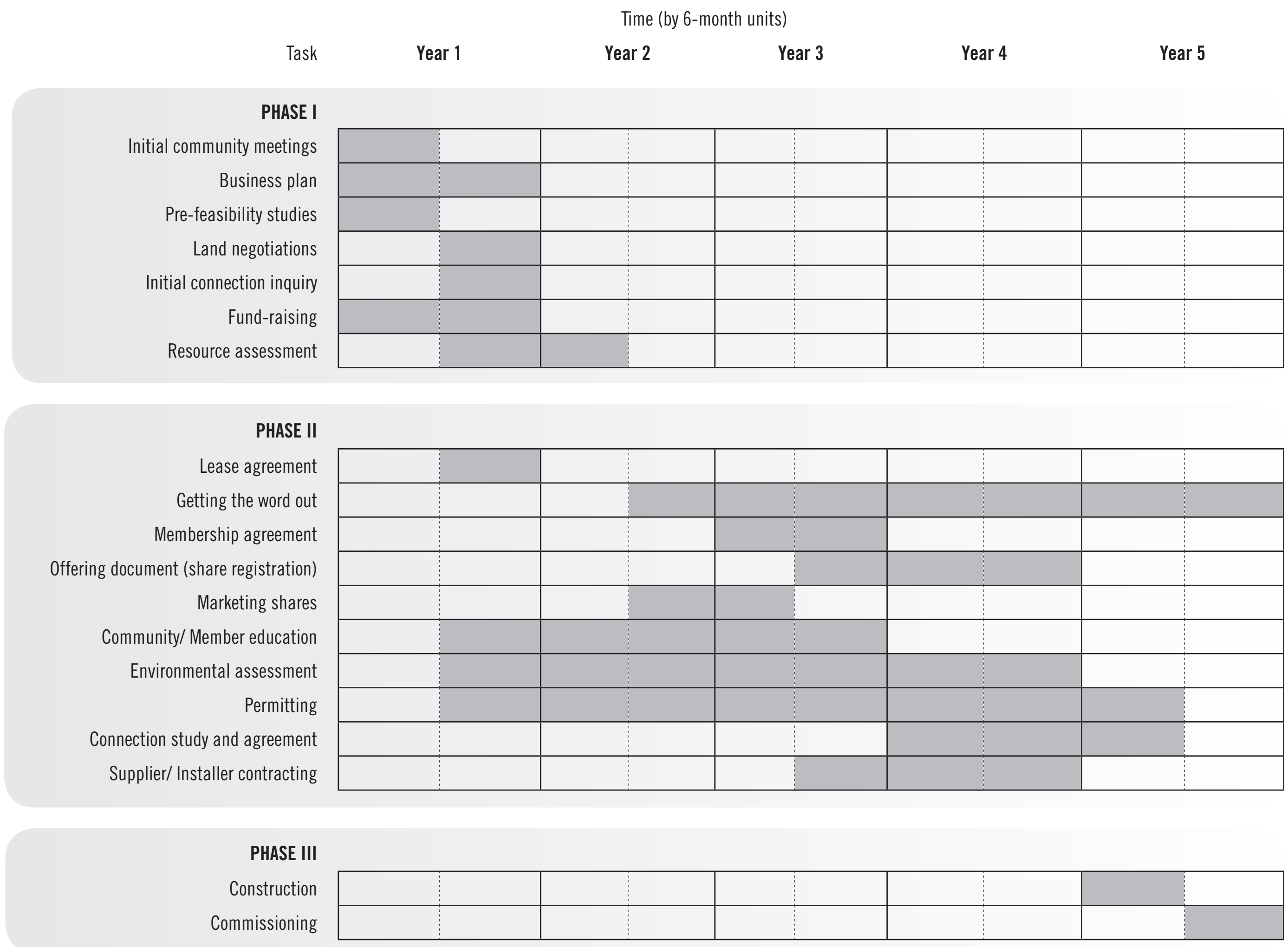
From the Wisconsin Division of Energy

2.6 Micro-Hydro

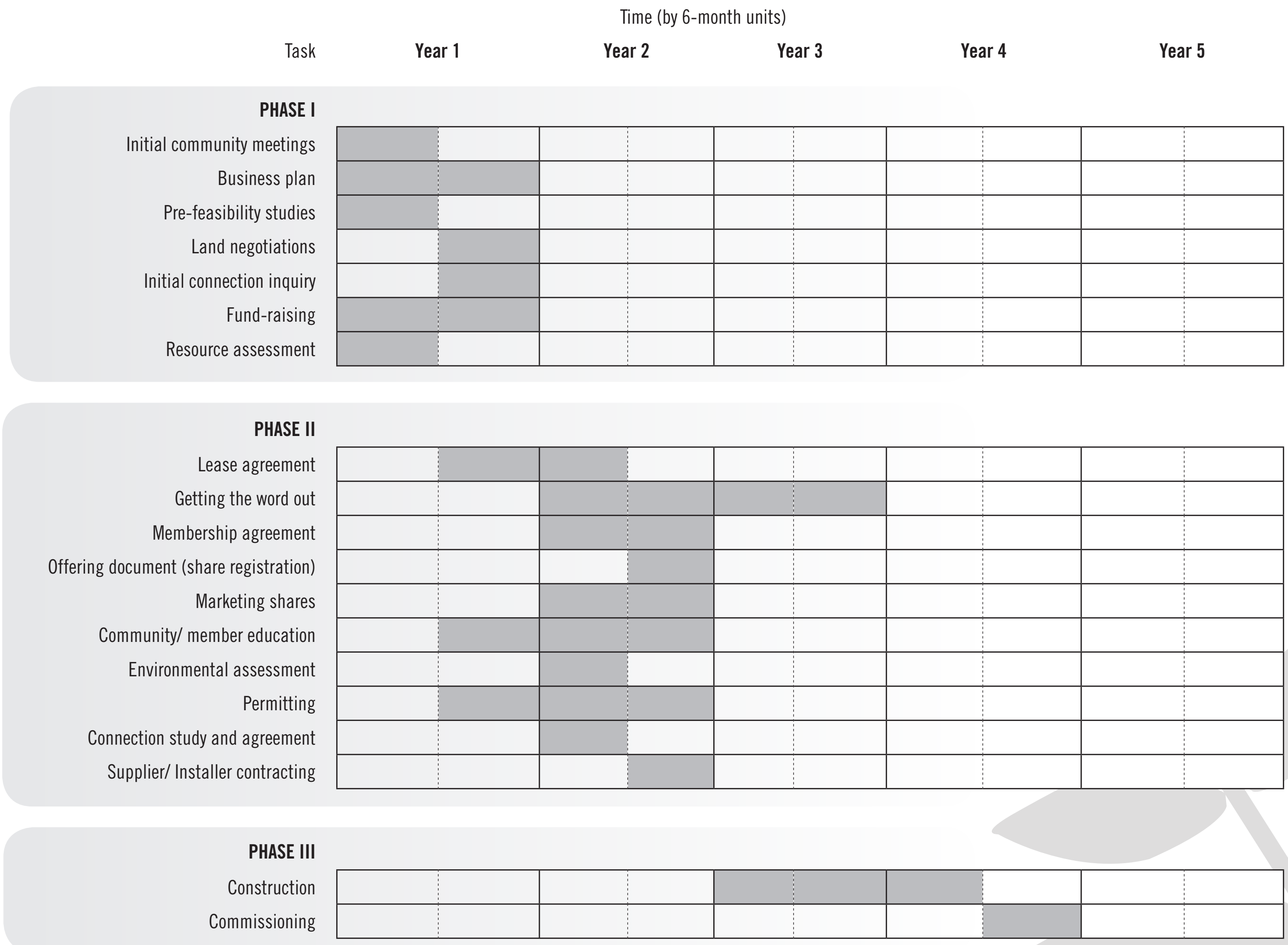
The *Handbook for Developing Micro-Hydro in British Columbia* has excellent recommendations for developing very small hydro projects, a process that would generally be simpler than community-scale projects.[4] However, many permits are required even for micro-hydro systems (under 100 kW). Aside from the permitting, sustainable hydro projects are quite cost-effective and straightforward to develop.

4. See http://www.bchydro.com/environment/greenpower/greenpower1753.html.

2.7 Community Hydro



2.8 Community Biomass



3 Steps to Develop a Community Renewable Energy Project

3.1 Initial Idea and Networking within the Community

Community renewable energy builds on the local expertise, knowledge, planning experience, organizational development expertise, local public relations knowledge and financing skills and contacts. Early community engagement can make or break a project, and not just because it reduces resistance (although it does) but because any community will have the skills embedded in its citizenry to impel the project forward, help it through local planning process, create excitement about the project, raise equity financing, and ensure that the structure of the enterprise fits local needs and experience. For instance, is the community largely a farming community? Then a landowners' pool or collective may work best. Is the community near a small urban center? In that case a cooperative or small business that allows for non-landholding investment may work better. Does the town have a local co-op already? Then a co-op model will be familiar, and may be well-received.

For instance, in the case of the Washington Electric Cooperative's venture into small hydro and renewable energy production, the co-op members drove this new initiative, choosing a new strategic direction for their electric co-op (see http://www.washingtonco-op.com/). This choice has occurred in other rural electric cooperatives throughout the United States.

Local community members can participate at many levels in a project, from doing most of it themselves, like the *WindShare Co-operative* project in Toronto, to projects that plan for ongoing community dialogue but are largely the work of outside developers, as the British Wind Energy Association suggests in their Best Practices for Wind Energy Development (1994). As several studies have shown,[5] greater community involvement means greater community acceptance.

Community resistance is often called NIMBYism (Not In My Backyard). In actual practice, a majority of people support renewable energy and would like to see more of it; the problem in communities seems to have more to do with how some developers approach the community's ownership and stewardship of the area.

Some developers go to the community late in the process, after resource assessment and after obtaining the rights to the land. Sometimes the first community meetings are only held as the wind company begins to offer equity shares in the planned wind farm. Such developers tend to have, understandably, a great deal more trouble than developers who engaged the community from the beginning, or even better, were part of the community as in the case of most community renewable energy co-ops.

In actual practice, community engagement ranges from frequent consultations with the community, and a reliance on community expertise and leadership for completion of the project, to simple solicitations for capital several years into the project. The former model is the most relevant one (and in many ways promises to be the most generally successful, although at the beginning it will seem more daunting and difficult than other approaches).

5. See, for instance, Martin J. Pasqualetti, Paul Gipe, and Robert W. Righter 2002, *Wind Power in View.*

Common Community Concerns: Many studies have been completed to address common community concerns. The greatest focus so far has been on wind development, partly because of the scale of wind installations and partly because the economics of development have meant rapid development of this renewable energy sector.

It is important to note that the concerns that are common in communities tend to be the issues that the environmental assessment process must address when required in a renewable energy project. In Canada, an environmental assessment application requires project proponents to engage in extensive community consultation as part of the assessment process. In addition, the planning and permitting work with local authorities and municipalities will also require research and studies that address these concerns. Any project developer, whether a private corporation or a local community cooperative, will find it necessary to address these concerns.

Engaging the community early can mean community participation and a smoother planning process, facilitated by community members who have visited a similar installation and heard the soft noise of the wind in the blades up close, and perhaps community members who assisted in local bird studies. More details are given below on specific environmental issues that communities will want to address.

- **Birds (wind power)**: The environmental assessment process for wind projects usually requires a study of the bird use of the area before and after construction, and often a mortality survey after construction. Studies of turbine installations suggest that informed site selection is extremely important in reducing the number of birds killed by a wind plant. Often a community group will be interested in participating or completing this study.
- **Noise:** Noise concerns arise particularly around wind energy systems. Local planning authorities generally require setbacks for turbines from residential areas and roads that minimize this impact.
- **Visual impacts:** It is said that your own pigs don't smell. Equally, concern with turbines in your view tends to wane with ownership and engagement. The turbines might be generating dividends for you with each sweep of the blades, making their appearance a welcome symbol for many communities and homeowners. A recent report found that in all but a couple of areas, property values actually increased after the installation of renewable energy; predictable increases and comparisons with similar areas without wind turbines were factored in to confirm the numbers.[6] Concerns with view and landscape aesthetics must be addressed during local meetings.
- **Fish and wildlife:** Community-scale hydro projects will probably require studies of the potential impact of the project on fish and wildlife in the area. Mitigation factors in the equipment design will be necessary to address these concerns before proceeding with the project or obtaining permits.
- **Other environmental impacts:** Hydrological and soil studies should be done for larger renewable energy installations. These studies will ensure a minimum of erosion from construction and access roads, and identify any possible concerns for the construction of the foundations. They are required for any environmental assessment process. Air emissions are a concern with biomass energy facilities. Since wood does not have mercury or sulfur emission problems as do some fossil fuels, the main concern will be particulate emissions. It may be necessary to reduce particulate emissions well under the legally required thresholds in order to increase public acceptance for a new plant, or there may by an impact on the choice of available sites if inhabited areas are downwind of the plant. In addition, the transport of biomass by truck, if required, will lead to increased noise (as well as noise from the plant itself) and air emissions along the access roads. Alternate routing or alternate fuels, or simply a reduction of the size of the plant can reduce impacts from increased traffic. Cooling water, if required, may have to be disposed of, further restricting the choice of possible locations.
- **Public acceptance:** Public acceptance of renewable energy is higher than one would think from the media reports—angry and resistant communities make good press but often represent a small minority of the population. The support and interest in renewables, and even premiums for green energy, are widespread, as confirmed by several opinion polls in North America.

The media may be play key role to play in a transition to renewables. Success in community engagement often depends on careful cultivation of local media outlets; renewable energy proponents should send press releases and informational articles to mark the project's milestones, invite journalists to community meetings and engage them directly about the project. It is essential to engage the community early in the project development with clear presentations of the benefits to the community. Nurture local champions and supportive community leaders, and ensure their presence at community meetings from the beginning of the project.

A typical framework for community engagement starts with two initial meetings and continues with community leader contacts through ongoing cooperative planning sessions:

6. See George Sterzinger et al. 2003. "The Effect of Wind Development on Local Property Values," May. Renewable Energy Policy Project.

Hold a local meeting:
It is important to keep in mind in early consultations that it is advantageous to encourage community choices, and therefore community commitment. Many communities begin with a gathering to discuss energy problems and choices, and then move to choose a technology that seems feasible for the area and generally acceptable to the local populace. Other organizations may have a specific project or technology in mind when they first approach a community. They should make this clear, and offer a range of choices for whatever is relevant: perhaps the size or site of the project.

Local meetings can be used to provide information on renewable energy to the community. Do some background research into what renewable energy resources your community has and may want to develop. Leave options open at the beginning in order to allow as many community members as possible to explore the details of the project and to make a strong, informed decision about their commitment. Also, be able to clearly describe the scale and specifics of the proposed project. Be ready with information about the technologies, project design and expected impacts on neighbors, wildlife, views, etc. Find answers ahead of time for frequently asked questions about specific technologies. Initial meetings can be approached as public consultations: these may be future member/ owners of the co-op. What are their concerns? What would they like to see happen in their community around renewables? Do they support the community energy opportunity? Invite key community leaders and plan in enough time to answer questions at the end of your presentation.

Before the first consultation, you should also solicit the support of local community leaders who will attend the meetings and champion the project. Invite representatives from other community renewable energy projects and give them time on the agenda to talk about their experiences.

Announce/hold another meeting for learning more: For this meeting, you could for example invite a community energy organization from another community to speak to your community. Make sure you get a list of participants for this meeting. Invite the local press to attend and report on the meeting. Send out your own press releases to local papers, and post them on community bulletin boards and on the project web site. Request meetings with community leaders to back the project, and start discussions with the town council and others to leverage a small development budget, unless you already have such funds at hand. Meet with knowledgeable renewable energy organizations to get a big picture idea of the project. Hold regular meetings with key community members, continuing on from this second meeting.

3.2 Organizational Structures

Before selecting the organizational structure best for your situation, there are several issues to address. One of the best things about the renewable energy sector is that it is so new and open to innovation. On the other hand, this is also one of its greatest challenges. This peculiar characteristic of rapid change, impressive growth, eager venture capitalists, and increasingly, mainstream capital markets, means exciting opportunities for entrepreneurs, forward-thinking communities, adventurous municipalities and resourceful homeowners. There are no single correct answers to the questions of how to structure the ownership of your energy plant, how to finance it, and which technology to buy. This means that to be involved means to be committed to being thoroughly engaged in the decisions, and willing to work hard to keep up-to-date and to keep track of the project, even for residential installations.

Look around at your own jurisdiction: how have other small businesses been formed? What are the key goals and values of your enterprise? What business formation will best reflect that and facilitate the realization of these goals and values?

Why?
Before shopping for technology, before going to the banker, before enlisting friends, every potential renewable energy owner or group should pause and spend the time to answer a few key questions: what are your goals in installing renewable energy? Do you want to:

- Be part of the renewable energy revolution?
- Reduce energy bills?
- Become energy-independent and protect yourself against energy price increases?
- Contribute to a cleaner environment?
- Own the means of energy production?
- Find an environmentally friendly tax shelter?
- Make money from a rapidly expanding sector?
- Play with a new technology?
- Participate in a shift to distributed generation, with ownership by communities and individuals rather than large centralized plants?
- Learn new skills?
- Bring new jobs and additional energy dollars to the local economy?

People have various reasons for engaging in renewable energy. A careful and honest assessment of your goals (which could cover several of these, or additional reasons) will provide a base for easier decision-making later. Your goals will determine what kind of installation you want (solar or wind, grid-tied or off-grid, residential or community-owned, etc.) and what to avoid. For instance, if profit is your main goal, you will need to know that certain technologies may be more financially promising than others, and that support structures may exist in your area to make specific technologies more attractive.

Who will be involved?

Another key question to answer is who will be doing this — are you an entrepreneur who likes to work alone, make all the decisions and is willing to take all the risks as well? Or are you most interested in community energy, utility-scale projects owned by a community group or cooperative? Or perhaps as a farmer you are most interested in working with neighboring farmers, pooling your land to maximize the resource use? Who are you willing or wanting to share risk with? The answer to this question depends on temperament, beliefs as well as opportunities—if you are on a large farm surrounded by wilderness, a community project might not be for you. On the other hand, if you have access to an urban center, perhaps through a farmers' market, a partnership with urban shareholders might be ideal, and marketing would fit into existing relations between city and countryside.

Ownership

After identifying your goals and with whom you can work most effectively, you can address the question of ownership. What organizational structure will best allow you to realize these goals? What local tax structures, community or renewable investment funds will facilitate your energy goals? What kind of decision-making do you want for the project?

Vision/mission/values

In the case of a community group, it is especially important to take the time early on to work through the development of your Vision/Mission/Values. For those not process-oriented, this may seem like a waste of time—they want to get on with shopping for the equipment. However, without clear Vision/Mission/Values, a community group can get bogged down (and often does) for years as they wander around without a clear focus or choice of project or decision-making process. Established groups frequently look back and wish they had done Vision/Mission/Values from the outset.

What are you trying to accomplish and why? For the group to work together effectively, there must be general agreement on the project they will pursue first (establish priorities) and the reasons for pursuing the project (see section WHY? above).

Triple bottom line accounting is a way of tracking a business or co-op's achievement of diverse goals: social, environmental and financial. The idea is that a business will measure not only its financial profits but also its progress socially (more networks, etc.) and environmentally (so many tonnes of carbon emissions reduced, etc.). Corporations and cooperative enterprises have begun to use the triple bottom line concept.[7]

Sustainability indicators may be a more useful way of evaluating your goals. This methodology has been used to excellent effect by municipalities to track the achievement of broad goals of social, environmental and economic benefits. The use of these indicators, unlike triple bottom line accounting, recognizes the potential for overlap among triple bottom line benefits. For instance, a community-owned solar panel array on the local town hall can bring financial benefits to a community as the energy is sold to the grid, but it can also provide cleaner air (environmental), reduce health problems (social), and reduce the need for emergency room visits on smog days (again, social and economic benefits). Many tools and workshop designs exist to help a group identify their key indicators for success.

3.3 Types of Organizational Structures

Once you or your group has sorted out why you are doing this and what exactly you are doing, the choice of structure is key to the success of the enterprise. Numerous possible organizational structures exist today for renewable energy projects. Some derive from local tax incentives for renewables and are specific to a location. Others are broader although the specifics will vary with location.

Each type of operation has its pros and cons; the stage of choosing your structure must not be short-changed. The strength and relevance of the organizational structure you choose can determine the success or failure of the project. In addition, the answer to which structure is right will vary from one jurisdiction to another, and from one technology to another, as will become clear in the sections below. This section will look at each of the most well-known structures available, although new ones are developed every day, often in response to changing opportunities and barriers locally.

Note: The following sections on cooperatives are drawn with permission from Ontario Sustainable Energy Association's (OSEA) *Community Power Guidebook*.

7 See Greenbiz at http://www.greenbiz.com/toolbox/howto_third.cfm?LinkAdvID=61079 for more information on how to structure your accounting practices according to this concept.

3.3.1 The Cooperative Model

Co-ops make good business sense; they are a proven economic model for enterprise, delivering financial sustainability as well as social and environmental benefits. There are pros and cons to any business model. Some of the negatives associated with cooperatives are mostly mythology rather than actual facts about cooperatives. For instance, people complain that co-ops are fragile and more likely to fail than conventional businesses. Co-ops actually have a greater chance of longevity than conventional businesses, particularly in new sectors. Co-ops are twice as likely to survive to the tenth anniversary mark as conventional businesses. This number goes up considerably in new sectors, such as ambulance and health care co-ops.[8] Across the world, worker co-ops have rescued struggling and bankrupt businesses, revitalizing local productivity in depressed economies like Argentina, and revitalizing local sectors such as the forestry sector in Quebec.[9]

Cooperatives are different from conventional businesses because they:

- are jointly owned by all members who each have one vote no matter how many shares they own
- usually list social and/ or environmental goals as part of their mission
- may operate as a nonprofit or zero bottom-line business, returning surpluses to members
- tend to require longer decision-making processes to reach democratic agreement (more people need to have their voices heard)
- tend to have widespread commitment to decisions from staff and owners once a decision is reached
- often have an educational mandate as part of their mission
- may have difficulty raising capital due to lack of awareness in the financial sector
- benefit from networking with other similar co-ops

Cooperatives succeed partly because they recognize the numerous possible stakeholders in the operation of the business. Cooperatives can be made up of consumers, workers, producers, investors, ambulance drivers, health-care workers, food co-ops and stores, etc. In Quebec, innovative experiments in solidarity co-ops structure the business around multiple categories of stakeholders. A wind co-op could have the staff, community member/ owners, local contractors for the installation and even the local utility as co-op members, with seats on the Board of Directors. A new wind co-op in Quebec, Val-Eo, is based on a pool of local landowners, and is exploring the solidarity co-op structure.

Cooperatives are distinguished by their commitment to the seven international principles of cooperation:

1. Voluntary and open membership;
2. Democratic member control;
3. Member economic participation;
4. Autonomy and independence;
5. Education, training and information;
6. Cooperation among cooperatives; and
7. Concern for community.

To reap the benefits of community energy does mean doing business differently. A community organization that chooses this route needs planning processes that are designed for their own development path. Strong co-ops have clear statements of goals and values, and build their structure, bylaws and governance processes around realizing those shared goals and values. Above all, the co-op must define its stakeholders**.** Are the member-owners the landowners? Local residents? The workers/staff? Will non-local people be able to buy shares?

Community energy projects do not necessarily have to revolve around utility-scale technologies. Small wind, solar and biogas technologies can be used in community energy projects through the various ways a community can cooperate on their purchasing, installation, financing, maintenance, etc. A community, for example, can form a buying group or co-op in order to bulk purchase solar panels, hot water heaters, compact florescent light bulbs, small wind turbines, biogas digesters etc. in order to secure a better price for everyone with the sellers and installers, as well as to negotiate a more cost effective operations and maintenance agreement. A group of individuals purchasing solar panels, for example, could also choose to form a producer co-op and aggregate the energy they each produce to facilitate the sale of power or associated emissions credits.

How does community ownership work? There are almost as many models of community energy as renewable energy communities; local jurisdictions have their own incorporation laws, strategies and financial incentives. In Europe,[10] what are commonly called cooperatives represent a range of ownership structures.

8. See Survival Rates of Co-ops in Quebec, 2000. **9.** Note that cooperatives have different regulatory requirements depending on the jurisdiction. For instance, Canadian cooperatives register with a provincial agency, but are responsible for regulations under the federal co-op act, as well as any provincial rules and regulations. This means that solidarity co-ops, for example, are only possible in Quebec; other jurisdictions do not offer that structure. **10.** See Mark Bolinger, 2001, *Community Wind Power Ownership Schemes in Europe and Their Relevance to the United States* (Berkeley, CA: Lawrence Berkeley National Laboratory) for more detailed account of community ownership.

In Denmark, wind turbines were legally required to be owned by electricity consumers. The projects are typically owned by several individuals collaborating in a "wind partnership." The wind partners are usually landowners and farmers (due to the largely rural base of the Danish population). The result is that 20% of Denmark's power comes from wind,[11] and 85% of that is owned by the residents of Danish communities.

Sweden's development has occurred through real estate communes and consumer cooperatives, both local (selling to the grid) and recently national (selling to its members). About 10% of Sweden's installed wind power capacity is community-owned. Real estate communes are based on Swedish principles of common ownership of land use rights (such as fishing and grazing). In the case of the local consumer cooperatives, patronage dividends are distributed to local owners based on their annual kilowatt use. Investment is made on the basis of an estimate of expected electricity use, with rules to sort out the differences each year. In the national consumer cooperative case, the co-op purchases wind turbines across Sweden and sells the power generated directly to its members. Subsidies from the Swedish government are folded into the price. The subsidies result in a very low price and consumers pay reduced sales tax amounts as well.

In Germany, about 50% of renewable energy projects are community owned, with more than 100,000 individuals owning a stake in a wind project. Most local ownership, until recently, has been through sole proprietorships, usually owned by individual farmers. There has been a recent shift towards larger projects and wealthy investor ownership (limited partnerships). In the United Kingdom, community ownership has developed slowly. It includes the Industrial and Provident Society model, which are cooperatives with economic and social goals, usually involved in charity work, and the innovative Wind Fund in which investors buy shares and receive dividends on investments in wind power projects. In the United States, many electricity consumer co-ops with tens of thousands of members dot the landscape, but their main purpose is to drive the price of energy down. Occasionally these co-ops will purchase renewable generation facilities with the co-op's surplus. Community-based generator groups such as MinWind in Minnesota act as co-ops (one member/one vote) but may not be incorporated under the cooperative regulations. Co-op values and processes are reflected in the bylaws of these organizations.

Cooperatives are common in Canada, particularly in Quebec, the Prairies and the Maritimes. The model has been applied to numerous innovations, including housing, funeral services, adult education, and restaurants. In the Maritimes, co-ops, including renewable energy projects, can be joint ventures between government and community. Community-owned energy assets will be encouraged on Prince Edward Island to reach the provincial renewable energy target.

Cooperatives in parts of Canada, as well as in the United Kingdom, the Basque region of Spain, and parts of the United States, have been able to establish second- and third-tier cooperatives or organizations that help to organize the sector. Often the initial goal is to consolidate buying power by purchasing cooperatively. For instance, the Ontario Natural Food Co-op is a natural food wholesaler that was started in the 1970s by Ontario retail co-ops and buying clubs to purchase food in volume and to achieve economies of scale in the natural food sector.

Ontario has several renewable energy co-ops, many of them catalyzed by OSEA (Ontario Sustainable Energy Association). OSEA has also recently developed and incorporated the Cooperative Fund for Community Power, which will invest in the early stages of community energy development. In the case of Ontario, both for-profit and not-for-profit co-ops exist, issuing either shares or bonds to their member-owners. The members receive dividends or interest on the shares or bonds based on the sale of energy to the Ontario Power Authority. Their return is based on the number and class of shares, while each member receives the right to one vote in the co-op's affairs.[12]

Co-op structure: Before incorporating, the co-op must decide if they will be a for-profit or a not-for-profit venture. Although most community energy co-ops choose the former, several advantages come with not-for-profit status: in addition to not paying corporate income tax, the not-for-profit structure can make marketing easier by reflecting the community value mission of co-ops that are focusing on more than financial gain.

Not-for-profit does not mean the co-op cannot generate a surplus, or return some of the surplus to members (as interest on bonds or loans, for instance). The not-for-profit status simply reflects a social mission, to revitalize the community, to reduce pollution, to leave a cleaner environment for the future, to educate as well as demonstrate, etc. Cooperatives should also identify their stakeholders: renewable energy co-ops come in all forms, including consumer, producer, worker and "investor."

Another consideration with the co-op structure is the relative novelty of this form of cooperative. The core of the cooperative structure is the ownership of the business by the users. This is clear in agricultural co-ops, where the co-op is

11. See Danish Wind Energy Association for more details on their wind power industry, http://www.windpower.org/composite-53.htm. **12.** Many similar support organizations exist in US states and Canadian provinces, including the British Columbia, Sustainable Energy Association http://www.bcsea.org/, as well as Oregon's Energy Trust http://www.energytrust.org/ and the Massachusetts Technology Collaborative http://www.mtpc.org/.

formed to process grains or to market the farmer's goods; investment and returns are based on the level of use by the farmer. Renewable energy co-ops can represent new approaches to equity capital in areas such as Ontario, where the energy market is restricted: cooperators cannot buy the energy they produce, but must sell into a common pool (the grid) and buy their electricity from their local distributor.

3.3.2 Small Business Structure

Another possibility for a community group is to use the limited liability structure of a small business. While cooperative structures include limited liability, small businesses offer a number of important differences. The arms-length structure of the corporation protects the investor from the risk of investing in a new and rapidly changing sector. Decision-making is not necessarily democratic, allowing in many cases for more rapid (but perhaps less well-informed) decision-making. Operation is not as transparent—cooperatives generally have very public and transparent financial operations, since financial reports are presented to all stakeholders at least once each year. In some cases, incentives and development support are specifically available to small businesses and corporations.

For instance, currently in Canada, it is unclear whether cooperative shares are eligible for the CRCE (Canadian Renewable and Conservation Expenses) incentive, which allows the development costs of the first turbine in a project to be written off, with the tax breaks potentially flowing to the shareholders. This attracts investors with high tax exposures to renewable energy, but it is a provision that may apply only to corporations. In addition, since cooperatives tend to be locally based, unless the demographics are unusual the cooperative will have to rely on more than tax appetite to entice member/owners, especially in sparsely populated rural areas. In a conventional corporation, shareholders do not have to be members, and do not necessarily have a vote—power accrues to those with the most shares.

The choice of a limited liability corporation over a cooperative structure may also affect the financial planning. The expense of issuing shares will vary with the jurisdiction, the organizational structure, and particularly the size and number of shareholders. Since it is difficult in most cases to change an existing structure, it is important to clarify these elements in your area before choosing a structure.

3.3.3 Landowner Pools

In Germany, the traditional arrangement for the wind power sector has been landowner pools, a distinctive structure for renewable energy projects that has been applied in jurisdictions in Canada as well. Several landowners with adjacent land will pool the land to maximize the use of the natural resource and to compensate all affected landowners. Each pool develops a formula based on the amount of land they bring to the table, the number of turbines erected on their land, and the length of any road or cable installed on their land.

This model has the advantage of avoiding "turbine envy." Turbine envy occurs when one landowner gets his turbines up first, arraying them in such a way (on the boundary) that the neighboring landowner cannot erect his own turbines, and yet receives no benefit from the installation. Landowner pools also benefit from existing rural relationships. Neighboring farmers are likely to be used to working together, possibly for generations, sharing some labor, sharing equipment, working out challenges such as wandering livestock, or water ownership.

In a francophone agricultural community near Ottawa, Ontario, farmers benefit from a 100-year-old cheese co-op as well as a local cooperative grain facility. Recently, they decided to start a renewable energy cooperative to negotiate with a wind developer, building on existing relations and a long history of cooperative work together. They are working with a francophone renewable energy developer (Val E.O.) to establish a landowner pool structure. Their chances of success, given the existing local structures and existing relationships, are very high.

The German model was also recently imported to Ontario to Huron-Perth County, where the *Countryside Energy Co-operative* suggested the model to the landowners adjacent to their project. The landowners met several times to determine the exact percentages they would receive from the project based on amount of land, number of turbines, and secondary installation (roads, cable trenches, etc.). They also elected to join the cooperative as shareholders, benefiting from the dividends received on the sale of energy to the grid, as well as from the land lease.

3.3.4 Partnerships

Partnerships can distribute risk and increase a project's access to equity. In the early stages of a community project, a newly formed group may look for partners to gain expertise, development capital, or equity. The complexity and novelty of renewable energy projects requires careful consideration before a partnership is established. Ideally, the two partners should be relatively equal in access to capital, and this equality should be reflected in structure and decision-making. However, examples exist of community cooperatives that have been formed to own a small portion of a larger private installation. For instance, the *Boyndie Wind Farm Co-operative* was formed so that the local community could have a stake in the Boyndie Wind Farm in Scotland. The share offering closed successfully in August 2006; the project was facilitated by *Energy4All*, a renewable energy co-op developer and promoter in the

United Kingdom. *Energy4All,* in turn, was established by the *Baywind Co-op*, one of the UK's first successful renewable energy co-ops.

In California, the *Wine Service Co-Operative* represents a partnership among various local wineries. They originally formed to share storage space and a distribution facility, but recently installed solar panels on the roof of the shared facility to benefit from the attractive terms in California for solar energy.

Another common structure partners a community cooperative with a municipal utility. The well-known 40 MW Middelgrunden installation off the harbor in Copenhagen is a joint venture between the local utility and the local cooperative. Canada's first urban wind project, *WindShare*, on the shores of Lake Ontario in Toronto, is also a 50/50 joint venture with Toronto Hydro, the local utility.

Co-op/co-op partnerships: *WindShare* co-op's current project partners with *Countryside Energy Co-op* in rural Ontario. Each co-op will own half of the planned 10 MW wind project (Lakewind Power Project). Recent interest from private developers in the social capital generated by community co-ops has meant some exploration of co-op/ corporation partnerships. In the case of partnerships with corporate developers, a community's work on Vision/Mission/Values becomes key. These partnerships can break down around a conflict in values between the two structures, since most corporate developers are not place-based and are not driven by the accumulation of community benefits or local economic development.

Homeowner/individual: Certainly individuals can enter the renewable energy world, as the increase of consumer-oriented marketing of renewables can attest. The financial benefits may not be as high, but the homeowner can feel satisfied that they have made a small contribution to reducing pollution from energy generation. In Toronto, a recently incorporated solar co-op operates a buying club for renewable technology. The homeowners have worked together to increase their purchasing power and to negotiate with a supplier to have solar installations on each of their roofs.

In the northwestern United States, owners of residential solar installations have created a co-op to market their renewable energy certificates (RECs) (also known as green tags, RECs are the environmental attributes of a renewable energy installation which in some jurisdictions can be traded separately from the energy sales). The market for these is new and in many areas still non-existent. In this case, the RECs are sold to Bonneville Power Foundation, which resells them and invests the income in new renewable energy installations. Without this arrangement, homeowners probably could not access this limited market yet.

Schools/municipalities: Public institutions are getting on the bandwagon, and in many places even leading the way in renewable energy. An attractive net metering arrangement in Iowa has allowed schools to install utility-scale turbines to sell energy at a standardized price to the grid. Iowa recently reduced the incentive in this program and development has slowed, but the power of innovative policy is evident in the rapid development it inspired.[13] Universities all over North America are sporting solar installations. In Waterloo, Ontario, a small group of students developed a solar array on the school library. Such arrangements reduce the challenge of land use and permitting and provide the university with demonstration projects that easily fit into their educational mandate.

The Flip model: The Flip model that has been used in several US states is highly dependent on local incentives. A number of tax incentives and funds exist for renewables, including the federal PTC (Production Tax Credit) incentive. The PTC incentive applies to the first ten years of a project's life. However, these mechanisms are sometimes in conflict: the regulations prohibit double-dipping, which means the incentives can overlap and cancel each other out, in some cases reducing the incentives below viable levels.[14] Developers in Wisconsin, Minnesota and recently Oregon install renewable energy on a landowner's property essentially for free, requiring only a small purchase of equity, or a very attractive loan. The landowner's initial income is either the interest on the loan (Wisconsin) or small dividends from their share in the project (Minnesota). At the end of the ten years, the developer turns the project over to the landowner or community group, who then owns it free and clear and receives the dividends over the next ten years or so until decommissioning. This model is an excellent and relatively trouble-free approach for a landowner, requiring little upfront engagement (although a wise landowner will find out as much as possible about the corporation occupying their land before signing anything).

The flip side of the advantages is that the landowner or group receives a used turbine at the time that the operations and maintenance contract has probably expired, and the turbine is beginning to require new parts and more attention. After ten years in a sector with rapid innovation and considerable effort and capital being devoted to research and development, the ten-year old turbine will undoubtedly feature flaws that have been remedied in later

13. For more details on these installations, consult Teresa Galluzzo and David Osterberg, "Wind Power and Iowa Schools," (Iowa Policy Project, March 2006). See http://www.eere.energy.gov/windandhydro/windpoweringamerica/schools_projects.asp.
14. See Mark Bolinger, "Avoiding the Haircut: Potential Ways to Enhance the Value of the USDA's Section 9006 Program," July 2006, http://eande.lbl.gov/ea/EMP/reports/61076.pdf.

models. It also means that the landowner probably had little say in the development decisions—type of turbine, etc. Nothing comes free of charge, and in a new sector with rapidly changing technology, all gift horses should be looked sternly in the mouth.

3.3.5 Projects on Indigenous Lands

Community energy projects have appeared on indigenous lands with ownership by indigenous communities, nations, tribes, First Nations, or by an indigenous company or cooperative. For instance, the Mother Earth Renewable Energy project on Manitoulin Island in Canada is owned by the M'Chigeeng Nation through a cooperative and is moving through the development stages to a small wind farm.

3.4 Landowner Relations

3.4.1 Introduction

In many cases, renewable energy installations can occupy land for decades. The rules for land use, recompense to a landowner, to the building owner for solar, to other water users in the case of hydro, or to adjacent landowners should be clear and acceptable to all from the outset. The issues are different for the different technologies. Note that this section deals with landowner/ developer relations specifically around the physical plant and use of the space. Financial agreements, equity and dividend flow will be addressed in the section on financing.

3.4.2 Wind Power

A Land Option Agreement gives the community group or developer the first right to develop the land for a wind farm. It should precede the erection of test towers to ensure that the data remains with the owner of the test tower. It generally includes:

- The right of first refusal to develop the land for renewables
- Details of the wind resource measurement agreement (right to put up test tower, maintain it, check data, etc.)
- Detail of data use in the event no turbine is installed

The Land Lease Agreement is the next step. It is much more detailed and should be carefully reviewed by a qualified lawyer or expert. The land lease will include:

- Length of lease (minimum 20 years)
- Royalty percentage with minimum or floor payment (preferred over flat fee or rent)
- For cooperatives, an agreement on the rights of each landowner in the co-op, financial returns, etc.
- Extension options
- Purchase agreement or Standard Offer Contract
- Agreement not to conflict with normal activity on land without compensation
- Arrangement for the installation to be part of land deed in case of transferal
- Agreement by the developer to pay development costs and taxes
- Agreement by the developer to minimize impact, compensate damages, and assume liability
- Access to land provisions
- Decommissioning
- Interconnection sites, depth of electrical wires[15]

3.4.3 Solar

Large field-installed solar arrays will trigger many of the questions above, although they will occupy considerably more land than wind installations for the same amount of power generated. The resource assessment process will be relatively simple, while provisions for heavy equipment, construction access, etc. must be clear. Solar arrays also can have a longer lifespan than wind. They can also be installed on existing industrial buildings with flat roofs. The owner of the building must agree to any improvements for load-bearing that are required, and provide access to the developer for installation and maintenance.

Interconnection agreements will need to be worked out; in some jurisdictions the installation may be behind the meter, offsetting the local load before the surplus is sent to the grid (net metering). An innovative arrangement in parts of the United States means that the developer installs solar panels on an industrial or municipal roof and receives revenue from the sale of energy to the building owner. The financial arrangements, placement of the meters and interlocking responsibilities should be clear in the lease or contract before installation.

15. See Paul Gipe and James Murphy, *Ontario Landowner's Guide to Wind Energy*, Ontario Sustainable Energy Association (OSEA), first edition, 2005, http://www.ontario-sea.org/pdf/OSEA-2005-r1-v3.pdf, for more information.

3.4.4 Hydro

The key rights in hydro development are the water rights. In the United States, this involves a number of agencies, which vary by location, jurisdiction, and issue. In Canada, water rights are owned federally and administered by the province (unless it is Crown or First Nations land). In addition, any access roads, cable trenches, etc., will be subject to lease or land use arrangements with the landowner. Stipulations as to erosion protection and frequency of access for maintenance should be included. Often, third parties will have to be compensated if energy generation interferes with other water uses, such as recreational ones. To obtain land-use rights, it may then be necessary to settle any conflicts of the use of the river.

3.4.5 Biomass

For biomass power and heat plants, the land issues are usually not related to the location of the plant, but rather the sourcing of the biomass fuel. This fuel can come from nearby forests or from agricultural surfaces. To leverage investment from outside the community (if desired), the fuel for the plant needs to be secured for very long periods of time, i.e., 10 to 20 years. This is done through contracts with local landowners, farmers (if agricultural biomass is to be used), or companies holding licenses to harvest trees from public lands, such as sawmills or pulp and paper mills. In some cases, the community group seeking to develop a community project may already own a land resource and can harvest wood using its own resources. Care must be taken to adhere to sustainability principles, i.e., the forest resource must be large enough to support the biomass energy operation. Governmental regulations may still apply to such land, aimed at protecting the current use of that area as forest or agricultural area.

4 Developing a Business Plan

The business plan helps the new group to focus their project plan, consider timelines, financing, and documents the business case for their project. It will be used when the co-op offers equity to the community in the form of shares or bonds. The business plan can be part of the membership agreement for recruiting new members. It will be a key part of the pitch to lenders for raising debt financing for the equipment purchase. It will be used to raise development funds from grants, city councils, and other organizations.

Your business plan is also a good tool to assess the cost and benefits of your project so you know if and how much you will save on energy after project implementation. The plan will vary in its details, depending on your location, the actual energy resources and the type and cost of technology you are using, as well as operational costs, such as salaries, etc. The plan may also evolve over time, i.e., an initial, preliminary plan could be used to present the general business case to raise some seed money, but to attract outside investment to actually start the project, you will need detailed and reliable data on which technology you use, how everything will work, who is responsible, and especially what the expected costs are, based on actual quotes. The next chapter discusses technology selection, which will need to be completed before the business plan is finalized. Model business plans for a wind power project (also representative of what is required for a small hydro plant or a larger PV project) and for a biomass project are annexed as examples to this Guide.

Four Reasons to Write a Business Plan

Assists in Financing – The business plan identifies the amount and type of financing or outside investment required and when it is needed. The plan is also required for a lender or investor to assess the viability of your proposal.

Accountability – A plan establishes a system of checks and balances for your business so that mistakes can be avoided.

Control – A business plan sets up benchmarks to keep your business under control and improves your ability to manage your business.

The Big Picture – Having a business plan encourages realism and allows for thinking through the entire business process.

Source: *Handbook for Developing Micro-Hydro in British Columbia*

Table 4.1 Financial Information for a Business Plan

Several economic measures should be used to evaluate an investment.
In order to compare options, the following categories of information typically are needed:

General Project Information
- Rated capacity
- Capacity factor or other standard measures of power output
- Inflation
- Start year
- Project lifetime

Revenue – Cash Inflows
- Fuel or energy displacement savings
- Ancillary products or benefits
- Cost recovery – depreciation or expensing
- Cost recovery – tax credits
- Tradable renewable credits
- Grants and incentives
- Interest earned on debt service reserves
- Power Purchase Agreement or other sales agreements

Costs – Cash Outflows
- Equipment costs including installation and site preparation
- Balance of system (BOS) costs including all non-equipment
- Capital costs, such as interconnection and civil works
- Developer soft costs, such as developer planning, environmental studies, licensing and permitting and negotiation of power purchase agreements
- Construction loan interest
- Recurrent costs, such as equipment replacement
- Operation and maintenance (fixed, variable, or a combination of the two)
- Site owner rent or royalties
- Property tax
- Project insurance
- Production insurance
- Income tax on revenue

Financing Costs – Debt and Equity
- Loan debt
- Debt percentage (the percentage of capital costs being covered by a loan)
- Loan interest rate and term
- Equity
- Equity financing fees
- Initial working capital
- Debt financing fees
- Debt service reserve fund and other debt covenants
- Discount rate that is used to calculate the net present value (NPV) of the project by discounting future cash flows to the start year

A thorough business plan includes:

- Profile and history of the organization
- Description of the technology and location
- Business model (ownership and responsibilities)
- The cooperative/ organization's Vision/Mission/Values and Goals statements
- History of the project and future plans
- Industry profile (the projected market and marketability)
- Energy market analysis (who will buy the power)
- Risk analysis
- Financial planning (costs, revenues and financing)
- Sensitivity cost analysis
- Long-term outlook and expansion opportunities
- Case studies (local and abroad) showing success with the model
- List of government, tax and other incentives to support the business
- Fuel study results (assessment of renewable energy resource)
    - Summary of studies addressing environmental and other concerns
    - Operation plans: Daily operation plan and Maintenance plan

Table 4.1 provides an overview of the type of financial information you will need to complete a business plan for your project. When using the annexed model business plans, make sure you do not just retain the economic parameters as they are given, but find out what exactly the specific costs for your own project are, as these may vary considerably from one location to another. You can use some software tools, such as the RETScreen model (see Useful Links, which also refers to other resources helpful with business plan development), to conduct a pre-feasibility study and as a tool to develop the financial side of the business plan. RETScreen offers a standardized way of approaching financial questions, as opposed to creating your own spreadsheet model, which lacks transparency and is not easily accepted by initial outside investors. Eventually, however, it is no substitute for accurate, detailed and professional custom spreadsheets for the project. The best way for a community cooperative to get accurate costs for their project is to get quotes and estimates from potential suppliers, installers, consultants, etc. In addition, the group should be in touch with other similar groups, and may be able to look over existing business plans as well.

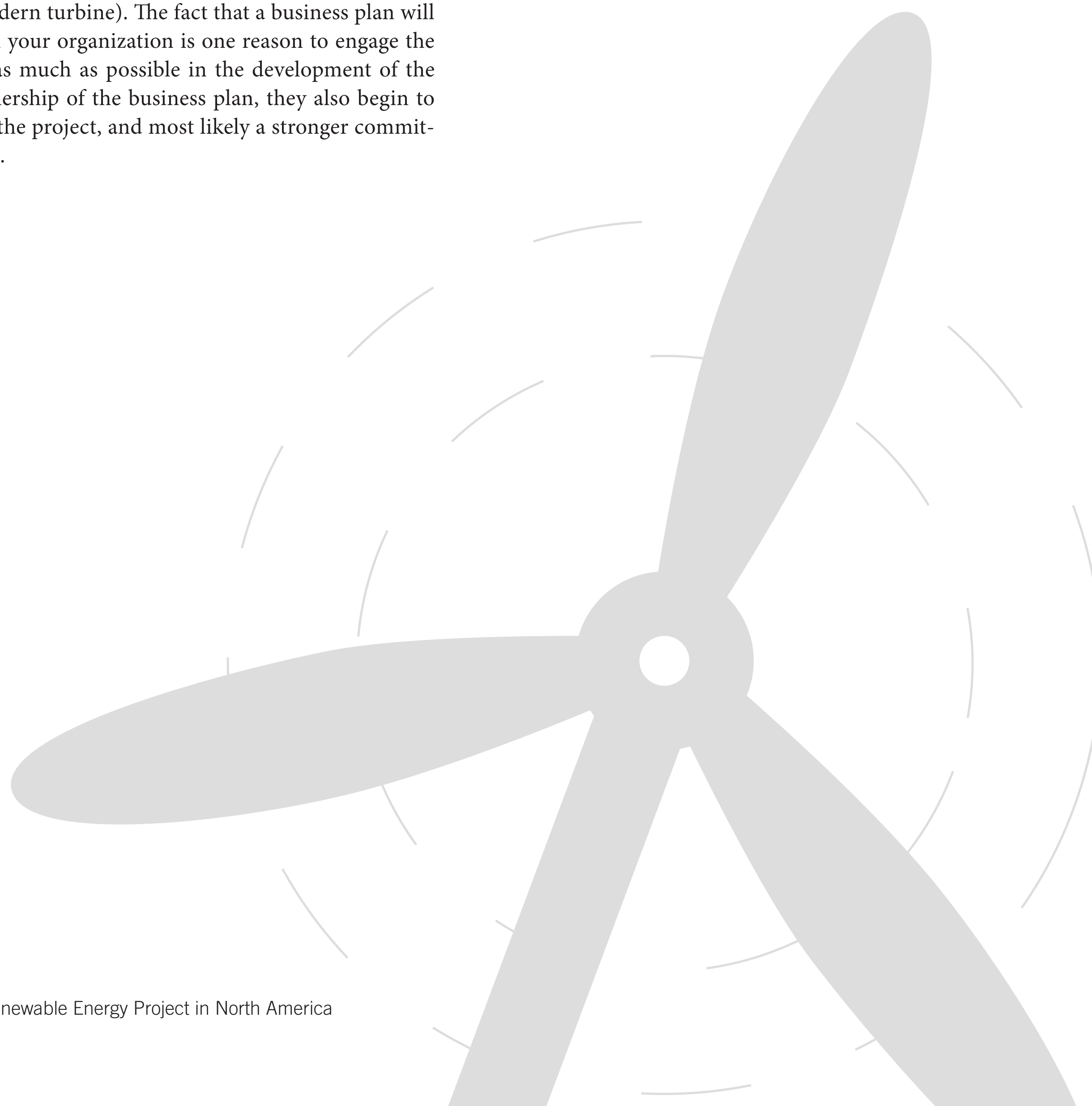
The development of a business plan, if done properly, is a complex and time-consuming task. Early versions require a great deal of thought and attention to achieve good business decisions for your start-up. In the case of community-based projects, a good process for decision-making should be in place. The development of the business plan is a good time to polish this structure for future challenges. Do you have everyone make strategic decisions? Do you have a committee that does the research and proposes strategies for approval? Do you let the general manager make all the decisions, rubber-stamping his/her initiatives (not to be recommended in a new organization, although later directors can take a more hands-off approach)?

Business plan development requires good writing skills, ease with financial analysis and good ideas of how to research the market, competitors, and the sector. It helps if the plan developer is in or develops a network of contacts in the field. Ideally, one or two people will be designated to complete the task, whether or not broader decisions are made by a cooperative board, membership, or by community groups. A thorough job will probably take several months, unless the writer has experience in the sector already. At the end of all this work, you have a solid document and financials that you can take to lenders to make a case for a loan, or use for grant applications. You will have completed clear strategic planning, and have the benefit of a hardheaded look at the market and your competitors.

Chances are, if you have a really good idea, someone else has already thought of it; research into the market and industry can help you see where they went wrong (if they did) and how ideally to position yourself. Even in a new market with lots of room, a business plan gives you a chance to think ahead; once lots of groups and entrepreneurs see the same opportunity you did, what will keep you successful and maybe even growing?

For homeowners, this step might seem dispensable, but even then doing a careful analysis of the financials, the market, and the plan for selling your energy, maintaining your equipment, etc., can help you avoid costly errors at the beginning. How will the installation affect your property values? What will be your ongoing responsibility and tasks to keep the equipment going? What is your plan for maintenance? For instance, if you have a fear of heights, plan to have a good maintenance contract with your solar installer; if you like to avoid debt, find another source for financing.

Business plans should be designed to change and grow with your organization. They may start fairly simply, with basic cash flow and market analysis. By the time a wind cooperative, for instance, erects its turbines (three to five years from the start of the project), the business plan should be a detailed and dense document, with a clear risk analysis and projections as much as twenty years in the future (the usual life of a modern turbine). The fact that a business plan will change and flex organically with your organization is one reason to engage the organization and the founders as much as possible in the development of the document. When they take ownership of the business plan, they also begin to have a deeper understanding of the project, and most likely a stronger commitment to seeing it through as well.



Selection of Technology and Resource Assessment

5.1 Introduction

The selection of technologies may have happened early in the project development phase, especially if you want to leverage outside investment—you will then need to base your business plan on firm quotes and reliable cost data in order to show the investor that the risk of exceeding your foreseen capital expenditure is low. However, a community project may already have a preliminary business plan that is only used to raise some seed money at the beginning. You would then probably be in the second year or so of development before choosing models and suppliers, after having created enough support for the project. This is a process not unlike buying a new car, or a house, with the same delights and pitfalls. And just like cars and houses, "one size doesn't fit all." Renewable energy comprises all energy forms that "renew themselves within about one generation", i.e., about 30 years as a maximum. This definition includes hydropower, wind, solar photovoltaics, solar thermal, and biomass (agricultural digesters, biomass combustion, gasification or pyrolysis), which are the subjects of this Guide. Geothermal energy is also generally renewable and is used for home heating and cooling or for power generation (at the industrial scale near hot volcanic areas). Some other types of renewable energy that are currently emerging include wave and tidal energy. Renewable energy includes electrical and thermal energy, or both (in cogeneration or combined heat and power facilities).

Many people enter the world of renewable energy because they have been surfing the Internet and think the technology is neat (that is, they started shopping first). Others come to it because they are in a remote location, or in a rural community that wants more control over its energy supply. In cases such as these, renewable energy is a means to an end. However you arrive in the renewable energy market, eventually you will need to follow the steps below.

While purchasing a renewable energy system is a little like buying a new house or a car, the difference is that renewable energy is fairly new to the mainstream market. This means that owners of systems must take responsibility for understanding the system; there are no handy mechanics around the corner who will rush in and refill the fluids in your battery because you have not bothered to read the manual. In another ten years or so, these support professions will probably exist, but for now this purchase means lots of reading about engineering and the mechanics of electricity or heat provision. Eventually, you or the community group will probably work with an installer, unless someone in the group is a mechanical engineer with a renewable energy specialization or experience.

However, there are a number of steps you should complete before choosing a supplier. These steps will vary depending on whether this is a residential or community-scale system, both because of differences in decision-making and because the requirements for larger community-scale systems are more likely to have an environmental impact and will most likely be grid-tied.

5.2 Decide on Key Specifications and Parameters

Your technology selection will be determined by a set of factors, including:

- Energy goals: how much will be produced or is needed?
- What type of energy will be produced (electricity and/or heat)?
- Resource availability: what type of energy source is available (wind, hydropower, biomass…)?
- Electricity Sales: net metering, power purchase agreement or standard offer contract
- Subjective preferences for particular technologies within the community
- Interconnection: grid-tied or off-grid installation
- Technical skills and abilities in the community
- General budget: how much can be spent now on development, staff, equipment and installation? Is there a plan for later expansion (i.e., addition of solar modules or additional turbines)?
- Interconnection ability
- Environmental impacts and requirements?

Energy Goals: The very first factor to determine is the energy requirements of the system. Is this a residential system scaled to meet the requirements of one dwelling? Is this a year-round residence or a summer cottage? Is this meeting the energy needs of an off-grid community? Before determining energy needs, the community should implement energy conservation measures to reduce the capacity needed for the energy system—energy conservation can save $3 on your energy system for every dollar spent.

Or is this a community energy system designed to connect to the grid and bring energy dollars and clean power into the community? In this case, energy conservation programs are excellent and dovetail well with a community process around developing renewables, but they are not directly related to the size of the system the group decides to purchase. In that case, the group should hold a series of meetings and decide, in addition to which type of renewable energy they want to pursue, what size system they are interested in installing.

Need for heat and electricity: Do you want to produce heat to alleviate the purchase of expensive fossil heating fuels in your community? Then a biomass system may be right for you. Similarly, you may wish to incorporate solar hot water heating alongside a photovoltaic system. Is your main aim to provide electricity in a rural setting? Then as a small hydro, wind, or photovoltaic system might be the best option. Producing electricity from biomass is more complex than with other systems, and the choice of technologies is still fairly limited.

Availability and type of local resources: Next, find out whether you have renewable energy resources available to you. For example, do you live in a region with lots of wind? Do you have a forest, agricultural, animal husbandry, biowaste (e.g., from household collections or a nearby sawmill) or other large biomass resource that you could use? Some biomass can be burned directly, whereas other types of biomass are more suitable for an anaerobic digester, creating a combustable gas which is subsequently burned in a generator. If you use a digester, you should also think about what you can do with the compost residue you will produce—are there agricultural or other facilities nearby that would be able to use your residue? Is there a river or creek you could harness for hydropower production? Make sure that you know whether you can legally access nearby resources. This question will be answered once you enter into the permitting process and talk to local and other authorities and stakeholders. You also need to consider the seasonal availability of your resource. For example, a creek may carry varying amounts of water depending on the season, and may even stop flowing entirely for some months, e.g., during the winter season. Likewise, agricultural or forest residues may not be available throughout the year and you have to foresee storage.

Electricity (or heat) sales: How can you sell the electricity produced? Is there a net metering provision in your area such that the utility will definitely accept interconnection of your renewable energy system to the public grid, and you save on the consumption you did not take from the public grid because of your new energy system? Find out how much you save per kWh—since often you save only the basic tariff, but not transmission costs or other surcharges on your electricity bill. There are also restrictions on the maximum size of system you may interconnect that way. Does your utility seek to contract independent electricity producers? Then find out what types of technologies qualify, what the minimum and maximum permitted system sizes are, and if you need any other certifications for your technology. Some regions of North America, such as Ontario and Washington State, have introduced so-called "standard offer contracts," which allow you to feed your power into the grid at a fixed price, without a bidding process. If your project generates heat, ask yourself to whom you plan to sell it—is it an industrial user that will require heat year-round, or a residential heat loop that will only require a fraction of the heat in the summer that it requires in the winter? Your system size needs to be designed so it can respond to peak winter needs, which may have impacts on fuel storage, project economics, etc.

Subjective preferences: Maybe you already know what technology you will use. For example, solar energy systems can be used in virtually all regions in North America. If your community has a clear preference for one or the other technology, you still have to determine what size your installation should be (residential versus central), and which technology provider you want to buy from. What about other stakeholders, such as neighboring communities? Do they support your renewable energy plans? Make sure you have considered the needs of other stakeholders; for example, the use of a stream or small river for power generation may interfere with other uses, such as recreational kayaking or fishing. If your government provides incentives for a particular technology, such as wind power, then that may be the favored technology to choose for your project.

On or off-grid: If you simply want to serve your own community or home, you need to adjust the system type and size to your specific needs. For example, a biomass heat system needs to provide enough heat for the winter period. If you want to install wind turbines or solar technologies in an off-grid scenario, you need to provide storage or backup power because these units produce electricity only intermittently. It may then be more favorable to use hydro or biomass technologies with a more even power generation profile over the year. If you are grid connected, your options are larger, but will then depend mainly on the regulatory environment in your area. If you live in a valley with air pollution problems, a biomass power plant may be difficult to implement.

Technical skills and abilities: To develop, operate and maintain renewable energy systems, you will need to have certain qualifications. For example, a biomass cogeneration system based on a conventional steam engine will require a certified steam engine operator, as such systems are complex and hazardous if not operated by qualified personnel. Such personnel may not be available in all situations, such as in remote, off-grid communities. To develop a community project, the community group should also ensure that they have financial and technical expertise, as well as community developers, and fund-raisers.

Budget: Table 5.1 provides an overview of the cost of energy systems. Make sure you get several offers, including installation and interconnection, as these prices are only indicative and may change over time. Note that you may invest a few thousand dollars for a residential system, but that more complex units, such as a biomass cogeneration plant or a commercial-scale wind turbine, will cost several million dollars. Your budget and the financing options open to you may depend on available incentives and loans or grants, as well as on the interconnection cost. For more extensive descriptions of budget and financial models, see Financing, Section 6.

Table 5.1 Renewable Energy System Cost Overview (US dollars)

Technology	Cost	Comments
Large wind turbine	$2 million/MW for a modern 2 MW turbine	Includes interconnection, planning and permitting
Small wind turbine	$10,000 for a residential system of about 2.5 kW	
Solar PV	$20,000 for a 2 kW panel	Includes installation; discounts on installation costs may be available if several systems are purchased
Solar hot water	$2,400 to $6,000 for a residential rooftop system	
$600 to $1,500 for simpler systems in warm regions	Will provide about 60% of annual residential hot water needs in cool and cold climates, 100% in warmer regions	
Geothermal heat pump	$15,000 to $25,000	This is for an installed residential system; centralized community heat systems are also feasible
Small hydro	$1,300 per kW	
Biomass heat	Individual pellet stove: $4,000	
District heat system: $900/kW	Including installation and heat distribution system	
Biomass cogeneration	$2,500 per kW (electric)	Excludes heat distribution system, which may also cost millions of dollars depending on size of distribution network
Agricultural digester	$3,000 per kW	Excludes cost for transporting biomass feedstock etc.

In addition to purchase costs, you also need to consider costs for maintenance, repair and possibly operational costs. Do you prefer a system that runs all by itself and requires no or little maintenance, or is it your aim to create local employment and opportunities to run and maintain a plant, transport biomass resources, etc.?

Interconnection ability: For on-grid electricity generating projects, as you identify your project technology and monitor your resource, you must also contact your local utility or distribution company to assess the interconnection requirements and availability. Your local utility will be able to tell you what the process will be (including requirements for impact assessments and cost estimates for transmission upgrades), whether there is an appropriate connection point near your site and whether there is space on the grid for new power generation. You may be one of the first renewable energy projects they have connected, and they may ask you to provide more information on renewable energy and distributed generation interconnection. It may be necessary to become familiar with the interconnection issues first, in order to understand the grid operator's concerns and to respond to them. For instance, the grid operator will probably want to know about islanding protection. If the grid goes down, the grid operator wants to know that your installation will not continue to put energy onto the grid, endangering line workers when they go out to fix the system. Most systems have automatic and manual disconnects to protect against islanding. The grid operator may also be concerned about the effects of variable generation, since their goal is to keep the flow of electrons as stable (and simple) as possible. This concern with renewable energy has been overstated in the past, and so far has not caused any problems even in countries like Denmark, where wind is a significant portion of the supply mix. However, availability of space on the grid is a real challenge in some parts of North America, as transmission systems age and new generation adds additional stress to the systems. In remote areas where renewable resources may be readily available, the grid may be insufficient to carry the new load, requiring expensive upgrades. It is important for these reasons to begin discussions early with your local utility.

5.3 Resource Assessment

Not all of the renewable energy resources identified above will be available and economically viable in your project area. To determine whether you have a project or not, it is necessary to conduct a resource assessment. Unless you have the necessary experience in-house, you may want to hire a consultant to help you assess your renewable energy resource—especially for larger (non-residential) projects. For community wind and hydro projects, professional resource assessments will be necessary to raise debt financing; banks and credit unions will require professional data collection before proceeding with a loan contract. In some cases, technology providers may be able to help you identify options, or to advise you on the best location or technology to be used. Below is some very initial advice on determining which technologies may be suitable for you.

To have an idea about size, a 1 kW system will provide a portion of a household's annual electricity needs; 5-10 kW may cater for a home's total electricity requirement; 200 kW will provide part of a small community's energy needs; and a commercial scale wind turbine (2 MW) will produce electricity over the year for about 500 to 600 households. Most community energy projects will not provide power directly for a load but will be grid-connected, through a sales agreement with the local utility (see "Selling Your Electricity" in Financing section below).

Wind power: Wind is available in all parts of the world, but not every location is suitable for erecting a wind turbine. For a small turbine (1 to 5 kW), you can use the rule of thumb that when a flag flutters in the wind in your community most days of the year, you have a good enough wind resource. Note that there is generally less wind in the summer than in the winter. Also, some days—or even weeks—without wind does not mean you cannot use a wind turbine if you have a good wind regime during the rest of the year. If you are situated in a valley or other location where wind is generally very weak or a flag almost never flutters in the wind, you should not use wind turbines to generate electricity. However, a nearby hill or mountain crest may provide a better resource and should be examined for its wind power potential. Keep in mind the cost in cable and in line loss that occurs when the electricity must be transported over distances, either to the grid or to the load. The same rule of thumb can be used to tell whether a large wind turbine could be used. However, when investing several hundred thousand dollars, or even millions, you must first set up a wind-measuring device in the location where you want to erect wind turbines. This device should run for at least a year, and gather data from several different tower heights. It will provide you with crucial data to make a decision about using wind power in your community. Wind systems can also be combined with storage systems or with other renewable energy technologies in hybrid systems. Solar/wind systems work well since the wind tends to blow in the winter months when shorter days and cloud cover reduce the solar production. If your community is connected to the grid, you can usually contract with your electricity provider to feed the electricity generated into the grid, and still use grid electricity whenever the turbine is not producing enough for your own needs.

Apart from devices as simple as a flag and a wind monitoring device, you can also consult wind resource maps and atlases for information adequate to prepare pre-feasibility studies. For example, the Canadian Wind Energy Atlas[16] allows you to determine whether your area might be good for wind power development. You need to input the location and hub height of the turbine(s) you intend to install and the software will then give you an idea of average wind speeds at that height.[17] Note that an Internet-based wind atlas cannot replace measuring the resource on-site for a larger project. A turbine will be up and generating electricity for at least twenty years at the same place, so it is worth the effort to make sure you get the best site that you can. See section on land options and leases for guidelines on working with local landowners in community energy projects; for community projects, the best local site might not be on your property, but on a local farmer's or landowner's land.

Solar photovoltaics: The sun shines everywhere, so solar PV is possible in any area of the world. You do not need to live in a desert or in an area known for its many hours of sunshine: a solar panel will also produce electricity under a cloudy sky. The US National Aeronautics and Space Administration (NASA) provides sun-hour atlases; see Useful Links for NASA's web site and sun-maps for Canada. The question as to whether you "have a project" or not therefore becomes one of economics, rather than one of location. If you want to know how much electricity your panel will produce, you can use the RETScreen model, which has weather data and information on latitude and insolation already built into it (see the "Useful Links" section to find the RETScreen web site). You need to make sure that you install the panel facing south. Buildings that are shaded by trees or by other buildings, hills etc. may not be suitable for the installation of solar panels. Note that you can also install solar panels on a mount that follows the sun. While this makes it more expensive, such a tracking device can increase the production from a panel by 20 to 30%. Solar panels are still very expensive, but are already cost-effective in some remote grids, taking into account their long useful life of 25 to 40 years. The cost of solar electricity is expected to decrease over the coming years. If you install a large number of panels in your community, you may be able to obtain a discount from the retailer and/or installer.

Solar thermal: A solar thermal panel will produce some of your hot water, and will supplement your existing water heater by raising the water to a higher starting temperature. These panels can be sized so they deliver 100% of the hot water you need in the summer, and a small portion in the winter, with an annual average of about 60%. In southern areas without sub-zero temperatures, fairly simple panels can be used and can provide up to 100% of domestic hot water requirements. In most of the USA and Canada, panels need to be freeze resistant. Still, their cost (around US$3,500 for a household system) is low enough to make such an investment worthwhile, with payback periods under ten years. Note that you still have to produce some of your hot water with electricity, natural gas or other energy carriers, unless you use year-round heat storage, a technology that is now available but significantly increases the overall cost of your system. Solar hot water panels can be used anywhere in North America, but note that in very northern communities hot water production in the winter will be strongly reduced due to the lower solar intensity at higher latitudes. As in the case of solar electric (PV) panels, the hot water panels need to be installed facing south, and must not be in a shaded area. A Canadian example of a successful community solar project is the Drake Landing Solar Community [www.dlsc.ca], a 52-unit subdivision in Alberta designed to use solar energy to fulfill ninety percent of each home's space heating requirements. Using seasonal solar thermal energy storage, solar thermal energy is collected in the summer, stored underground, and then returned to the homes as heat during the winter.

Landfill gas: If your community has a landfill, it may be possible to capture the landfill gas emanating from it (landfill gas consists of about 50% methane, which can be burned to produce energy) and run a small generator. Such facilities are, however, only worthwhile on larger landfills. For example, a 2 MW system would require the annual waste of a community of at least 200,000 people, i.e., a mid-sized city. Many North American examples and resources are available from the US EPA's Methan to Markets website at: http://www.epa.gov/methanetomarkets/.

Agricultural digesters: An agricultural digester uses cattle manure to produce biogas which can then be used to produce both electricity and heat. Digesters are industrial-size units that come in sizes of 35 kW and more. Usually, they are installed on large farms or for a group of farms and have a size of several hundred kW. Such digesters can also be run on municipal effluent and biowaste (which needs to be collected separately from other household waste). It is then necessary to create the infrastructure that allows for the use of these biomass resources in the reactor, and the resulting compost material needs to be disposed of—ideally on agricultural lands, as it is a good fertilizer. To cost-effectively produce biogas

16. See http://www.windatlas.ca/en/index.php. **17.** The Canadian wind atlas is available online at http://collaboration.cmc.ec.gc.ca/science/rpn/modcom/eole/CanadianAtlas.html.

from manure, a farm should have at least 150 cows. Larger systems will source manure from several thousand head of cattle. Note that cattle that run free will make manure collection impossible, but other sources could be added to complement agricultural biomass (e.g., biowaste). A digester could be run entirely on biowaste separately collected from households, but will require a community size of a minimum of 1,000 people to source enough waste for a very small reactor of 35 kW electric generation capacity. It is important to check local rules on waste transportation if you are planning a system that will draw from more than one farm or area.

Very simple, individual digesters are currently being used in China (see "Useful Links"). These digesters produce biogas for household purposes, but since they are not well insulated, they will only work well in moderate and warm climates, such as in Mexico or the southern United States. This technology is not yet in use in many other areas of the world.

Biomass power and heat: Most commercial biomass systems for power production are mid-sized, i.e., 20 to 50 MW. There are few small systems for power production from biomass available. Note that a steam-based system will require a certified steam operator, as steam boilers are complex industrial facilities that need to be supervised 24 hours a day. There are other biomass power systems more suitable for small-scale projects called "Rankine Cycle engine." Those systems will allow a project size of 2 to 10 MW.[18] For each MW of plant capacity, 14,000 tonnes of dry wood are required each year, i.e., a minimum of about 30,000 tonnes for the smallest Rankine cycle plant. In terms of cubic meters, this is equivalent to more than double those numbers. Woody biomass can either be obtained from sawmills or paper mills if they are in the area. However, transport costs would also need to be factored in, and possibly you will have to pay for the woodwaste itself as well. If you plan on harvesting your own wood, short-rotation forestry (using poplar or willow, for example) will provide high annual yields of between 2 and 15 tonnes per hectare, depending on the climate. For each MW of plant capacity you will therefore need between 1,000 and 7,000 hectares of land per year.

Note that this is for cogeneration plants that deliver both electricity and heat. Some communities have opted for heat-only plants, which can be built in much smaller sizes. Such plants will provide space heating through a district heating system and can replace electricity, heating oil or natural gas currently used for heating purposes. These systems can be sized to fit a community's needs, but it may be necessary to change the heating systems in the homes and other facilities to accommodate district heat.

Small hydro: To quantify the capacity of hydropower to generate electricity, you only need two parameters (flow and head), and this can be done fairly easily. Head is a measurement of the vertical distance the water falls. For flow, you need to determine the amount of water that is carried by a creek or river over a specific period of time. This can be done by capturing a part of the water in a container while taking the time and extrapolating from there what the entire creek may carry. Note that in some areas, water flow can be very low either in the summer or in the winter. You will have to have or procure the right to use the water, but there may be restrictions as to how much water can be used or stored from the river for power production. For a larger river, you could measure depth and width of the river and then estimate the flow by letting an object float down the river and taking the time between two markers at a known distance from each other. You also need to know the head, i.e., the height difference, between a potential water intake point and a potential location for the powerhouse. The formula to calculate your expected power output is:

Power (in kW) = 9.81 x Flow x Head x Efficiency

The number 9.81 is the gravity constant; the flow should be given in m^3/s, and the head in meters. The overall efficiency of hydro projects is usually fairly high; for an estimate you can use a number of 0.85. This formula will give you the power capacity of the plant in kW. Generally, a small creek that you can wade through will only be good for a micro-hydro project of less than a kW or a few kW at the most. A small or larger river will be required for a community-size project. Of course, in mountainous areas where a small creek can be harnessed for power production with a high head (50 to 100m), you can still produce a fairly large amount of electricity, but usually you will only be allowed to use a percentage of the available water flow for power generation, such as 20%.

Geothermal: Geothermal heat pumps harness the heat in the soil and can save electricity, oil or natural gas otherwise used for heating. Heat pumps can be installed for each home or as a central district heating facility. Geothermal heat pumps can also be used for cooling in the summer by reversing the heat flow. Note that for remote grids powered by diesel generators, heat pumps are less favored as they increase electricity consumption, which is generated very inefficiently with generators.

18. An emerging technology, Turboden, can work for projects as small as 250 kW, but is not commercial yet. See http://www.entropicenergy.com/.

Geothermal power plants are currently only economically feasible in areas with very hot zones within a depth of not more than a few hundred meters, such as near volcanoes or hot springs. These are usually fairly large plants developed by professional companies. Smaller, community-based systems are a fairly new technology and could be feasible in some communities with the right resources.

Other technologies: In larger rivers or at ocean fjords or narrows, *tidal energy* can be harnessed. This technology is still being developed and the first pilot projects are currently being deployed. Likewise, *wave energy* can be harnessed in coastal areas, but this has not yet been fully developed. *Fuel cells* are not a renewable energy technology, but can be run on biogas or landfill gas to produce electricity. Some pilot projects using this technology already exist. Note that fuel cells are still very expensive if compared to engines, although they are more efficient.

5.4 Vendor Selection and Contracting

5.4.1 What you need to know before choosing a supplier

The answer to the question "what do I need to know?" varies with each technology. The following section provides an overview by technology for the preliminary work you should do before approaching a contractor or installer.

Residential wind: For small, off-grid installations, first identify your energy needs. Figure out ways you can reduce your energy use or move it from peak hours. The load will determine the size of the turbine and the size of battery you need for storing electricity for later use. For on-grid installations, determine your interconnection plans—is this a small system to offset only your use or will it be tied to the grid through net metering (using the grid as the "battery")?

An excellent source of information for evaluating technologies is the book by Paul Gipe, *Wind Power*.[19] He emphasizes the importance of resisting impulse buys (the cute puppy that grows into a 100 lb beast, the weird-looking used turbine "that just needs a little lovin'"). Gipe encourages buyers to look for referrals from others using the same system, and to look for reports on tests for particular turbines. He emphasizes the importance of field tests over wind tunnel tests.

Gipe also suggests research into the operational history of the turbines—how long have they tended to last, how much maintenance and parts replacement is usually required? Is there a well-known weakness in the design that would be problematic for you? If you like to tinker and understand the equipment well, and have the time, constant adjustments might not bother you. If, on the other hand, you are hoping that once installed you can leave the wind turbine in the field and not have to worry much about it, you need a different model (or maybe a different technology).

Finally, some pre-feasibility work around permitting requirements may save you from disappointment. Check the local zoning ordinances for any stipulations as to wind energy—height or setback rules, for instance. Some municipalities have official plans that ban the installation of wind towers in their area. You would need a bylaw amendment to be able to proceed in such a jurisdiction, and also a sense of why there is a ban. Would your neighbors launch protests with the local municipal board against your plan? What are their objections?

Community wind: Community wind cooperatives and enterprises using commercial-scale turbines have somewhat different challenges. These installations must be between 4 and 20 MW to achieve economies of scale. Each turbine will be around 2 MW. Installation will necessarily be by professionals, with large cranes and other equipment. Some suppliers will offer installation programs as well, although most community groups have local economic development goals and prefer to use local contractors as much as possible. Selecting a supplier means negotiating with them for guidelines on who does what, hammering out an acceptable maintenance contract and warranty and planning carefully when the parts will be delivered, when the down payment is due, etc.

For community wind, contractors will be necessary for the resource assessment, roads, trenches for cables, and the foundation. Community-scale installations must take the resource assessment phase very seriously; projects cost about US$2 million/MW (including all costs of development, purchase and installation). The financial modeling is extremely sensitive to the wind-speed, so it is best to reduce the range of error as much as possible. The community group will be responsible for negotiating and supervising these various contractors, and will almost certainly have a program manager by the time construction is underway (usually the third year or later).

Construction includes a number of steps that will be undertaken by different agents. Some of the work can be done or overseen by the co-op, some of it requires a high level of technical knowledge and requires expert contractors. The steps in Table 5.2 give an overview of the process, as well as options for who does what in the installation phase.

19. See http://www.wind-works.org/books/wind_power2004_home.html.

Table 5.2 Roles during Wind Farm Construction

Step to take	Who will do	Who will supervise
Purchase turbine	Co-op	
Ship turbine		
▪ Shipping (international)	Supplier	
▪ Heavy haulage after shipping	Local contractor	Supplier
Civil engineering		
▪ Geotech assessment	Local contractor	Co-op
▪ Roads	Local contractor	Co-op with landowner input
Foundation	Local contractor	Supplier
Interconnect *(building for transformer, etc., cables, trenches for cables)*	Local contractor	Co-op
Install turbine		
▪ Erection: assembly		Supplier
▪ Erection: lift crane	Local contractor	Supplier
▪ Commissioning: wiring	Supplier	
▪ Commissioning: power up/test systems	Supplier	

In any renewable energy installation, decide ahead of time as much as possible who will do the work. This may affect the choice of system—if you have elected to do it yourself, then keeping it as small and simple as possible will be more likely to lead to success.[20]

Residential solar: The Canadian Renewable Energy Network (see Useful Links) offers excellent buyer's guides for all renewable technologies. The solar guide recommends that you answer the following questions before approaching a dealer:

- What is the application?
- What needs to be powered?
- Are my loads as efficient as possible?
- How much power (wattage and/ or energy (watt-hours per day) is required?
- What is the energy usage pattern (e.g., hours per day, days per week, seasonal use)?
- Do I need battery storage?
- Do I want an autonomous, hybrid or grid-connected system?
- Do I want to start small and add modules in the future?

Community solar: For a community solar project, the questions to answer are similar to the community wind questions, although in many ways the projects are simpler. Local sun hours are usually easily obtained from NASA and other places (see Useful Links). The site will need to be identified before approaching an installer—working with a school or municipality can reduce some of the costs of the installation and the permitting. The size of the system will be largely dependent on the budget the group works out, unless it is a solar hot water heating system for a housing co-op or condo, in which case it needs to be sized to the local energy needs as with the residential solar case.

Residential/micro-hydro: In off-grid applications, the estimation of the power needs is the first planning step. The following are some questions that a feasibility study should answer:

- How much head is available?
- How long does the penstock have to be in order to reach the required head?
- What are the minimum and maximum flow rates, and when do these occur?
- How much power can be generated with the available flow rates?
- Who owns the land?
- Where are the nearest electricity power lines?
- What would the environmental effects of installing a micro-hydropower system be?
- What is the approval process to install the micro-hydropower system?
- How much will it cost?

Most micro-scale projects will probably not impede the flow of water very much and will not trigger serious environmental concerns. The main concern will probably be around establishing the water rights. In British Columbia, the process is handled through a single agency (Land and Water British Columbia Inc.), whereas relevant authorities in other states and provinces may be distributed across various departments and agencies.

20. See Paul Gipe. *Wind Power (2004)*, for more on tailoring a system to your own needs and abilities (p. 164). This chart was originally developed with Ed Hale for OSEA's Community Power Guidebook.

Community hydro: Community hydro will be similar to the other community projects in the identification of shareholders, budget and size of installation before working with a supplier. The project is likely to be large enough to need to proceed through a lengthy permitting process to secure water rights and assess the environmental impact. This process can take as much as five years.

Biomass: Some of the questions were raised in previous sections, such as whether you want to develop a heat, power or cogeneration system. The choice of system will depend on the type of biomass resource you have available (e.g., liquid manure will lend itself to a digester, whereas wood can be burned). In general, the questions to be raised are the following:

- What is the local biomass resource (manure, wood, biowaste…)?
- What is the need for electricity and/or heat?
- Is the technology available in the size you need it for?
- Is the technology proven and certified?
- Can it comply with local air emission regulations?
- Can the installer guarantee that the system will work according to specifications?
- What kind of wastes and residues does the system produce?
- What kind of qualifications are needed to operate and maintain the system?
- What is the cost of bringing the biomass to the facility, and can it be run cost-effectively counting in the capital cost of the system?

5.5 Choosing a Supplier

Much of the literature on choosing a supplier simply sounds like good consumer sense. However, in addition to being an expensive purchase that you will have to live with for decades, renewable energy requires unusual care and knowledge on the part of the buyer. One of the key recommendations for those looking to install a renewable energy system of any scale is: be knowledgeable! Read, research, and talk to others. Coupled with the challenges of working in a new and changing sector, you will undoubtedly become part of a unique network of people for whom the flow of electrons into their home or community is no longer a mystery.

It is important to recognize that in a fairly new industry, certification programs and consumer reports on equipment may not yet exist, but are developing rapidly in many sectors now. If there is a technology certification program in your country or another, this may provide you with an orientation of which manufacturers have gone through an independent verification process to certify that the quality of their products is recognized. Likewise, there are some certification programs for installers in several jurisdictions.

Here are a few things you can verify yourself to assess an installer:

- Professional credentials
- Electrical license (or access to someone to certify the work)
- Bonded and insured (less common, expensive for contractor)
- Training (is it current?)
- Experience (recent)
- Variety and quality of products
- Service agreements and performance guarantees
- References[21]

Given the novelty and rapid changes in the sector, most literature strongly recommends looking for referrals. For small wind turbines, talk to others who have used the equipment, and determine the reputation of the firm, how long they have been in business, and how well the technology has held up over the years (if a previous customer had to replace a blade every year, there is a good chance that you may have to as well). It is important to ensure that the supplier is licensed by the manufacturer to sell and install the product. A quick call to the manufacturer or a check on his web site may save a great deal of future heartache.[22]

Note that for more complex systems, such as a biomass cogeneration plant, the vendor and installer may be different entities. The vendor may recommend an installer for you, but in general you will want to work with a company that has references of previous successful projects available and can oversee the entire installation process. The company may also be able to guarantee that the technology will work according to specifications, at least for an initial period. This assures you that they will make every effort to get the system to work as promised without you having to pay anything extra in case there are any problems.

It is best to get more than one installation estimate. An estimate should include the cost of hardware, shipping, installation, connection to the utility grid, travel and sales tax. Remember, the lowest price is not always the best price. A good contractor will also help you acquire permits, co-funding and an approved utility interconnection by filling out the paperwork for you.

Community groups may find themselves limited to certain suppliers willing to work in the 10-20 MW range. Some manufacturers, given the tightness of the market, may only be interested in working with larger developers (they find it simpler to do sales of 100 MW of equipment to one customer rather than to ten different ones). This problem will probably ease as more suppliers enter the market. Currently, some utility-scale wind turbines are still shipped from outside North America. A local manufacturing base in regions doing community energy would also make a difference, since shipping and other logistical requirements would be more straightforward.

5.6 What You Need to Know After Installation

It is important to work through the list of things you will need to know after installation. What routine maintenance and checks should you expect to do yourself? Are there any regular maintenance checks in your supplier contract (what exactly does it cover)? Are you familiar with the manual (never work with a supplier who can't provide a manual)?

Ask your installer to give detailed, written instructions on how to maintain your system properly and safely. Keep an eye on metering systems and utility bills to be sure your system functions effectively and efficiently. You might also ask your installer how you can perform simple troubleshooting or maintenance, such as greasing moving parts on a wind turbine. Be sure to learn basic safety requirements and procedures, like how to shut down the system in emergencies such as a flood, windstorm or other situations that could damage the system; and how to power up the system after it has been shut down.

21. From Laurie Stone, "How to pick a pro," in *Home Power* magazine, Issue 114, Aug/Sept 2006, pp. 48-53. **22.** See Paul Gipe's "Buying a Wind System" in *Wind Power: Renewable Energy for Home, Farm, & Business* (2004). See http://www.wind-works.org/books/wind_power2004_contentspage.html.

6 Financing

6.1 Introduction

The early dreaming and planning stages are well under way; your shiny new idea must now be subjected to the cold light of financial reality: how can you or your community go about getting this done?

The work of financial management comes in three parts, each requiring your undivided and well-informed attention:

- Decide how much you need (budget)
- Decide when you will need it (cash flow)
- Decide where it will come from (financial plan)

These key decisions will vary depending on the organizational structure, technology and location of your project. There are a great many useful tools out there to help. Many community groups have benefited from making sure that in addition to the visionaries and leaders who can get people mobilized for meetings and excited about a project, there are also participants who have the expertise and interest to tackle the financial issues of the more complex projects.

One advantage of a community co-op over a business with one or two owners is that a successful co-op does not need to embody all the necessary skills in one or two people. With careful planning, co-op organizers can array a co-op board of directors and membership who together bring all the requisite skills to the table (and may be able to avoid burnout by sharing the responsibilities).

6.2 Budgets

It is essential to avoid as many surprises as possible when developing your community energy project. Therefore, it is also essential to have a detailed budget that the group frequently revisits. However, if the group enters the financial stage and reverts through this process to a pure focus on profit, it may not be doing justice to the motives for the project. Likewise, simple payback (analyzing when a project pays for itself) does not necessarily cover everything you gain by installing solar domestic hot water, or a farm-based biogas system. For example, payback gives no indication of the earnings a wind turbine will produce after it has paid for itself. Another measure of investment worthiness is return on investment (ROI). ROI is the ratio of money gained or lost on an investment relative to the amount of money invested. Similarly, investers often look at a project's internal rate of return (IRR). The IRR is the annualized effective compounded return rate which can be earned on the invested capital, i.e. the yield on the investment. Is should be noted that traditional investment metrics obscures economic, social and environmental results of strong, locally run, economic projects. If the group is using triple bottom-line accounting (factoring in social, environmental and economic returns) or tracking sustainability indicators, these must be part of the financial planning as well.

Wind: A generic budget for a community wind system (less than 10 MW) is used here, which assumes community engagement and participation at each step of the process. The budget is for the development process, and does not include the cost of equipment purchase, transportation of equipment or installation. This budget is from OSEA's *Community Power Guidebook*, based on the Canadian context. Categories and most amounts will be the same in other jurisdictions. The budget is divided into phases, which represent the three years (approximately) of project development. In general, although a group or cooperative can complete tasks within phases in a different order, all tasks should be completed before moving on to the next phase. The table provides an indication of capital costs for various renewable energy systems. Note that the capital cost per MW usually increases for smaller systems, i.e., there are economies of scale when you buy a larger system.

Solar: Solar PV technology is developing rapidly and prices are volatile in North America. New technologies like thin cell and other cell materials are on the market or will be soon, and prices are expected to drop in the mid-term. A solar community energy project will have reduced costs for the project development period due to more rapid resource assessment, and possibly simpler environmental studies and other permitting issues. The reduction of costs will depend on the size of the project. Large solar arrays in communities will trigger many of the same costs as a wind power development.

Budgets will be site and technology specific: technology costs vary with transportation distance, while interconnection, permitting and development costs vary with the location. In addition, cost analysis for solar technology depends on the price available for energy sold. Solar PV tends to have a very long payback, or features a small financial loss over the life of the technology. Most groups installing solar PV are not focusing on profit, except in a few jurisdictions like Germany and California, where local regulations make its installation profitable. Some basic estimates for solar installation costs are offered by the Wisconsin Division of Energy in their *Consumer's Guide to Photovoltaic Systems (PV)*.[23]

Hydro: The budget for small hydro will be specific to the site and resource. The costs of development will be similar to the community wind power project described above. The cost of the equipment will vary depending on your resource, since different types of flow require different types of equipment. Additional costs are likely to occur during the permitting phases (during the development stage of the project). In addition to the regular requirements for environmental protection, land leases, etc., the small hydro developer must also obtain a contract for water rights from the appropriate levels of government.

23. See http://www.wisconsun.org/learn/PV_June2003.pdf. The Canadian Solar Industries Association also offers a good overview of the range of costs for the components of a PV system at http://www.cansia.ca/more/PV4.asp.

Community Power Budget (US dollars) **– Phase I**

Expenses	Activities	Cost
Project Manager (part-time, PT)	Project plan Pre-feasibility study ▪ Probable resource ▪ Potential site options ▪ Interconnection – basic grid survey ▪ Planning permits – identify RETScreen analysis draft business plan	$40,000
Community Engagement Coordinator (PT)	Community engagement plan Community sustainability indicators Outreach and education Community education coordination Organizational development Volunteer coordination	$35,000
Overhead and Administration	Rent Basic administration Office expenses	$26,000
Capacity Building/Training	Project management Technical assistance Community engagement Governance	$17,000
Material Development	Web site Brochure Information Q and As	$9,000
Legal	Incorporation Bylaw development	$5,000
	Total	**$132,000**

Community Power Budget (US dollars) **– Phase II**

Expenses	Activities	Cost
Project Manager (full-time, FT)	Business plan (Triple BL) Project plan Option/Lease agreements Governance Feasibility study Supervise Resource assessment Environmental assessment	$56,000
Community Engagement Coordinator (FT)	Follow-up on Community engagement plan Community engagement process Outreach and education Media Capacity building Membership drive Organizational development	$48,000
Administrative Support (FT)	Database Web site Bookkeeping etc.	$26,000
Overhead	Rent, etc. Office expenses	$22,000
Materials Development/Printing	Member agreement	$5,000
Land Option/Lease Agreement		$5,000
Feasibility Study	▪ Resource Assessment ▪ Initial Grid application ▪ Engineering study	$52,000
	Total	**$214,000**

Community Power Budget (US dollars) **– Phase III**

Expenses	Activities	Cost
Project Manager	Permitting and approvals coordination Coordination of PPA Coordination of interconnection Purchase of Study/Permit Coordination of supplier agreement Insurance Coordination of construction and commissioning	$56,000
Community Engagement Coordinator	Volunteer coordination Training and capacity building Outreach and education Membership drive Organizational development Member agreement Offering document	$48,000
Administrative Support	Database Web site Bookkeeping etc.	$26,000
Overhead	Rent, etc. Office expenses	$22,000
Environmental Assessment		$45,000
Land Use Planning Permit		$5,000
Legal	Supplier agreement Power purchase agreement Member agreement Offering document Loan agreement	$9,000
Power Purchase Agreement		$5,000
Offering Document/ Member Agreement		$9,000
Member Training		$5,000
Materials Development	Sales and marketing materials Training materials Environmental assessment documents	$9,000
	Total	**$239,000**

Biomass: A generic budget for a biomass cogeneration plant is included within the appended Business Plan. The budget will depend on the type of installation; a heat-only application will be cheaper than a power plant, which will be cheaper than a cogeneration plant. Note, however, that the heat distribution system contributes to overall costs if you don't have a local heat user but intend to build a district heat system.

6.3 Cost Categories for Wind, Solar, Small Hydro

Below are the key cost categories for small hydro projects. These categories would apply generally to most renewables with some adjustments. For wind, additional expenses occur in the resource assessment phase when it is necessary to install a test tower and collect data for at least one year at several heights. For biomass, the operational cost will be higher than for other renewables due to the need to provide biomass fuel. For hydro a hydrological study and stream gauge assessment or stream monitoring over at least one year may also be required.

Initial Costs
- Pre-feasibility
- Feasibility
- Development

Engineering
- Equipment
- Balance of plant
- Owner's costs (own man-hours for management and development)
- Contingency

Annual Costs
- Loan costs
- Land leases
- Property taxes
- Water rental
- Insurance premiums
- Transmission line maintenance
- Operation, maintenance, surveillance
- General administration
- Green criteria (certification and verification costs for green attributes)
- Contingencies

Some additional financing costs occur during the equity financing period, in the preparation and presentation of the share offering statement for registration and to the community for purchase. In addition, the costs of democratic and community-based organizing are all lumped under "development" in the list above, and need some detail for cost analysis.

Community development costs include:
- Community meetings
- Community education and training events
- Material development for education and marketing
- Development of a project web site
- Community liaison personnel (either the cooperative's general manager or another staff person to manage memberships, volunteers, etc.)
- Board liability insurance

6.4 Cash Flow

A successful organization keeps a close eye on cash flow. Development plans must necessarily dovetail with cash flow. Cash flow also provides some clear guidelines and scenarios for a group. For instance, although a new cooperative may have an educational mission built into its bylaws, initial funding might only be provided for a resource assessment. The group must decide how its educational goals can be met by volunteers, and what it wants to postpone pending fundraising or a revenue stream.

Cash flow analysis alerts an organization to upcoming holes in the financials—a two-month hiatus, for instance, where there is no money for staff, or a shortfall on legal fees during a key permitting phase. Many milestones of a renewable energy project are time-sensitive; in Ontario, a project must proceed through the various steps to get a Standard Offer Contract (which will allow selling energy to the grid) within a prescribed timeframe. If the group doesn't have the funding to complete these steps on time, the entire process may have to be started over again.

A number of web sites offer analysis tools for renewable energy projects. The best known is probably the RETScreen software, developed and offered free of charge by Natural Resources Canada (available in English, French and Spanish). The software offers linked spreadsheets that are ideal for the pre-feasibility phase of the project, allowing one to do a cost and budget analysis, run cash-flow scenarios, and determine the key sensitivities of the financing model employed. The software is offered in different modules for different technologies and is continually updated. These updates include additions to the technology selection options where you review and choose the type of solar panels or wind machine you want. Integrated climate, technology supplier and resource databases make this a very useful tool. RETScreen is also an excellent starting point for those interested in becoming more familiar with the various technology capabilities. Integrated climate, technology supplier and resource databases make this a very useful tool. RETScreen also offers a free online training course. Paul Gipe's book *Wind Power (2004),* referred to above, contains some sample cash flows for residential and farm-based applications (pp. 76–78). Other resources can be found under Useful Links later in this Guide. Note that all these tools allow for preliminary calculations that may stop you before you try to develop that 5 m/s wind site. Many of them are meant for pre-feasibility work and do not preclude careful and detailed financial spreadsheets once the project is given the go-ahead from the community group.

6.5 Financial Planning

Your financial plan will reflect the work you have done above, as well as a clearly stated plan for mobilizing the financing you will need. It will include

- Budget
- Cash Flow statements
- Profit and Loss Statements
- Financial Resources
  - Personal
  - Bank/ Credit Union/ Farm credit sources
  - Renewable energy tax incentives
  - Renewable energy rebates or grants
  - Income from renewable energy certificates or emission offset sales where applicable
  - Partnership funds

A good financial plan will also be able to show an assessment of the risks of the project. It will review multiple scenarios and priorities for the project. What steps are indispensable to the project? Can the project do without the signage for tourists? Will it still go forward if the co-op can't meet the costs of interconnection to their isolated location? As a community enterprise evolves, the complexities and strength of a financial plan will develop. Sudden crises (power purchase agreements that are set at prices below expectations for instance) will not be the end of the project, but can be incorporated into a flexible and well thought-out financial plan. Most financial planning will provide a cushion for unforeseen circumstances (usually 10 to 15 percent of the total capital cost)—the crane that gets hit by lightning, the foundation bolts that do not arrive in time, etc.

6.6 Financial Resources

In the early stages, community-based renewable energy projects have been able to mobilize development funding from numerous venues, including community economic development funding, non-profit grant agencies, environmental organizations, cooperative development initiatives, state, provincial and federal incentives, etc. See Section 9, Useful Links, for some of these sources. In Canada, early development money has come from non-profit foundations, federal programs, municipal funding and from partnership arrangements with municipalities or developers. In the United States, early development money has tended to come from state-level renewable energy funds and incentives. In some cases, large rural electric cooperatives, with thousands of members, have invested some of their surplus in renewables. In addition, municipalities have participated in offering incentives for local development projects. In Mexico, state agencies may provide some support and money for renewable energy projects. An interesting option for Mexico is the creation of an emission reduction project under the "Clean Development Mechanism," which creates extra value for projects under the Kyoto Protocol on Greenhouse Gas Emission Reductions. With international investment, money can be leveraged based on the emissions avoided by such a project. In most cases, finding such funding will require a project of fairly large size—i.e., small residential projects will most likely not be eligible. For the United States and Canada, one option when producing electricity may be the sale of renewable energy certificates. Many companies and utilities will be ready to buy such certificates so they can claim that they are using only renewable energy for their needs (or, in the case of utilities, they can sell these certificates to their customers who want to buy emission-free electricity). Note, however, that you are then giving up any claim to using "clean" energy yourself. Selling these certificates means that you will lose the "green benefits" of renewable energy generation. While this is based on a theoretical construct, the sale of the benefits as emission reductions or renewable energy certificates means in legal terms that you are using electricity from the grid, whereas all the renewable electricity you produce is exported and delivered to whoever buys the certificates.

Most renewable energy projects that are on a community scale will be based on a mix of debt and equity funding. While a residential installation may command as much as 80% in loan financing (based on the small size of the project, and probably the collateral of a second mortgage on your house), a community project can assume that it needs to raise at least 30 percent, probably more like 40 or 50 percent, in equity financing. Financial analyses are usually highly sensitive to the interest rate on your debt; therefore, the interest rate may determine the amount of debt you can afford to carry. The interest rate must be compared to expected dividend rates on shares (or the interest on bonds) in order to determine the effect of percentage changes in these key factors.

The shareholders brought into the organization through equity financing will already have been partly defined when the structure was identified—at that point the group would have made some general decisions about the kinds of investors they are looking for. A renewable energy project looking for widespread community buy-in, at various levels, will necessarily look at equity financing differently from one that is looking for wealthy investors, or ones with tax appetites who will expect certain things from their shares.[24] Planning the equity financing in any scenario means figuring out the demographics and financial interests of the potential project owners/ shareholders. Are they most interested in a healthy bottom line or in a new economic venture that brings a new business focus to the community? Or are they committed to seeing green energy installed in their community as an environmental good? The share structure will determine the type of marketing the group will do as well.

As the project unfolds and matures, it will gain access to a number of tax incentives and accelerated depreciation for the capital costs of renewable energy development. Canada offers a tax incentive called the Canadian Renewable and Conservation Expenses (CRCE). CRCE applies to the installation/ development costs of the first "test" turbine in a large installation. The incentive allows the company to flow through a broad list of development costs for the first turbine to shareholders. This allows the shareholders, providing they have sufficient tax exposure, to benefit from tax credits from these expenditures. Such provisions are very common in the corporate world. Revenue Canada may not allow the application of CRCE to cooperatives. Cooperatives planning to use this dispensation should contact Revenue Canada early in their development process. Canada's CCA (Capital Cost Allowance) is another accelerated depreciation mechanism for renewable energy projects.

In the United States, depending on the jurisdiction, there are quite a few tax incentives, renewable energy funding possibilities, rebates, etc. For an excellent guide to the federal and state possibilities, go to the DSIRE database (see Useful Links). In Mexico, accelerated depreciation for investments in renewable energy equipment is available (100% in the first year), as well as fiscal incentives for energy efficiency and renewable energy related to R&D (*Estímulo Fiscal a la Investigación y Desarrollo de Tecnología*).

Shares in a renewable energy cooperative, subject to certain restrictions, may be Registered Retirement Savings Plan (RRSP) eligible in Canada, allowing smaller investors to avoid immediate tax payments by purchasing shares. Savings through RRSPs are greatly increased at higher levels of income, and co-op shares are only eligible in self-directed RRSPs, which the average wage earner would not be able to afford.[25]

Note that any lists of incentives, unless regularly updated, may contain some inaccuracies. As you develop your financial plan, you should contact the appropriate agencies to find out more about any incentive program you plan to use. Some Canadian provinces now have Sustainable Energy Associations, which are non-profits that focus on getting the word out about support for community-based renewable energy development. See the sections below for more detail on both financial and regulatory incentives.

6.7 Borrowing Money

Unless you are unusually lucky in your access to personal wealth, you will be dealing with local lenders for your renewable energy project. In some jurisdictions, renewable energy projects may have access to excellent terms on borrowing money. Interest rates on your capital are one of the most sensitive factors in a financial plan—as half percent differences are stretched out over 20 years of a long-term investment they become very significant budget items, and it is well worth the time spent to get them right.

For lenders, the main concern is the level of risk (to themselves). Since the renewable energy industry is fairly new, the debtor will need to explain the market opportunity as well as offer some assurance that the power or heat generated can be sold in the long term. In addition, lenders want to know what the debt/equity ratio is; in general, the preference is for 60/40, although many community co-ops

24. The common tax incentive systems in the United States means that good financial models tend to be based on attracting wealthy investors with high tax exposures who can use the project to reduce their taxable income. In this case, shares and share purchase minimum might be high, $5000 per investor or higher. Other projects might be based on broad subscriptions from many sectors of the community at small amounts each; in this case, shares of $500 might be an important part of the financial plan. Many community projects come up with a hybrid share structure with different kinds of shares that target different types of investors. **25.** In Canada, Concentra Trust (see http://www.concentrafinancial.ca/public/default.asp) can help cooperatives that are interested in this possibility for their shares.

DO's and DON'Ts of working with lenders

DO	DON'T
✓ Have a clear business plan	✗ Ask for money too early
✓ Have a clear cash flow plan and financial plan	✗ Ask for money for the wrong things: lenders prefer infill stage (turbine or panel purchase) to development stage
✓ Start to raise community equity first	✗ Have a vague business plan
✓ Be knowledgeable about your market, selling price, etc.	
✓ Know exactly what you are going to do with the loan	
✓ Place share/ bond holders subordinated to debt financers in business plan	

need to go to lenders with 70/30 ratios depending on how much equity they have raised from the community.[26] **The key issue is that lenders want to know that the risk they take in lending the money is shared with others, through shares or bonds purchased by the community.**

6.8 Selling Your Electricity/Heat

With grid-connected installations, since you cannot cart your electrons down to the nearest farmers' market and offer them at the going rate, you will need to have an agreement with a purchaser for selling your power. The purchaser can be the local utility or distribution company or a state or provincial authority, or even a municipality, depending on your jurisdiction. These agreements can take years to finalize, so discussions with local distributors should begin early. There are four main models out there for selling your power, with many variations across the world:

- Net metering (not a selling arrangement but a way to bank your power with the grid)
- Power purchase agreements
- Standard Offer Contracts/Feed-in Tariffs
- Renewable Energy Certificates (RECs)

Net metering: Net metering allows the power producer to connect to the grid, and to draw power down from the grid to cover their own needs. This applies mainly to small, residential energy applications. There are numerous variations on this: the load can be behind the meter (so the electrical load—all your appliances—is removed before the power is put on the grid) or the energy system can feed directly onto the grid, while the load draws down from the grid. Some residential installations, even if grid-tied, may have a small battery, as well, to store energy for a couple of days in case the producer is disconnected from the grid or there is a power outage on the grid. Net metering installations rely on single meters that can run backwards as the generator puts power onto the grid, and forwards when they are drawing from the grid. The difference is worked out according to the utility's net metering provisions. In most cases, the utility allows the generator to bank the surplus only for a certain length of time before it is absorbed by the grid. Net metering therefore encourages generators to size the system only to fit their own needs. Such arrangements might mean that the generator is choosing less cost-effective technology simply to avoid putting free power on the grid.

Not all areas have net metering provisions. Contact your electric utility to find out if net metering is available in your area, and check for details like the maximum system size, and which technologies are eligible.

Power purchase agreements: These can be the result of a Request for Proposals (RFP) from a provincial or federal authority, or the result of negotiations between project proponents and the connecting utility. The Power Purchase Agreement (the agreement to purchase power at a certain price up to a certain number of units) is extended to the winners of the RFP, in general those who offer to produce energy at the lowest price for the utility. These are common for larger projects (10 MW and more). The cost of preparing the proposal for an RFP can be too high for projects of 10 MW and under, precluding the participation of many community-based energy projects.

Standard Offer Contracts/Feed-in Tariffs: In Europe, several countries can boast of renewable energy generation that represents a significant portion of their supply mix: 20 percent in Denmark, 13 percent in Germany as well as a significant and growing percentage in Spain. These remarkable numbers, which have been achieved in a relatively short time, reflect the effects of Feed-in Tariff mechanisms.

26. This portion on lenders relies particularly on the section on lenders in OSEA's Community Power Guidebook, developed with Jens Lohmueller. For an additional discussion of what lenders require with a US focus, see the ELPC Community Wind Financing Handbook (p. 13). (See Section 9, Useful Links, below, and http://www.elpc.org/documents/WindHandbook2004.pdf.)

Feed-in Tariffs provide a standard price for renewable energy installations, vary by technology and provide long-term contracts. The startling results of Feed-in Tariffs in these countries are made more significant by the ownership of the new renewable installations. Feed-in Tariffs have made it possible for communities, cooperatives, and landowner collectives in places like Denmark to pool their resources and put up their own turbines and solar panels. Ontario, Canada has recently joined the ranks of these progressive thinkers in approving the Standard Offer Program, which offers C$0.11/kWh for wind, small hydro and biogas up to 10 MW in size, and C$0.42 for solar PV. An aging transmission grid and other challenges have meant the program is moving forward slowly, but nonetheless it makes Ontario a leader in North America in renewable energy. Important pricing programs do exist elsewhere in North America, including California, Minnesota, Washington State, and PEI in Canada.

These pricing mechanisms do away with the need to sign custom contracts for power sales.

They provide a guaranteed income for projects over a period up to twenty years, which will enable a large number of sites to be developed economically. Note that in North America, these tariffs are so far only available for smaller projects and not for industrial-size projects as is the case in Europe.

For heat, you will contract directly with an industrial heat user or for municipal heat, with the municipality or directly with the households using the heat. If you have no intermediary to sell the municipal heat to, you need a written agreement from community members that they will purchase the heat you produce once the project is commissioned. Individual contracts will increase your business risk, which is not attractive to outside investors, if applicable.

Renewable Energy Certificates: Renewable Energy Certificates, or RECs (pronounced "recks"), represent the technology and environmental attributes of one MWh of electricity generated from renewable sources. These attributes may be sold separately from the associated electricity and passed on or sold as a separate product. If the attributes are separated from the associated electricity, the electricity is no longer considered "green." RECs allow the buyer to get the benefits of green electricity even when actual green electricity is not directly available or is not being produced in our area. They offer consumers a means of having less impact on our environment and supporting sustainable energy generation.

RECs offer electricity consumers a way of ensuring that the environmental benefits of green electricity are preserved and used only once. That means that no one else can claim these benefits or use them.

Although there are many definitions of green electricity and RECs, several organizations working in this area have incorporated similar elements. They have already conducted research into what could and should be defined as "green." Additionally, programs like EcoLogo^M and Green-e, administered by independent third-party organizations, have credibility, have verified whether or not the electricity/REC meets their definition, and have formally certified certain products.[27]

6.9 Financial and Regulatory Incentives

In general, incentives fall into two categories: financial (market mechanism) and regulatory (such as federal renewable targets). The regulatory and policy mechanisms are essential for shaping and driving the more specific market mechanisms, which can range from long-term pricing contracts to green tags and green premiums.

The renewable energy sector has inspired quite a diverse range of financial incentives. Canada provides production incentives at the federal level, mainly for industrial-scale projects. Ontario also offers fixed prices for electricity from smaller projects up to 10 MW. In Mexico, a production incentive is being considered which would offer $0.011/kWh through a new "Green Fund" (*Fondo Verde*) for the first five years of a project under the Large-Scale Renewable Energy Project (*Proyecto de Energías Renovables a Gran Escala*—PERGE) financed by the Global Environment Facility. The Small Rural Community Energy Services Project (*Servicios Integrales de Energía para Pequeñas Comunidades Rurales en México*—SIEPCRM) mainly targets small aboriginal communities of 500 or less inhabitants and leverages money from international institutions to support energy generation in these communities. Tax incentives are available in all three jurisdictions (see Section 6.6 above). Information for the United States can be found in the Database of State Incentives for Renewables and Efficiency (DSIRE, see Useful Links). To illustrate the different incentive types, the following provides an overview of the different incentives covered in the DSIRE database, with some examples.

Tax incentives: Tax incentives are a common and familiar stimulus for a new market. A jurisdiction can offer corporate tax credits, as in Maryland, where installers get tax credits when installing renewable energy on commercial sites or multi-family buildings. The target may be residential installations, as in Idaho where a graduated personal tax deduction is offered, starting at 40% in the first year after installation. It applies to all technologies, and includes pellet stoves. In West

27. ^M The "EcoLogo" is a registered Mark of Environment Canada.

Virginia the focus is on property taxes, the target mostly rural landowners and farmers. Increased property taxes can make renewable energy non-viable—West Virginia assesses wind farms at their salvage value only, reducing it to 5 percent of the original value and protecting owner/ developers. Many areas offer sales tax reductions—in North Dakota, it applies to wind installations over 100 kW, and hydrogen (an unusual addition to the technology focus).

Grants/loans/rebates: Another way to drive the market forward is to provide capital through grants, loans or rebates, reducing the money a developer has to come up or easing the debt burden for installations. Grant programs are often specific to technologies that a state may have a vested interest in due to local manufacturing, available resources, etc. Thus, Michigan has the Biomass Energy Program Grant, while Missouri focuses on grants for 1 kW solar systems on schools.

States may provide loans with low or zero interest. In Alaska, the Alaska Power Project Loan Fund, which offers loans up to $1 million, keeps the interest rates tied to municipal bonds. In Eugene, Oregon, a loan/rebate program for solar is provided through the local utility.

California offers as many as 20 different rebate programs to catalyze renewable energy. A rebate reimburses a good percentage of the purchasing price of a renewable energy system—often between 20 and 50 percent. The Sacramento Municipal Utility District alone offers rebate programs targeting both solar hot water and solar PV.

Producer support: Incentives can target the producers, making it easier for them to produce energy. The most effective of these is probably the Feed-in Tariff or Standard Offer Contract (mentioned above). Net metering facilitates interconnection as well, but generally only offers the going electricity rate to project developers, and often limits the size of eligible projects to those of residential nature. States have contributed their own production incentive to the mix, notably Minnesota with 1.0-1.5 ¢/kWh, indexed to inflation. Massachusetts has made the commitment to buy green tags from installations, which they then retire. Orcas Power and Light on the San Juan Islands offers an aggressive photovoltaics incentive of US$1.50/kWh, but caps the amount at US$4,500 per project. Alabama and Georgia as well offer production incentives but cap the program at 5 MW, restricting the impact the program could have on the supply mix.

Bonds: Another strategy that is gaining momentum is bond offerings, often provided with the backing of the state. Idaho has provided state bonds for the use of private developers of renewables. Honolulu Island offers bonds for the development of solar on public buildings. Recently, the US government created the Clean Renewable Energy Bonds program through the Energy Tax Incentives Act of 2005, allowing co-ops and other not-for-profit utilities to issue bonds to fund renewable energy developments. In December 2006, the Internal Revenue Service approved bond issues for 78 co-ops.

Regulatory support: Supply management incentives are designed to support generation and construction directly. The most common, though perhaps not the most effective, is the Renewable Portfolio Standard (RPS). These can be established by nations, states or even municipalities. An RPS makes a public commitment to a percentage of renewables in the supply mix by a certain date.

Arizona has an RPS that calls for 15 percent renewable energy in the supply mix by 2025, Prince Edward Island in Canada seeks 30 percent by 2016, and the municipal utility in Jacksonville, Florida, has set its own goals to 4 percent by 2007 and 7.5 percent by 2015. New York State has called for 24 percent by 2013. A variation on the RPS is a state requirement for each utility to offer a green power option to customers, usually in the form of a green premium option.

Green certificates: As a market-based option, green tags or the purchase of renewable energy certificates generated by a renewable energy producer have become somewhat popular. Since the sale of these certificates means giving up ownership of the "green attributes" (e.g., the avoided emissions), the sales of them means for a community that they give up the claim to have a renewable power project that provides its electricity, since the "green" electricity is exported to the grid and technically used by whoever buys the certificates. In some jurisdictions, customers can choose to buy green power not only from a utility with a green power program, but directly from a generator. For example, shareholders could then also pay a monthly electricity bill to the co-op and would receive electricity from the co-op generator plant .

Certification: Certification programs exist for technology suppliers, renewable energy technologies (such as a certain brand of solar panels) or for the energy itself. The new industries are scrambling to put supplier and contractor licensing in place, as the market is flooded with contractors who range from dependable and committed to opportunistic and under-trained. CanSIA, the solar industry association in Canada, has developed certification programs for solar installers. Nine US states have programs for contractor licensing, generally for solar. Equipment certification programs also exist: Arkansas, for instance, requires certification of solar equipment through their Department of Health.

Planning support: Incentives may take the form of support for planning and permitting. Interconnection may be streamlined or simplified as in Hawaii. Although interconnection is the most important, planning and permitting comes into play throughout the development of a renewable energy project, and varies depending on the technology. Often these can represent major hurdles to a project depending on the jurisdiction.

Bill 51 in Ontario, Canada, is hailed as a boon to the wind industry because it promises to remove many of the barriers to wind development. Bill 51 will streamline the municipal input to projects and requires province-wide standardization of bylaws and zoning ordinances around renewables.

Federal incentives: The United States has a number of federal incentives. The most important has been the Production Tax Credit (PTC). However, the strenuous efforts of the government to avoid double-dipping in the PTC and other programs has reduced the effectiveness of the program. In addition, the program has a history of expiring and being refunded, creating serious challenges for developers trying to plan ahead.

As mentioned above, the new Clean Renewable Energy Bonds program is promising, especially for community-based projects. The federal government provides various other credits as well, including the Modified Accelerated Cost Recovery System and the Business Energy Tax Credit.

For American farmers interested in renewable energy, the USDA programs are particularly important (and unfortunately tend to lead to reductions in the PTC when applied). Through the 2002 Farm Bill, farmers can access grants up to 25 percent of the costs, and loans up to 50 percent for renewable energy projects. For homeowners, there is the Energy Efficient Mortgage Program, while the federal government has set itself modest green energy procurement goals: 3 percent for 2007–2009, rising to 5 percent by 2010 and 7.5 percent by 2013.

In Mexico, in order to favor remote, intermittent renewable electricity self-supply projects (notably wind), the CRE issued in January 2006 a revised special interconnection contract known as the New Interconnection Agreement for Self-Supply from Intermittent Sources of Energy with credited capacity. This new agreement incorporates a methodology to estimate and credit the capacity contribution of RE sources of energy to the national electric system.

Other support: Some states require generation disclosure, either once per year (Iowa) or more often quarterly, as an insert with the customers' bills (Illinois). This information allows customers to see the percentage of the supply that comes from coal, renewables, etc. Often it lists the emissions from each generation type as well.

Public funds can help to stimulate the installation of renewables. Public Benefit Funds (PBFs) are often part of local utility restructuring. A percentage of the utility's revenue, varying by region, will be set aside to stimulate renewables. Often the money is used to stimulate energy efficiency measures for homeowners. About 75 percent of New Jersey's $1.23 billion "Societal Benefits Charge" fund is spent on energy efficiency programming, including programs targeting low-income customers.

In Canada, OSEA has incorporated the Cooperative Fund for Community Power, a fund to support utility-scale, community-owned renewables that may be seeded partly with government funding. Sometimes, community or rural economic development funds can be applied to renewable energy ventures. For instance, a community energy initiative has been recently launched in Quebec; the province's long history of cooperative development and well-established local funding mechanisms for cooperatives promise a rapid growth for this new initiative.

Finally, new construction and design policies require renewable technologies and energy efficiency technologies in new and renovated construction projects. Spain has initiated an aggressive approach in new houses and commercial buildings by requiring solar thermal panels to be used. In Hawaii, Bill 2175, in addition to earmarking funds for PV panels on schools, creates requirements for state buildings to foresee conservation and renewable energy measures. In Ontario, Bill 51 allows individual municipalities to require sustainable building and renewable energy technologies in their area.

7 Permitting

7.1 Introduction

This section sketches the legal requirements for your renewable energy project. Since these requirements vary from one jurisdiction to another, and also locally, make sure you verify which permits are applicable to your particular project, at the particular location you selected. A local renewable energy company or organization, your provincial or state energy office, or your local officials should be able to tell you about the requirements that apply in your community. This section will give you a good idea as to what is generally required to get the necessary authorizations to allow construction to go ahead. However, be prepared to include additional requirements as you move through the permitting process and be in close dialogue with the permitting authorities to make sure all aspects of your project are covered.

Renewable energy technologies are still encountered infrequently, so there may be a delay in the permitting process because the zoning, code, a nd approval reviewers need to become comfortable with them. It is a good idea to develop an informational package or presentation to provide these reviewers with some background information on the technology used in your project. You may also want to include examples of successful similar applications when approaching local authorities if they are not familiar with the technology.

You must identify the zoning for your renewable energy facility site. Often you may not find yourself in an industrial setting, and an exemption to existing zoning laws may be necessary to erect a facility. In some jurisdictions, such exemptions are automatically granted (e.g., Oregon state law states that a wind farm is an authorized use of agricultural and forest land). However, this may not be the case in all jurisdictions, and you must then file for an exemption from the usual zoning rules, or a bylaw amendment, which will probably extend the permitting process by a few months. See “Useful Links” for more insight into particular scenarios to obtain a construction/siting permit. Note that planning applications might be appealed by someone in the community, so community support is crucial.

To understand the political context for your project, identify local and national policies that may be relevant to your project. For example, the project may meet criteria for:

- State/provincial policy statements and goals
- Economic policies
- Environmental policies
- Business retention policies and programs
- Job creation policies

Situating your project within the stated policy objectives of your government will increase acceptance and can facilitate the permitting process.

7.2 Construction/Siting Permit

For energy projects, obtaining a construction or siting permit will usually entail a number of steps, including:

- Notice of intent to the authorities (may be waived for small projects)
- Review by authority and identification of information required for the full application (such as site plan, equipment specifications, construction and operation, decommissioning; emergency response, and potential negative impacts of the project and mitigation measures, including wildlife, transportation, cultural sites, neighboring properties, etc.)
- Submission of application
- Publication of the intent to proceed with the project for public comment
- Public hearing
- Issuance of permit, possibly after taking into account contestations or appeals

To identify a suitable site and verify whether your project fits in with land-use objectives in your area, get copies of local land use plans that affect your project. These might include:
- Zoning bylaws
- Official land plans
- Sustainable energy plan or other sustainability plan
- Environmental plan

The permit may take between three (for small projects) and 12 months, or more, to obtain. It usually includes all building-related permits, such as road construction, land use permits and building construction permits. An environmental impact assessment is usually required for energy projects, but may only be triggered from a certain project size onwards. Check with your local planning office to find out if you might be exempted. In some jurisdictions, the environmental assessment may be a separate process under an environmental protection act.

In addition to the construction permit, tall structures like wind turbines will require notification of the aviation administration, and tower lights will have to be installed. Electrical permits are required to hook up the buildings and facilities to the public grid (not to be confounded with arrangements to feed power produced into the public grid). The structural building permit is required in addition to the siting permit to approve of the actual layout of buildings and their conformity to the provincial/state Building Code. A stormwater permit may be required during the construction of buildings and facilities. If an access road must be built or upgraded, a road permit must be obtained from the local authorities. The following section will give an idea of the types of permits required and the agencies that may have jurisdiction, depending on the technology and country.

7.3 Technology-Specific Permits

Wind power: Wind projects, and all non-residential energy projects, are subject to environmental assessment requirements. Community wind projects will complete permit applications in land use planning and for environmental studies. Land use planning permits include bylaw and zoning amendments, site plan approval and building permits. The environmental studies include studies and mitigation plans for noise, bird and wildlife impacts, lighting impacts, soil, hydrology impacts and community consultations. In general, the environmental studies will be completed or at least started before the land use application is filed as some results from the environmental studies will be required in the planning permit applications. In some jurisdictions, environmental assessments may be waived for smaller installations. Assessment requirements can range from an environmental screening (e.g., in Canada, for projects smaller than 2 MW) or a full-scale state/provincial or even federal application and review process. The requirements in the US may vary from one state to another, and in Canada project proponents must be familiar with provincial and federal regulations. Regulations are also changing rapidly so make sure that you verify the requirements for your project, and stay up to date as the project proceeds. In Canada and the US federal requirements can be triggered by a number of attributes.[28] In Canada, the federal process could be triggered if there is a federal financial contribution (e.g., an incentive, grant, or tax exemption), or if the project is located on federal land. For community-scale projects (less than 20 MW), the cost of completing the federal review process may mean that federal incentives are too complicated and expensive to obtain, and community energy groups then tend to look elsewhere for financing their projects. For large-scale projects that have to do extensive environmental assessments anyway, completing both the state/provincial and federal assessment processes is less onerous.

Environmental assessment applications for wind will address the numerous environmental impacts of the project. You will need to contact various public agencies for each issue, including bird migration patterns, noise, wildlife, effects on agriculture, soil and water and assessment of any possible archaeological sites. National bodies, such as the Canadian Environmental Assessment Agency, may offer on-line support for the assessment process,[29] as well as training in different communities for developers, planners and lawyers.

28. See the *Renewable Energy and Distributed Generation Guidebook* from the Massachusetts Division of Energy Resources for more information: http://www.mass.gov/Eoca/docs/doer/pub_info/guidebook.pdf. **29.** See http://www.ceaa-acee.gc.ca/index_e.htm, For excellent information on permitting for small projects in the United States, see the Energy Efficiency and Renewable Energy web site of the US Department of Energy at http://www.eere.energy.gov/consumer/your_home/electricity/index.cfm/mytopic=10690.

Solar: Requirements for solar, especially residential or community-scale, are much simpler than for wind. The installer will need building permits. Leases will be required for larger installations on private land or on commercial property. The solar equipment must conform to the applicable Electrical Code. Local homeowner associations have agreements that may constrain what can go on a roof or out in your yard; in addition, local easements may exist or be obtained that ensure continued access to the resource, such as preventing your neighbor from building a silo that shades your new solar roof.

Small hydro: Permits to gain water rights will be required for your small hydro project. In the United States you will need to contact the Army Corps of Engineers, and the Federal Energy Regulatory Commission, as well as the state and county energy offices to check for permit requirements.[30] British Columbia has designated one single agency to handle all hydro permitting issues. Obtaining water rights from the federal or provincial government will be a key part of the project. The development period for small hydro may amount to five years, especially when a lengthy permitting process with federal agencies needs to be accomplished—usually only when a commercial waterway or a stream on federal lands is involved. In addition, you will need to address environmental concerns (effects on fish, wildlife, downstream users of the water, etc.).

Biomass: In addition to the usual permits, biomass facilities will also require an air emission permit, as well as a traffic study. Licenses to procure the biomass fuel, store the fuel, as well as a backup fuel, a noise permit and possibly a permit to dispose of waste generated (ash disposal) must be obtained. If the biomass energy system is a steam engine, a licensed steam engine operator must be on-site as safety concerns are bigger than with simpler systems. On the other hand, a heat-only project (without electricity production) may qualify for a much simpler permitting process, at least if its size is fairly small (up to 10–15 $MW_{thermal}$).

All technologies: Consultation with aboriginal groups may be required in many areas of North America to assess any outstanding land claims, overlapping use, etc. As renewable energy development spreads rapidly across North America, this consideration is becoming increasingly important. Aboriginal groups are also exploring renewable energy development on their own land, partnering with developers, or forming local cooperatives. Table 7.1 details the types of permits most likely required for each technology. Table 7.2 describes, for each country, the levels of government that usually issue various permits. Fees for the various permits will vary between zero, a few hundred dollars and several thousand dollars. Some fees are fixed, rated according to project size, or based on the amount of pollutants emitted per year.

In Mexico, it should be noted that since 1960, the generation, transmission and distribution of electricity for the public good are, according to the Constitution, the responsibilities of the federal state, accomplished through its two vertically integrated utilities, the *Comisión Federal de Electricidad* (Federal Electricity Commission, or CFE) and *Luz y Fuerza del Centro* (Central Light and Power, or LyFC). Energy policy is determined by the federal government with virtually no state-level involvement. Following amendments introduced in 1992, the Public Electricity Service Act (LSPEE) allows private sector participation in the generation of electricity in the form of selfsupply, cogeneration (combined heat and power), independent production and small production (not exceeding 30 MW); as well as import and export of electricity under conditions established for each case (*Ley del Servicio Público de Energía Eléctrica*, Art. 36, 1993), regulated by the *Comisión Reguladora de Energía* (Energy Regulatory Commission, or CRE).

Interconnection: Apart from construction- and operation-related permits, you will also need to have an interconnection arrangement so you can link to the public power grid. This requirement will be covered by the certification of the system installation by the local building inspector for small residential installations, and will not be necessary for biomass heat. Unless you are in an off-grid situation, a wind, hydro, or biomass power project will require that you contact the power grid operator to obtain interconnection. This usually requires an interconnection study, which will be carried out by the grid operator, but you will be charged for it. Sometimes the grid operator will carry some of the cost, but it may still cost several thousand dollars for the developer. Such a study may also be broken up into several parts, such as a feasibility study (to determine whether additional equipment is needed to interconnect the project), a System Impact Study (ability of the grid to accommodate the new facility) and a Facilities or Cost Assessment Study (actual project-specific requirements and costs). If this assessment shows that transmission lines need to be upgraded to accommodate your project, additional costs may be incurred. An Interconnection Agreement is separate from the Power Purchase Agreement, which is discussed in the section on financing above.

30. See the US Energy Efficiency and Renewable Energy office of the US Department of Energy, http://www.eere.energy.gov/consumer/your_home/electricity/index.cfm/mytopic=11070, as well as The Handbook for Developing Micro-Hydro in British Columbia.

Table 7.1 Possible Permit Requirements by Technology

Technology	Permits required
Solar PV, small wind	May require a building permit in some municipalities Installation to be certified by municipal building inspector or provincial inspector Very large non-residential solar projects may require siting, construction and other permits, as well as land use and bylaw amendments
Wind power (large)	Construction/ siting permit Environmental Assessment (through provincial, state or federal Environmental Acts) Land use planning application/ permit Air Safety Notification Electrical permit (ESA approval in Canada) Structural building permit Stormwater permit Coastal Zone Management Office (if applicable) Natural Heritage Program Soil/hydrology studies Road permit Radio interference (US) Interconnection permit
Hydropower	Construction/siting permit Environmental Assessment (through provincial, state or federal Environmental Acts) Land use permit Water use permit Water impact studies Electrical permit Structural building permit Stormwater permit Road permit
Biomass	Construction/siting permit (may include traffic study) Land use permit Environmental Assessment (through provincial, state or federal Environmental Acts) Air emission/operational permit Waste management permit (if, e.g., sawmill waste is used) Cut license if use of public forests is intended Electrical permit Structural building permit Stormwater permit Water use permit (process water) Road permit Fuel reservoir permit, also for backup liquid fuels Permit to store biomass/fire permit Ash disposal permit Noise permit or study (depending on location) Licensed steam operator (in case of steam engines used to produce electricity)
All	Generator's license (usually not required for residential projects) Transmission line and substation construction permits (not for residential systems)

Table 7.2 Level of Government Issuing Permits

Permit	Canada	USA	Mexico
Siting permit, including environmental impact assessment*	CEAA process Provincial and possibly federal (depends on size of project as well as funding and siting; certain considerations trigger federal EA requirement as well as provincial)	Municipality or state energy siting authority. Some projects may require permit from the EPA under the National Environmental Protection Act, and from the State Environmental Acts	Federal ministry of environment and natural resources (Semarnat)
Land lease/use agreements	Provincial, Municipal, Aboriginal groups	State, Municipal, Indigenous groups	Municipal, Aboriginal groups
Water use permit	Provincial, Navigable waters agreement. Natural Resources Canada (federal)	State Department of Environmental Protection. If in navigable waters, US Army Corps of Engineers and FERC (Federal Energy Regulatory Commission)	*Comisión Nacional del Agua*
Air emission permit	Provincial and municipal	State department of environmental protection (DEP); municipal public health board	Semarnat
Waste management permit	Provincial and municipal	State department of environmental protection (DEP); municipal public health board	Semarnat
Tree cut license	Provincial forest ministry	Local municipality or State Forestry Department	*Federalización de Servicios F orestales y de Suelo* (Semarnat)
Air safety authorization	Wind: Navigation Canada	Federal Aviation Administration (large wind turbines); state aviation department	Local government
Structural building permit	Provincial Municipal	State and municipal (depending on size)	Local bylaws on roof or yard use
Residential energy systems	Provincial and municipal (depending on size) Local bylaws on roof or yard use	Local bylaws on roof or yard use	Local government
Stormwater and sewer	Municipal	Municipal water/sewer commission or state EPA	Local government
Fire safety code	Municipal	Fire inspector	Local government
Road permit	Municipal (for local roads)	Municipal (Public Works)	Local government
Business license	Municipal and Provincial government	Municipal and State	Local government
Energy Generation Permit	Local or provincial utility requirements; Purchase agreement contract or Feed-in Tariff contract	Utility; state and federal power purchase agreements	*Comisión Reguladora de Energía*
Electrical interconnection	Provincial level: Grid operator (utility or provincial power authority)	State-level: Utility or Grid operator	*Comisión Federal de Electricidad*

Municipality: city, county or district government. * May require separate permits from state or provincial authorities to cover heritage and endangered species and wetlands impacts.

Health and Safety: Finally, some more complex installations, such as a biomass power plant, will require that you get acquainted with occupational health and safety standards. Information can be obtained from your federal Department of Labor, Health or Industry Ministry. Compliance with health and safety standards will be necessary before starting to operate a plant. Often, the technology provider and engineering firms involved in such projects will be able to identify issues for you and help you with the implementation of health and safety measures.

7.4 Who Will Do This?

For community energy projects, much of the permitting may be done by community and co-op members. Depending on the local expertise, community members (for instance, a local naturalists' group) may help with the bird and wildlife studies. It is important to identify early which permits will require professional input. As the co-op works with local contractors, the permit applications may be vetted or drawn up by the contractors. A local planner may be interested in the project and willing to help with planning applications to the local municipality. Many permit applications (for instance, environmental assessment applications) are public, since they include public consultation processes. These can be reviewed for help in developing your own applications. If a similar project exists in your area, it is important to contact the project proponents for any help they are willing to give. At the very least they may be willing to warn your group about possible barriers or stumbling blocks, and possible solutions.

It is often possible to require your installer to take care of all the necessary interconnection and permitting studies, paperwork, and fees as part of the project contract. Installers providing such services are called Integrated Service Providers (ISPs) (see Table 7.3 for some examples) and can simplify the implementation of renewable energy projects and bring needed expertise and experience in navigating the interconnection and permitting processes.

Table 7.3 ISPs in the United States

Integrated solution provider	Location	URL
AES NewEnergy	CA	newenergy.com
Celerity Energy	OR	celerityenergy.com
Next Gen Power Systems	CO	nextgenpower.com
RealEnergy	CA	realenergy.com
Valley Energy	CA	valleyenergy.com

Source: http://www.distributed-generation.com/Library/Monitor_Aug02.pdf

8 Operational Phase

8.1 Introduction

While renewable energy technology can be surprisingly trouble-free (especially the newer models), nonetheless, it is machinery and needs occasional attention. In addition, because the sector is new and rapidly changing, it is crucial for owners of residential and community energy to understand the mechanisms and to be familiar with the schedules of maintenance. Not only does your renewable energy installation need occasional attention, but also it will almost certainly need that attention from you or from another member of the community group.

Another word of warning: although this guidebook has waited until the last section to talk about maintenance, please do not do that yourself. Maintaining your machinery will be much easier if you have planned ahead for it. There are a number of reasons for this:

1. When choosing the technology, maintenance requirements and commonly occurring defects should be part of your research. If your chosen model has any flaws, you should know about them ahead of time and be prepared to watch for them.
2. Your installer or supplier may have offered a warranty and maintenance contract, but this will not include things like running out to refill the fluid in the battery or doing visual checks on turbine blades for wobbles.
3. The period of construction is one of the best times to learn about your new machinery. Whether you are installing it yourself, or overseeing a crew installing a 10 MW wind farm for your community, it is a chance to become familiar with the different parts. In the case of solar and hydro in particular, maintenance is simple and routine, and in general the owner will perform them. The period of construction is when the installer is likely to offer training in maintaining your system, and to answer any questions you have after reading the manual. ALWAYS READ THE MANUAL.
4. The construction and commissioning period is also an excellent time to write up a maintenance schedule, based on all the materials you can get your hands on—manuals, design drawings, system specifications, expert advice.
5. Also during construction, you have a chance to think ahead about making your maintenance tasks easier. Have you installed the intake pipe for your micro-hydro system in the middle of a stream surrounded by high slippery cliffs, or can you easily walk over and unplug any sticks and debris clogging the mouth? Are your panels mounted on a steep roof that might require special arrangements to reach? Are they on the roof of a condo where you need special permission to go up?
6. Finally, if the installation is owned by and benefiting a community, it is extremely important to address post-commissioning responsibilities. The literature is full of cautionary tales of visionary groups who failed to look past the moment when the turbines finally began to rotate. This moment may coincide with the end of the grant money for demonstration projects. Planning cycles must look beyond commissioning. The first few months in a wind turbine's life are when defects in installation or design are most likely

> to show up. Many people in the core founding group may want a rest at this point, or time to find a job, or to start a new project. Success of a community wind farm can ride on whether the group has clearly established a maintenance schedule and delegated the tasks to a paid staff member or an (extremely) dedicated co-op member. In addition, the group or cooperative must plan ahead for the cost of maintenance. For instance, maintenance budgets for medium-size wind turbines tend to range from 1 percent to 7 percent of the total investment.[31]

As the project moves from planning to maintenance, from fund-raising to bookkeeping and careful accounting, debt servicing, dividend distributions, annual general meetings for shareholders, etc., the new phase calls for different skills from the ones that got the project this far; often, new people will need to take up the reins at this point. While the community is riding the momentum of getting the blades spinning, this is an excellent time to hold a membership meeting to clarify maintenance responsibilities and to discuss the use of any surplus revenue—does the cooperative want to start looking towards another project?

8.2 Operations and Maintenance

The answer to this varies a little for different technologies. A supplier may offer a maintenance package, which includes annual check-ups (a rotating check of bolts, etc.). Such packages may be a crucial condition to lower risks when you are looking for outside investment. For micro-hydro, you are more likely to be on your own, and need to be completely familiar with the systems operations. In all cases, a community-scale project is likely to have and to require expert assistance with maintenance and a regular schedule of maintenance from an installer or supplier, or paid staff in the case of larger installations. For utility-scale installations, the system will have computer monitors of varying sophistication, which will notify the person in charge when they detect certain problems.

8.3 Maintenance Checklists by Technology

The following tables give you an idea as to how much maintenance is required for each technology discussed in this Guide. This will help you decide which tasks you can carry out yourself in the community, and for which tasks may need outside assistance, such as a maintenance contract with the installer.

Small Wind Power

Task	Frequency
Check kilowatt-hour meter against anemometer to check performance	Monthly or more often
Inspect turbine and tower	Spring and fall
Check grounding	Twice yearly
Check guy cable tension	Twice yearly
Check bolts	Twice yearly
Change oil in gearboxes	2-4 times/ year
Check wiring connections visually	Frequently
Maintain battery Check charge Check voltage Check fluid	Frequently

Source: Gipe, Paul: *Wind Power*, pp. 349–351

31. See Paul Gipe's *Wind Power* for more on maintenance planning.

Solar Thermal

Solar thermal probably requires a little more attention than just cleaning. Here are a few suggested maintenance points directed to residential owners of solar hot water heating systems. Larger public and community scale installations may require professional maintenance as well.

Task	Frequency
Clean collector	Annual
Check pH	Annual
Check corrosion inhibitor and solution concentration	Annual
Check pump for lubrication	Annual
Check pressure gauge	Annual
Inspect pipes and fittings for leakage	Annual
Check air pressure	Annual
Check pressure relief valves	Annual
Flush sediment from tanks and pipes	Every five years
Check insulation on pipes and tanks	Annual
Check mounting brackets and all bolts for tightness	Annual
Check roof penetration points for leakage	Annual

Source: Colorado Office of Energy Management and Conservation.

Hydro

The maintenance of such systems will usually be left up to you. As renewable energy becomes more common and the small hydro sector expands, regular maintenance contracts will probably become available from installers. Community installations may be in partnership with local utilities, and the group will probably need to work out maintenance contracts and schedules with an experienced waterpower expert. Some checks, however, can be performed by anyone with a little training.

Task	Frequency
Check for clogged intakes	Weekly/ monthly depending on site
Adjust system for seasonal flow variations	With seasonal changes in flow
Grease machinery	Monthly
Tighten bolts	Monthly
Check battery water levels	Monthly
Check for silt in works	Once or twice yearly
Repair leaks	Once or twice yearly
Check for deteriorating equipment	Once or twice yearly

Source: Natural Resources Canada. *Micro-Hydropower Systems – A Buyer's Guide*
http://www.canren.gc.ca/prod_serv/index.asp?CaId=196&PgId=1303.

Solar PV

PV systems are among the most durable and reliable renewable-energy technology in use today. Since PV modules have no moving parts, they degrade very slowly, and offer a lifespan that is expected to be measured in decades. Standard factory warranties usually last 10 years, with some manufacturers offering up to 20-year warranties. Some sources report that maintenance generally entails simply cleaning the modules.

Biomass

These systems are more complex, since they involve a combustion process and sometimes steam systems. A small heat furnace can most likely be serviced by local staff. For more complex systems, certain regular maintenance items such as fuelling and ash removal or greasing of moving parts can be carried out by trained staff within the community. However, a maintenance contract with the technology provider or installer is strongly recommended, and will be necessary in most cases to leverage external funding. The system is likely to be down for several days each year due to scheduled maintenance. Some smaller biomass systems require little maintenance and supervision, i.e., a few hours a week. Others require personnel to be on-site all the time to control the process.

8.4 Budget for Maintenance

The maintenance costs will vary with the technology and during the life of the system. For instance, commercial-scale wind systems tend to come with ten-year warranties. After ten years the maintenance costs may also escalate. In some cases of early technology installations (as in Denmark and Germany), the owners of the wind energy systems found it made more economic sense to replace the entire installation with newer, larger turbines than to continue to repair the less productive, older models. In general, well-maintained systems may continue to operate with little trouble well beyond their expected life-span; the literature suggests that preventive maintenance (rather than reactive or crisis maintenance) will lead to much greater longevity for your renewable energy system.

Useful Information and Web Resources

9.1 Govenrment Programs and Resources

US Department of Energy (DoE)
http://www.eere.energy.gov/
The DoE's Energy Efficiency and Renewable Energy web site provides detailed information on technologies and has useful links to documents and studies on the development of renewable energy resources.

Comision Nacional para el Ahorro de Energía
http://www.conae.gob.mx/wb/CONAE/CONA_24_energias_renovables
Web site about renewable energy, legislative information and the electricity system in Mexico. This site comprises a *Guide to Developing Renewable Energy Projects in Mexico* (*Guía de gestiones para implementar en México plantas de generación eléctrica que utilicen energies renovables*) (text in Spanish).

CANMET
http://www.nrcan.gc.ca/es/etb/ctec/cetc01/htmldocs/home_e.htm
Web site with information on renewable energy, research, and government funding in Canada.

EPA's Clean Energy Programs
www.epa.gov/cleanenergy
Web site with information on renewable energy, research, and government programs in the United States.

Landfill Methane Outreach Program
http://www.epa.gov/lmop/index.htm
Web site with information on the US EPA's landfill methane program; with links to program partners in Canada, the US, and Mexico.

***Secretaría de Energía*—Federal Support Programs (Mexico)**
http://www.energia.gob.mx
The Renewable Energy Development Law (LAFRE) has proposed several funds to support renewable energy projects in Mexico, such as the "Green Fund" (*Fondo Verde*) for large-scale projects, the Rural Electrification Fund (*Fondo de Electrificación Rural*) and the Biofuels Fund (*Fondo de Biocombustibles*). LAFRE was approved in December 2005 by Mexico's Chamber of Deputies and is awaiting approval from the Senate.

9.2 Other Renewable Energy Organizations and Resources

Ontario Sustainable Energy Association
http://www.ontario-sea.org/
OSEA provides information and support for community energy developers. It also issued a detailed wind power project development guide, and is working on additional guides on the development of renewable energy projects. Similar associations exist in most other Canadian provinces.

Comision Nacional para el Ahorro de Energía
http://www.conae.gob.mx/wb/CONAE/CONA_24_energias_renovables
Web site about renewable energy, legislative information and the electricity system in Mexico. This site comprises a *Guide to Developing Renewable Energy Projects in Mexico* (*Guía de gestiones para implementar en México plantas de generación eléctrica que utilicen energies renovables*) (text in Spanish).

Oregon Energy Trust
http://www.energytrust.org/
Energy Trust is a public purpose organization focused on energy conservation and renewable energy in Oregon. Their book, *Community Wind: An Oregon Guidebook,* http://www.energytrust.org/RR/wind/community/forms_request.html was partly used to create this present Guide.

Massachusetts Technology Collaborative
http://www.mtpc.org/
MTC is a quasi-public agency that promotes renewable energy and innovation for the state. They also administer the Renewable Energy Trust, an innovative fund that supports the development of renewable energy, including community-owned projects.

RENEW Wisconsin
http://www.renewwisconsin.org/
Web site with lots of information on renewables, with a focus on Wisconsin.

Renewable Energy Industry Associations
All North American countries have industry associations promoting the wind, solar, hydro and biomass industries in their countries. Their web sites may provide useful information on the development of renewable energy projects, and existing support and incentives structures in each country.

9.3 Renewable Energy Resource Assessment

Canadian Wind Energy Atlas
http://www.windatlas.ca/en/index.php
The atlas provides an overview of wind speeds and energy all across Canada. It is based on some wind speed data as collected at airports and other locations, and integrates such data with the relief and landscape structure to estimate average wind speeds. The atlas is a good tool to make a first assessment of the wind resource in your area, but must be accompanied by a one-year assessment using a wind measurement device in the actual location if you want to invest in a large-scale turbine (as opposed to a home-based system).

Canadian Solar Maps
http://www.cansia.ca/solarmap.asp
https://glfc.cfsnet.nfis.org/mapserver/pv/index_e.php

Renewable Energy Atlas of the West
http://www.energyatlas.org
Atlas with maps showing the potential for renewable energy projects (wind, solar, geothermal, biomass) in the Western United States.

US Wind Maps
http://rredc.nrel.gov/wind/pubs/atlas/chp1.html
Atlas with wind speeds for the entire United States.

NASA Solar Database
http://eosweb.larc.nasa.gov/sse/
Resource to assess solar insolation.

Mexico – *Comisión Federal de Electricidad* (CFE)
http://www.conae.gob.mx/wb/CONAE/CONA_24_energias_renovables
The Unit of Geothermal and Renewable Energy, an agency of the CFE, is working on assessing the potential of wind energy. Some general information on renewable energy potential can be found in the *Guide to Developing Renewable Energy Projects in Mexico* (see Section 9.7 below).

PVWATTS Calculator
http://rredc.nrel.gov/solar/codes_algs/PVWATTS/version1/

Solar Electric Researchers at the National Renewable Energy Laboratory developed PVWATTS to permit non-experts to quickly obtain performance estimates for grid-connected solar electric systems. It is available for locations within the United States and its territories, as well as Canada.

9.4 Technology Selection and Purchasing

***Wind Power: Renewable Energy for Home, Farm, and Business* (2004), by Paul Gipe**
http://www.wind-works.org/books/wind_power2004_home.html
This book (and web site) contains lots of information for small and large wind power projects, including sample cash flow analysis, advice on technology and vendor selection, resource assessments, and the structuring of a cooperative.

NREL Small Wind Consumer's Guides
http://www.eere.energy.gov/windandhydro/windpoweringamerica/small_wind.asp
http://www.eere.energy.gov/windandhydro/windpoweringamerica/pdfs/small_wind/small_wind_guide.pdf

Prometheus Institute Solar Report
http://www.prometheus.org/technologycost
A web site with information on solar energy, including a new report on technology and costs.

Solar System Maintenance
http://www.state.co.us/oemc/publications/solar_system/index.htm
Article from the Colorado Office of Energy Management and Conservation.

Consumer's Guide to Photovoltaic (PV) Systems (2003)
www.wisconsun.org/learn/PV_June2003.pdf
From the Wisconsin Division of Energy/Wisconsin Solar Use Network.

Handbook for Developing Micro-Hydro in British Columbia
http://www.bchydro.com/rx_files/environment/environment1834.pdf
Explains the development process for British Columbia, but covers many aspects that are common to all jurisdictions.

Manufacturer Lists
Contact Industry Associations in your country for information where to purchase energy systems. There are also numerous lists on the Internet, some more dependable than others. See one extensive solar database at http://www.cirkits.com/.

9.5 Financing, Funding and Incentives

Renewable Energy Financing Case Studies: Lessons to be Learned from Successful Initiatives
http://www.cec.org/pubs_docs/documents/index.cfm?varlan=english&ID=2022
Document from the Commission for Environmental Cooperation describing renewable energy financing mechanisms and several international case studies.

DSIRE USA
http://www.dsireusa.org/
This database is updated regularly and provides information and links to US federal, state and utility programs to support renewable energy and energy efficiency.

Community Wind Financing Handbook
http://www.elpc.org/documents/WindHandbook2004.pdf
This 25-page handbook, published in June 2004 by the Environmental Law & Policy Center, explains the options for structuring and financing community-based wind power projects.

Solar System Funding (Canada)
http://www.cansia.ca/government.asp
The Canadian Solar Industries Association provides a list of support for solar projects, which includes federal and provincial initiatives

Mexican Infrastructure Investment Fund (FINFRA)
http://www.banobras.gob.mx/BANOBRAS/ServiciosFinancieros/FINFRA/
This fund of the Mexican Bank for Public Works and Services (BANOBRAS) provides risk capital up to 35 percent for privately financed energy and other projects.

***Comité Mexicano para Proyectos de Reducción Emisiones y de Captura de Gases de Efecto Invernadero*—COMEGEI**
http://cambio_climatico.ine.gob.mx/secprivcc/secprivcc.html#comegei
The Mexican CDM Office facilitates the development of so-called CDM projects that create greenhouse gas emission reductions. Renewable energy projects in Mexico are seen as an attractive source of emission credits by the international community. Selling these credits as part of project financing helps achieve attractive economics for a project in order to leverage the remaining investment needed.

Emission Reductions
http://www.chicagoclimatex.com/
The sale of emission reductions, or "offsets," is becoming an option in Canada and the United States as both voluntary and mandatory markets emerge for such offsets—mainly in the area of greenhouse gases. The Chicago Climate Exchange is one trading platform where US and Canadian companies and institutions with voluntary emission reduction targets buy such offsets.

Concentra Trust (Canada)
http://www.concentrafinancial.ca/public/default.asp)
A partner in Canada to talk about retirement plans using co-op shares.
Iowa Policy Project's "Wind Power and Iowa Schools" (written by Teresa Galluzzo and David Osterberg)
http://www.iowapolicyproject.org/2006docs/060307-WindySchools.pdf

Clean Energy Funds (Study)
http://www.cleanenergyfunds.org/CaseStudies/lbnl-56422_Impact_RE_UtilityScale_april2006.pdf
Study by Mark Bolinger and Ryan Wiser, "The Impact of State Clean Energy Fund Support for Utility-Scale Renewable Energy Projects" (May 2006)

Other lists of incentives can be found in:
Community Wind: An Oregon Guidebook (pp. 74-75; also Appendix E) – downloadable at:
http://www.energytrust.org/RR/wind/community/forms_request.html

And in *Community Wind Financing* from the Environmental Law and Policy Center (pp. 14-20) downloadable at:
http://www.elpc.org/documents/WindHandbook2004.pdf

9.6 Project Assessment and Costing Tools

RETSCREEN
http://www.retscreen.net/ang/home.php
RetScreen is free Canadian software, available in English, French and Spanish, for preliminary assessments of the financial aspects of renewable energy projects. Modules can be downloaded specific for each technology, and some resources, such as solar and wind, are programmed into the software to provide an indication of expected energy production.

Wind Energy Calculator
http://www.windpower.org/en/core.htm
From the Danish Wind Energy Association web site. RETScreen (above) can also be used to estimate wind power production.

Windustry
http://www.windustry.org/
Windustry is a non-profit wind energy organization that focuses on community and farmer-owned wind projects. It offers educational information and technical assistance to communities to develop locally owned and sited wind power projects.

National Renewable Energy Laboratory
http://www.nrel.gov/
The National Renewable Energy Laboratory (NREL) provides research in renewable energy and energy efficiency for the US Department of Energy. They offer studies and publications on renewable energy of different scales (small, community and large). They also conduct research and development for new renewable energy technologies.

9.7 Business Plan Development Tools

Interactive Business Planner
http://www.cbsc.org/ibp/en/index.cfm
Online tool provided by the Government of Canada.

Canada-Ontario Business Service Centre
http://www.cobsc.org/en/index.cfm
Additional materials available online, including an online business planning tutorial with a section on business plans.

The Cooperatives Secretariat
http://coop.gc.ca/index_e.php
An agency of the Government of Canada intended to help the government respond more effectively to co-ops and provide information and services to them.

US Small Business Administration
http://www.sba.gov/
The US Small Business Administration provides advice, training, networks and loans for small businesses in the United States.

USDA Cooperatives Program
www.rurdev.usda.gov/rbs/coops/cswhat.htm
This program provides cooperative development information and helps rural communities to form new cooperatives and to improve existing ones. They offer technical assistance and conduct research into cooperative development, operations, etc.

Many sites like www.bplans.com/ offer advice, templates and samples, as well as consultants, to help you to develop your business plan.

Many local nonprofits such as OSEA <http://www.ontario-sea.org/> provide support for members developing business plans and at other stages of community energy projects.

Triple Bottom Line Accounting
http://www.greenbiz.com/toolbox/howto_third.cfm?LinkAdvID=61079
Article on Greenbiz website, on adapting your business plans to triple bottom-line accounting practices.

Community Wind Power Ownership in Europe
http://eetd.lbl.gov/EA/EMP/emp-pubsall.html
Study by Mark Bolinger, *Community Wind Power Ownership Schemes in Europe and Their Relevance to the United States* (LBNL-48357, May 2001)

Business Structures for Farmer-Owned Wind Projects
http://eetd.lbl.gov/EA/EMP/emp-pubsall.html
Study by Mark Bolinger and Ryan Wiser, *A Comparative Analysis of Business Structures Suitable for Farmer-Owned Wind Power Projects in the United States* (LBNL-56703, November 2004)

Community Wind Power in Oregon
http://www.energytrust.org/RR/wind/index.html
Study by Mark Bolinger et al., *A Comparative Analysis of Community Wind Power Development Options in Oregon* (2004)

9.8 Similar and Related Studies and Guides

***WindWorks* website**
http://www.wind-works.org/
This website is maintained by Paul Gipe, well-known international advocate for renewable energy. It contains much useful information on renewable energy and community energy, with a focus on Feed In Tariff policies.

***Ontario Landowner's Guide to Wind Energy* (2005)**
http://www.ontario-sea.org/pdf/OSEA-2005-r1-v3.pdf
A guide to landowner issues in the development of wind in Ontario, by Paul Gipe and James Murphy.

Ontario Community Power Guidebook
http://www.ontario-sea.org/guidebookintro.html
In May 2006, OSEA launched the Community Power Guidebook. This CD is a step-by-step guide to the process of developing your own community power project, from conception to commissioning. It contains links to numerous resources, descriptions of each phase of a project, recommendations, contact names and contact links.

***A Comparative Analysis of Community Wind Power Development Options in Oregon* (2004)**
by Mark Bolinger et al.
http://www.energytrust.org/RR/wind/OR_Community_Wind_Report.pdf
This report compares different ownership structures of community wind projects.

Community Wind: An Oregon Guidebook **(see section 9.4 above)**
This 106-page book introduces the basic concepts behind community wind development, including permitting and interconnection issues.

Renewable Energy and Distributed Generation Guidebook **(2001)**
Massachusetts Division of Energy Resources
http://www.mass.gov/Eoca/docs/doer/pub_info/**guidebook**.pdf
Provides an overview of state and federal programs, regulations, and policies that pertain to the development of renewable energy and distributed generation projects in the United States.

Illinois CHP/BCHP Environmental Permitting Guidebook **(2003)**
http://www.chpcentermw.org/pdfs/030123-PermitGuidebook-volA_IL.pdf
Developed by the *Midwest CHP Application Center*, this Guidebook provides useful guidance for anyone facing interconnecting and permitting issues of combined heat & power (cogeneration) systems. Volume A, *Roadmapping the Permitting Process*, details the current permitting process for CHP (Combined Heat and Power)/BCHP (Buildings Cooling Heating and Power) systems and provides tools in the form of an Emissions Calculator and a step-by-step questionnaire to efficiently navigate the permitting process.

Harvest the Wind: A Wind Energy Handbook for Illinois **(2004)**
http://www.iira.org/pubsnew/publications/IVARDC_Reports_614.pdf
Handbook for wind project developers in Illinois, prepared by Windustry for the Illinois Added-Value Rural Development Center.

A Guide to Tribal Energy Development
http://www.eere.energy.gov/tribalenergy/guide/
Guide to energy project development on tribal lands by the US DOE's Office of Energy Efficiency and Renewable Energy. This site also contains a number of interesting links to further reports and case studies.

Guide to Developing Renewable Energy Projects in Mexico (2006) *(Guía de gestiones para implementar en México plantas de generación eléctrica que utilicen energies renovables)* http://www.layerlin.com/pdfs/guia.pdf
A guidebook from Sener and Conae with step-by-step instructions for the development of small-scale renewable energy in Mexico, including wind, solar, hydro and biomass.

Photovoltaic Power Systems and The National Electrical Code: Suggested Practices **(1996, US)**
http://www.prod.sandia.gov/cgi-bin/techlib/access-control.pl/1996/962797.pdf
Sandia National Laboratory has published a useful guide to installing photovoltaics systems in the United States. This Guide also applies to other technologies, such as small wind or micro-hydro.

Wind Resource Assessment Handbook
www.nrel.gov/docs/legosti/fy97/22223.pdf
From the US National renewable Energy Laboratory (1997).

The Ontario First Nation Guide to Windpower: Getting Grid Connected **(2005)**
http://www.ainc-inac.gc.ca/clc/tp/ofn/ack_e.html
Written by SGA Energy Ltd in association with Pembina Institute for Sustainable Development & Gale Force Energy Ltd.

Waterpower Generation Developments: An Outline of Steps and Insights **(2003)**
http://www.ainc-inac.gc.ca/clc/tp/wgd/exe_e.html
November 2003, Written by Cummings Cockburn Ltd.

9.9 Other Topics

National Rural Electric Cooperative Association
http://www.nreca.org/
The United States has many rural electricity cooperatives. These were mainly created as consumer co-ops, but some also generate their own power, based on shared ownership. These electric co-ops may be good partners for, or even initiators of community energy projects.

National Rural Utilities Cooperative Finance Corp
http://www.nrucfc.org/
A member-owned US financial institution that provides financial products to its approximately 1050 electric cooperative members.

British Wind Energy Association
http://www.bwea.com/ref/lowfrequencynoise.html
On noise impacts from wind turbines.

Chinese Small-scale Digesters
http://www.motherearthnews.com/Alternative_Energy/1981_May_June/Sichuan_s_Home_Scale_Biogas_Digesters
These digesters produce biogas for household appliances (heating and cooking), but are mainly suited for warmer climates, as very cold weather conditions would slow down or even stop the digestion process. The technology is not being widely used outside China.

***An Assessment of Wind Project Siting Regimes* (2002)**
http://www.stoel.com/showarticle.aspx?Show=885
Article from Peter Mostow of Stoel Rives LLP on options to permit wind power projects in the United States.

***Understanding Permitting for DER Systems* (US)**
http://www1.eere.energy.gov/femp/der/printable_versions/derchp_permitting.html
A web site with information and links on permitting distributed energy resources (DER) and renewable energy systems in the United States.

Permitting for Small Projects in the United States
http://www.eere.energy.gov/consumer/your_home/electricity/index.cfm/mytopic=10690
This page provides information on permitting requirements for small projects in the United States.

Wind and Real Estate
http://www.crest.org/wind/index.html
A study on "The Effect of Wind on Local Property Values" by the Renewable Energy Policy Project (May 2003) can be found on the CREST web site.

exa

Example A: Model Business Plan for a Wind Park

Example B: Model Business Plan for a Biomass Cogeneration Plant

Examples

Two model business plans are appended to this Guide. One focuses on wind power development in a co-op context. Financing is carried out with bonds sold to community members and the open market. This plan is representative for most renewable energy technologies and focuses on a utility-scale, community-owned project. The plan is designed for the mid-stage process of raising financing from the community through the sale of bonds (similar to shares in this case, but with interest rather than dividends returned to the investors).

The second business plan focuses on a biomass cogeneration project. It is set in a more commercial context, and designed to attract external investment from venture or other investment funds. This business plan represents the state of affairs at the final stages of project development, and presupposes that the technology has been chosen, and firm quotes and some of the debt financing have been secured.

Note: This business plan is written as if you wanted to submit it to an investor to raise money for the project. However, even if you have all the money necessary to finance the project yourself, it is still a very useful exercise to complete a business plan in order to make sure you have identified all the risks and costs related to the project. This plan is made for an imaginary community-based wind energy project. Certain aspects of this business plan will differ depending on the complexity of the actual project. It may be necessary to show that your project income is guaranteed by providing copies of contracts for the sale of electricity.

Do not just take over the cost parameters in this example, but determine your own costs. Some of the parameters used here are only rough estimates and may differ considerably for your project. Also, you may identify other parameters than those used in this example. Some models will suggest costs for various items, but again you should insert your actual costs based on engineer's estimates or even better, actual company quotes.

Example
Wind Energy Project Business Plan

1. Executive Summary

The Company X wind energy projects represent innovative and exciting new developments that will play a significant role in reducing climate change contributors and impacts in the Haldimand, Halton and Hamilton areas and across Ontario. These projects are financially sound and sustainable, with anticipated project lifespans of 20 to 25 years. Our co-op is backed by a management team with a solid blend of experience in wind power, community development, the environment and professional business management.

Company X has embarked on the development of two community-based wind farms: one on the north shore of Lake Erie in Haldimand County, and the other in the rural community of Flamborough in the City of Hamilton. The Lake Erie site has the capacity for an initial phase of 4 MW, or two turbines, with room to add an additional eight turbines. The Flamborough site, as originally tested, could accommodate a single turbine on the top of a drumlin. There are two nearby properties, owned by the Hamilton Conservation Authority, that are also good candidates for development, and when the feasibility work has been completed, two turbines could be brought online. For the purposes of this document, both sites will be referred to jointly as 'the project' or 'the sites.'

The total investment in both communities will be $8.8 million. Financing is based on a model that acquires this investment through a combination of debt offered by community bonds and traditional financing, with the financing divided into two phases. Residents in Company X's catchment area will be able to become both members and investors in Company X through community bond offerings delivered by our community cooperative. The first phase of financing will be a community bond offering that will cover the full development costs for Lake Erie, partial development costs for Flamborough, primary feasibility for the Conservation Authority lands, and most importantly, the down payment on two turbines for the Lake Erie location. The second financing phase will cover the balance of the equipment and construction costs and will include traditional financing from financial institutions that specialize in funding wind energy and cooperative developments as well as a third series of community bonds. Longer-term future plans will include subsequent community investment offerings to cover additional down payments and construction costs for expansion of the Lake Erie site and full development at the Flamborough sites.

Feasibility work for both the original Flamborough site and the Lake Erie site has been largely completed. A wind resource assessment was completed at the Flamborough site in April 2003. At the Lake Erie site, a wind resource assessment tower was erected in July 2004 and will continue collecting data into spring of 2006. Initial wind data analysis indicates that both sites have a good wind resource available, with the Lake Erie site having a more robust wind regime that makes it a more ideal site for development. Informal interconnection assessments have been carried out at both locations with the appropriate LDCs, and we have collected initial data for the wildlife component of the environmental assessment at all three Flamborough sites. Originally envisioned as two separate projects with separate financing and commissioning dates, changes in the Ontario electricity market, as well as our ability to accelerate the timelines at the Lake Erie site have meant that we are in a position to combine the financing and partially develop the Flamborough site alongside the Lake Erie site over the next year, as well as initiate the feasibility work for the two Conservation Authority sites near the originally identified Flamborough site. This will grant us additional economies of scale when contracting the necessary third party firms to complete the scientific and technical work for the development phase. Of the $8.8 million total project cost, the first community bond offering phase will consist of 2 series totalling just over $2 million dollars and will cover project development work, operational costs of the cooperative, feasbility work in Flamborough and the down payments for 2 turbines.[32]

The development phase for the project will take place over 2006, with the turbine orders and down payments made in mid-2006. Construction and commissioning of the wind farm will occur over the third and fourth quarters of 2007, with initial revenues expected in early 2008. The electricity generated from the turbines is expected to be sold under the Ontario Power Authority's Standard Offer Contract program. When considering normal losses and downtime for wind energy projects, the Lake Erie wind turbines will produce a maximum capacity of 10,383,200 kWh of green electricity per year—enough power to supply the needs of approximately 1000 Ontario homes.[1] The project will be lead by a core management team/Board comprised of key individuals from the community. In addition to the proven ability to manage a technically complex project from start to finish, this team also has the passion and skills to engage the community at a number of levels.

The community bond offering will consist of two series that will launch in January 2006 and will deliver a return of 6.5 percent for member-investors and 6 percent for investors. The payback period for both series will be five years, with annual return of interest and repayment of principle in year 5. Cumulatively, over $x,x00,000 million

32. The average energy consumption for residences in Ontario is approxcimately 10,000 kWh per year. (http://www.electricitychoices.org/ and http://www.hydroonenetworks.com/en/electricity_updates/pricing_changes/faq.asp) will be returned back into the community as interest income over five years, with additional returns to the community anticipated through subsequent project investment offerings in late 2006 or early 2007 and beyond. In addition to the direct economic benefits created through the community investment, these projects will also result in major reductions in climate change impacts. Over 9.43 tonnes of CO_2 will be displaced per year and over the lifetime of the turbines, this will grow to over 188.6 tonnes.[32]

In summary, the Company X wind energy projects are both a creative and sound investment that truly deliver triple bottom-line results.

2. Company X's Mission, Vision and Values

Mission With a commitment to leadership and innovation, Company X promotes the generation of clean, renewable energy through the development of community-based projects and education.

Vision Company's vision is a healthy and sustainable environment through community-based renewable energy.

Values

People
- Individuals and their contributions are vital to our organization
- Our strength comes from democratic and participatory processes

Community
- We believe in community-based leadership and empowerment
- Our renewable energy projects will include financially accessible opportunities for community ownership
- Our projects are designed to maximize benefits to the community

Responsibility and Integrity
- Financial, organizational, and environmental responsibility and sustainability are the cornerstones of our decision making

Positive Action and Innovation
- We lead by example through positive and focused actions
- We encourage innovation

Partnerships
- We partner with other groups to achieve common goals
- We are committed to sharing our knowledge and experience

Conservation
- We encourage energy efficiency and conservation

32. Calculated at http://www.electricitychoices.org/calculate.html

3. Organization Profile

Company X

Company X is a non-profit renewable energy cooperative incorporated without share capital, with an active Board and volunteer base, supported by both members and a full-time General Manager on staff. The organization aligns our internal and external resources into project teams that focus on the development of wind energy projects and the education of the community. Our Board of Directors and full-time General Manager are complemented by project teams and a strong volunteer base, which includes:

- A Board-driven Finance Committee that provides financial analysis and management of both the cooperative and our projects,
- Community presenters and educators that implement presentations and events and develop educational materials renewable energy, community-owned power and cooperative developed wind energy,
- Newsletter and web site volunteers that publish a bi-monthly newsletter and update the Company X web site with news and information of interest to members, volunteers and the community at large.

Our mission and purpose is to develop community based renewable energy projects, and recognize that there is an important educational component to the successful implementation of this type of project development. Educating the community about the benefits of renewable energy and the community cooperative model is a key part of our mission and mandate.

Company X develops its projects using the concept of "Community Power"—locally owned and sited green power that can encompass not only wind projects, but solar, biomass or run-of-the-river hydro. This model—where members of the community directly contribute to, invest in and benefit from the projects—has been very successful in Europe and parts of the United States.

Location

Our catchment area consists of three major municipal regions around the western end of Lake Ontario:

1. New City of Hamilton (Hamilton Proper and the communities of Ancaster, Dundas, Flamborough, Glanbrook and Stoney Creek), population 503,000, 194,000 households.

2. Region of Halton (City of Burlington, Township of Halton Hills, Town of Milton, Town of Oakville), population 375,000, 114,000 households
3. Haldimand County, population 41,000, 14,000 households.

With a combined population of just over 900,000 with 332,000 households and a geographic area that consists of both urban centres and rural areas, our catchment area has a particularly diverse base that represents a range of socio-economic communities.

Company X currently maintains an office within the City of Hamilton that provides a base of operations for the General Manager to support activities throughout our catchment area.

History

Company X was created as a result of the Green Community Workshop. A collaboration of local environmental and community organizations hosted this workshop, recognizing a need for local action to address the environmental concerns of smog and greenhouse gas emissions. As a result of actions and work stimulated by this meeting, Company X was incorporated as a non-profit cooperative without share capital on 1 October 2002, and chose wind energy as its first renewable energy technology focus. The Flamborough project was the first planned project for the cooperative and was initiated in November 2002 with the receipt of grants from the Hamilton-Wentworth Stewardship Council and the Hamilton Community Foundation. The Lake Erie project was identified as the Co-op's next initiative, and was supported by a grant from The Cooperators. This project was designed to provide better economies of scale and financial performance and support the ongoing efforts of Company X. Both sites offer good wind regimes, as well as supportive landowners and in both cases they represent the only community-based project in their respective communities.

Accomplishments and Milestones

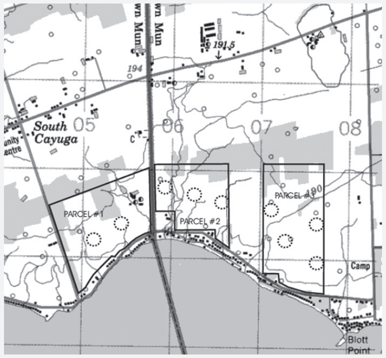
Since incorporation Company X has achieved a number of important milestones that will assist us in achieving financial independence and sustainability by virtue of successfully commissioning wind energy projects.

- Received over $220,000 in funding from granting organizations, including:
  - $5,000 from the Hamilton-Wentworth Stewardship Council for Wind Resource Assessment research
  - $30,000 from the Hamilton Community Foundation for Wind Resource Assessment research
  - $6,000 from The Cooperators for Wind Resource Assessment research
  - $150,000 from the Ontario Trillium Foundation (Hamilton Grant Review Team) to hire a full-time staff person and pursue project development and feasibility work
  - $7,800 from TD Friends of the Environment for workshop development
  - Over $10,000 from the Community Economic Development and Technical Assistance Program for consultation and assistance related to business planning, financial modelling and community outreach plan development
  - $5,000 from the Cooperative Development Initiative to complete our community investment offering statement
  - $8,000 from the Grand Erie Business Centre to assist with ongoing operational needs
  - $5,000 from the Ontario Sustainable Energy Association to help develop communications materials related to demographic research and community outreach

- Successfully completed our first wind resource assessment for our Flamborough site.
- Completed 18 months of data collection at the Lake Erie site.
- Hired a General Manager to manage the operations of the cooperative and the activities of our project teams.
- Completed a feasibility study to evaluate a variety of options to ensure that the cooperative can operate as an independent, financially sustainable non-profit organization.
- Developed a full business case (20-year financial projections, including income statements)
- Prepared and submitted an offering statement that represents the first investment offering in the wind energy sector structured under a not-for-profit model.

4. Wind Energy Project Sites

This is a jointly financed and developed project that consists of two geographically distinct sites within our catchment area of Haldimand, Halton and Hamilton.



Lake Erie Site

This is the larger of our two sites, and is located along the north shore of Lake Erie, near the Town of South Cayuga in Haldimand County. The initial 4 MW of turbines will be located along Lakeshore Road, near the Haldimand County Hydro transmission line that is along the Haldimand Dunnville Townline Road. This is a rural area, with the primary use being agricultural.

In December 2005, Company X entered into a Land Option and Easement Agreement with the landowner for the 3 parcels of land identified above, encompassing 640 acres. Our 50-metre wind resource assessment tower and meteorological sensors were installed in June of 2004. The wind resource data collected to date suggests we have a viable location for a wind power project, with a measured 50m average wind speed of 5.75m/s and a predicted average speed at 80m of 6.60m/s. We plan to complete a federal level environmental assessment screening and a provincial environment assessment for this site, which will be initiated in the spring of 2005.

Flamborough Site

This site is located in the rural community of Flamborough within the City of Hamilton. The turbine will be situated on the top of a drumlin that is part of the Westover drumlin field and is closest to the intersections of Highway 6 and Safari Road. The area is rural, with the primary use being agricultural. We completed a one-year wind resource assessment in April 2003, and the measurements indicate an average wind speed of 6.1 m/s. More detailed extrapolation for average wind speed at hub height has not yet been performed, but will be initiated in Spring 2006.

Company X entered into a Land Option and Easement Agreement with the landowner of this site in October 2005. Site #1 on the second map indicates the original site of data collection, and sites #2 and #3 are the drumlins on the Hamilton Conservation Authority lands that have been identified as the secondary sites that will have feasibility testing performed during 2006. At this time, full development for the Flamborough site has been postponed in favor of focussing on the Lake Erie site, which is more financially viable due to the potential economies of scale present at a site that can support more than one turbine. As the feasibility work is completed for the Hamilton Conservation Authority sites in Flamborough, the majority of the development work will be bundled with the work remaining at the original site in order to experience some economies of scale and increase the financial viability of the original site.

5. The Company X Business Model

Overview of Project Structure

Company X is an Ontario incorporated cooperative without share capital, operating on a non-profit basis. The financing for both sites (along with feasibility and supportive operational costs) can be combined due to the similar work that remains to be done at both locations before construction at either location can begin, and the fact that the electricity from all the turbines will be bid into the Standard Offer Contract renewable energy procurement system currently being designed by the Ontario Power Authority under direction from the Ministry of Energy. It is also logical to seek financing using a phased approach, where financing for the development phase of the project is sought separately from that required for the bulk of the equipment and construction costs. For this reason, a community bond offering has been designed that will provide the necessary cash for the full development work at Lake Erie, partial development for Flamborough, and feasibility work for the Conservation Authority sites, as well as down payments on the wind turbines, and the operational costs associated with the cooperative during the development phase. The remainder of the equipment and construction costs will be financed using a third bond series available once the initial $2 million offering has been fully subscribed. Additional project costs, including the full equipment costs for both turbines that will be situated on the Conservation Authority lands and other development work at the Flamborough sites, will be financing through additional investment offerings and traditional financing in the years to come.

Management of Project

The project will be managed by Company X's General Manager, under direction of the Board of Directors. Additional administrative staff will be hired as required and will report to the General Manager. The General Manager will also be responsible for the day-to-day management of all relationships with all third-party contractors and consultants.

Rationale

This model allows for a relatively easy way to approach the community to directly invest in the project and provide adequate compensation for their risk in doing so. This model also allows Company X to maintain its community focus and non-profit status and mission to educate and inform the public while optimizing community ownership and involvement in the project. The combination of financing and development phases for both projects will allow Company X to experience economies of scale for turbine purchasing, and to maximize the human and financial resources available within the co-op.

A Proven Model – TREC's WindShare Experience

WindShare is Canada's first wind power co-op, with its first wind turbine built in 2002 on the Exhibition Place grounds, and it began producing power in January 2003. WindShare was developed by the Toronto Renewable Energy Cooperative (TREC) in association with Toronto Hydro Energy Services Inc. (THESI) to provide green energy to residents of Toronto. Just over 400 WindShare members purchased $800,000 worth of ownership shares to finance turbine construction, and the green electricity generated by the turbine is sold to a local energy retailer. WindShare is considered a 'Generator Co-op' and any co-op surpluses resulting from the energy sale are redistributed to the members. Following the first year of operation of their Exhibition Place turbine, Windshare was in a position to provide 4 percent dividend payments to all share members. Although Company X will be utilizing a different investment vehicle and going forward under a not-for-profit model, the proven success of TREC to successfully tap community interest in producing and investing in the generation of green energy bodes well for our own activities.

6. Industry Analysis

Global

Over the last 10 years, wind energy has become the fastest growing source of electrical energy in the world.[34] In Denmark, for example, wind power covers almost 20 percent of the national power production.[35] A recent report by the European Wind Energy Association estimates a total of 60,000MW of wind energy will be installed across Europe by 2010, which constitutes over 5 percent of all of Europe's energy needs.[36] In the United States, growth in wind energy capacity is also strong, and many state legislatures have implemented effective policy frameworks that guarantee continued strong performance for the industry.

Canada

In 2006, in Canada, wind energy production has grown to 682 MW, which is primarily centered in the provinces of Alberta with over 275 MW installed and Quebec with over 212 MW. Ontario makes up a very small percentage of the Canadian total—just 15 MW of total installed capacity. The Canadian Wind Energy Association (CanWEA) estimates that there is enough wind energy potential in Canada to provide 20 percent of Canada's electricity needs, and several sources estimate that there is a minimum of 7,000MW of capacity in Ontario.[37]

Ontario

In Ontario, the electricity market has undergone a number of important changes over the last five years, which has resulted in an overall realization of the challenges and opportunities in the sector, and a movement towards more widespread support of green power production in Ontario. A number of studies have looked at the potential of increasing our green power production, and the general consensus is that there is at least 7,000MW available for development in Ontario.

In 2004, the Province tendered an RFP for 300 MW of renewable energy generation as part of their target of 1350 of renewable energy capacity by 2007 and 2700 MW by 2010. Contracts for these 300 MW were awarded early in 2005 and it was followed later that same year by a second RFP that awarded 975 MW of renewable energy contracts. Also, in 2003 the Province announced their plan to decommission Ontario's coal fired generators by 2007. Moreover, on August 27, 2007, the Minister of Energy issued a ministerial directive to the Ontario Power Authority (OPA) to procure 2,000 MW of renewable energy supply for projects that are greater than 10 MW in size. The OPA is expecting to procure the 2,000 MW of renewable energy supply in multiple phases.

This supports the conclusion that there is movement at the provincial level to substantially increase the level of power production that Ontario derives from renewable energy resources. The current provincial RFP system is almost exclusively geared towards large-scale wind development, but there seems to be a growing realization at the provincial level of the benefits of smaller scale generation, which will benefit generation projects developed by community cooperatives.

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34. http://www.canwea.ca/downloads/en/PDFS/CanWEA_brochure.pdf **35.** http://www.windpower.org/en/stats/shareofconsumption.htm **36**. http://www.ewea.org/documents/Thefacts_Summary.pdf **37.** http://www.davidsuzuki.org/files/Climate/Ontario/brightfuture.pdf: Christine Elwell, Edan Rotenberg and Ralph Torrie, Green Power Opportunities for Ontario (David Suzuki Foundation, CIELAP and the Toronto Renewable Energy Cooperative, 2002). The wind power potential has been updated based on the revised estimates in the Ontario Wind Power Task Force Report: Industry Report and Recommendations (Ontario Wind Power Task Force, 2002), p. 37-8 and includes only inland resources. The offshore wind potential in Lake Erie alone is estimated at 144,000 GWh/year, i.e., 98% of Ontario's 2001 electricity demand.

The Ontario Sustainable Energy Association, an organization Company X belongs to, has been particularly active in advocating for a policy environment that would be more conducive to community-based local projects. We are recommending the implementation of Standard Offer Contracts (also known as Advanced Renewable Tariffs), which have been highly successful in fostering rapid deployment of renewable energy projects in Europe. For more information on the Standard Offer Contract model, please review Appendix C.

Company X's Identified Sites

For wind power projects to be successful, it goes without saying that an adequate wind resource is required—both in wind speed and the percentage of time that the wind blows. The wind resource at the Flamborough site has been recorded as 6.1 m/s (at 50m), and the site was selected in part due to the local topography (a drumlin field), which leads to higher localized wind speeds at the tops of the hills in the drumlin field. Haldimand County is situated along the north shore of Lake Erie, long known for the strong winds coming predominantly out of the southwest off the Lake—a much more robust wind regime. Natural Resources Canada released a Wind Atlas of Canada in October 2004 that illustrates the average annual wind speeds of the many regions across Canada,[38] and reinforces that the Lake Erie site is located in one of the best available wind regions in southern Ontario. The data from the site bear this out—we have a measured 50m average wind speed of 5.75m/s, with estimated 80m speeds of 6.6 m/s.

Wind Power Economic Benefits

The Canadian Wind Energy Association estimates that increasing wind energy capacity to 4,000 MW within the country will generate $6 billion in investment and create 42,000 job-years of employment, which is a significant economic benefit.[39] Considering that there is an estimated 7,000 MW of wind power available in Ontario, this would indicate a strong potential for economic growth in the wind energy industry within the province of Ontario.

With cooperative wind energy developments, there are a number of local economic benefits in addition to the more widespread economic effects due to the growth of the industry. Community cooperative projects, like the ones that Company X is developing, depend on members of the local community to support the turbine development through the sale of share or bond units. The revenue that the cooperative receives through the sale of electricity is utilized to provide a return on investment. This allows supporters of the project to benefit economically from the project. The Iowa Policy Project has recently done comparative research into the specific economic benefits offered by locally owned, smaller scale projects, versus very large installations, and there is clear, definable local benefits to local economies that host numerous smaller projects instead of hosting only one larger project.[40]

Wind power is well suited to rural areas due to the predominance of open wind-swept areas without obstacles normally associated with urban development. Rural landowners benefit economically from wind energy development through land lease agreements with developers, where they are paid a fee per turbine, which is generally a higher price per acre than most cash crops currently being farmed in Ontario. A Standard Offer Contract program, as is currently ongoing in Ontario, has the potential to further benefit landowners and local communities by providing a more attractive economic climate in which they can more effectively develop smaller scale projects.

7. Trends Influencing Wind Energy Development

Health Impacts

The Golden Horseshoe region suffers from some of the worst air-quality in all of Canada, due primarily to the burning of fossil fuels for energy and transportation. Increased demand for coal to generate electricity caused greenhouse gas emissions of elements such as carbon dioxide to jump 28 percent from 1990 to 1998. Government data shows that total greenhouse gas emissions in Canada in 2003 were 24.5 percent above 1990 levels.[41] In 2005, the Ontario Medical Association updated their economic impacts of poor air quality report, and reported that when taking into account direct health care costs, productivity losses, and loss of life, poor air quality cost Ontario citizens over $7 billion in 2005.[42] This recognition of the costs and impacts of poor air quality has led to a widespread acknowledgement by environmental NGOs, community groups and municipalities of the importance of reducing our dependence on fossil-fuel combustion for electricity generation. This in turn has led to a growing acceptance for wind power generation as an acceptable alternative that will help improve our air quality by reducing our dependence on fossil fuel for electricity generation.

38. See http://www.windatlas.ca. **39.** http://www.canwea.ca/en/PublicOutreach.html **40.** http://www.iowapolicyproject.org/2005_reports_press_releases/050405-wind.pdf **41.** http://www.ec.gc.ca/pdb/ghg/inventory_report/2003_factsheet/2003Factsheet_e.cfm **42.** http://www.oma.org/Health/smog/report/ICAP2005_Report.pdf

Environmental Awareness

As more wind energy development takes place in Ontario, the public acceptance of wind power is growing, especially when the need to improve air quality is taken into account. The public response to the wind turbine at Exhibition Place has been overwhelmingly positive. An Environics poll, commissioned by Toronto Hydro shortly after the Exhibition Place turbine began operation, found that 69-percent of individuals surveyed see the wind turbine as a positive addition to the City skyline.[43]

Awareness of Electricity System Pressures

The blackout that affected southern Ontario for the better part of a week in August 2003 brought the issues of alternate sources of electricity to the forefront of the public's mindset. The unreliability and unresponsiveness of the nuclear energy backbone of our electricity system, coupled with a growing recognition of safety and security improvements available with a distributed power system has made wind a much more attractive option to both the Provincial government and members of the public.

Conclusions

The overall growth of the wind energy industry in Canada bodes well for future development of wind energy in southern Ontario. Concerns around air quality, the stability of the electricity system and the need for local economic development are all factors that will increase the support and buy-in for Company X's current and future community-based renewable energy projects.

8. Customers

Investment

Company X's investment base for the project has the potential to be very broad. As a wind power co-op, progressive members of the local Haldimand-Halton-Hamilton community will have the opportunity to purchase community bonds to help develop the project, and in later phases to finance construction and equipment purchasing. Community bonds for the development phase will also be offered to the corporate, industrial and public sectors, particularly those that are energy-intensive and sensitive to public perception, such as the steel industries or heavy manufacturing sector. Governmental agencies pushing a green mandate or participants in the MUSH sector (Municipalities, Universities, Schools and Hospitals) in may also be interested in purchasing bonds. To this end, two series of community bonds have been designed—one for those residents and small business owners that wish to become members as well as investors, and a second series for those in the institutional and industrial sectors that only may wish to invest without also taking on a membership in Company X.

Power Purchase

The community bond offering for the development phase, and any later offerings that will finance the bulk of equipment costs and construction will only cover the costs associated with getting the project to the point of producing electricity. It is the sale of electricity that will provide the ongoing revenue to the cooperative, which will in turn flow back out to investors and provide the revenue needed to drive further project activities and achieve Company X's mandate. The green electricity generated by the project can be sold to a number of possible entities, including:

Local Distribution Companies (LDCs) – A number of LDCs are now considering purchasing green power to re-sell to consumer or business customers.

Private Buyers/Resellers – A number of innovative models are emerging for green power. One is the 'Green Tags' concept, whereby the environmental attribute is sold separately from the electricity commodity. The Pembina Institute has recently implemented such a program, and Green Tags Ontario is also active in the province. In addition, the corporate/industrial and institutional sectors may also engage in buying green power via a bilateral contract for differences; and this has been a key sector in US markets. Company X has had preliminary discussions with different organizations interested in potentially buying power via this model, however the electricity market issues (the artificial rate cap) in Ontario often make this a less attractive option than in other jurisdictions.

Provincial Government – The production from either site could be bid into the provincial RFP process for renewable energy, specificially the RFP III process designed for projects with a size under 20 MW.

At this time, weighing all the available options and judging the current market conditions in Ontario, provincial procurement (either through RFP III or most likely through Standard Offer Contracts) is the avenue that we will select. Company X has been been actively working with the other member groups of the Ontario Sustainable Energy Association and with the Ontario Power Authority and the Ministry of Energy to advocate for appropriate implementation of Standard Offer Contracts that will facilitate our project development.

43. http://www.canwea.ca/downloads/en/PDFS/Toronto_Case_Study.pdf

9. Competition

Conventional Power Generation in Ontario

In Ontario, the energy market is currently still evolving from a monopoly situation. Opportunity for competition or non-utility generation will continue to grow in time. Ontario Power Generation ("OPG"), one of Ontario Hydro's successor companies, currently operates over 74 percent of the Province's output.[44]

As of 31 December 2004, OPG's electricity-generating portfolio had a total in-service capacity of 22,790 (MW). Its generation capacity will be comprised of approximately 27 percent nuclear, 30 percent large-scale hydroelectric, 43 percent fossil and less than 1 percent green power.[45] The strength of OPG's product lies in the relatively cheap and reliable (compared to renewables) generation costs for the bulk of its generation facilities as well as the integrated infrastructure that the entity has with the power transmission grid, which is operated by another Ontario Hydro successor company, Hydro One. With the erection of a wind farm, members of Company X would be subject to high start up costs that would be offset by a return in the long term, and subject to various factors such as market demand for renewable energy.

However, Company X's core advantage would be energy production that is pollution-free, community-owned, and managed using a cooperative model. Unlike conventional polluting forms of generation, Company X's proposed utility grade wind turbines would not be subject to changing environmental regulations regarding emissions, and it is highly likely that the environment for green power will dramatically improve over time. If the total cost of power, including environmental impact costs, were factored into the comparison, the long-term cost of renewable energy is far less that coal and nuclear technologies.

Renewable Energy Initiatives in Ontario

Traditional retailers such as Oakville Hydro and Guelph Hydro are designing green energy programs that will include run-of-river hydro, landfill gas and some wind power. Ontario Power Generation has developed a very modest 'green power pool' which includes approximately 133 MW of wind power, existing hydropower, and landfill gas. However, the sum total of present renewable energy initiatives in Ontario is quite limited, and falls well short of the existing market demand for green power. Bullfrog Power, an exclusively green retailer, has recently begun operations and purchases power generated by several EcoLogo™-certified small hydro and wind projects, and retails them to consumers in several markets in Ontario for a premium price. Although relatively new on the market, uptake appears to be good in communities where Bullfrog is active, indicating that many people are currently ready to pay a premium for green electricity, and to further support the development of green power.

Wind Energy Developers

Currently there are six wind energy developments in the Province. Two were developed by OPG, one by Sky Generation, one by Huron Wind, and another at Port Albert that was financed privately. The WindShare Cooperative, in partnership with Toronto Hydro Energy Services also developed the first urban and first co-op owned site in Ontario. There are a number of other developments currently under construction and close to commissioning. A detailed list can be found on the Canadian Wind Energy Association web site.

The recent provincially tendered RFPs for 300 MW and 1000 MW of new renewable generation power had a tremendous response that has resulted in a number of new players coming into the market, and existing players that will be expanding their operations. This has the potential to change the landscape of wind energy in Ontario over the next 8 to 18 months. With additional developers showing interest, the potential for growth and local support of the wind energy industry is high, which may lead to further large-scale development.

The government followed this procurement process with plans for a third RFP geared towards projects of smaller size, below 20 MW. In response to these opportunities, the competitive environment has been intensifying. It has also become apparent that the existing RFP system favors very large developments almost exclusively, and so the demand for more equitable procurement that will allow smaller scale projects to participate in the provincial market more effectively has been growing over the last 18 months. The Standard Offer Contract model proposed by the Ontario Sustainable Energy Association and supported by a number of developers, policy organizations and advocacy groups, will offer more opportunities for new generators to enter the market and to provide new opportunities for innovative public-private partnerships and ownership models to contribute. Although the wind energy industry's competitiveness is increasing as the number of players increase, the opportunities are also increasing at the same time and there is more than adequate capacity to allow for a number of different players and project designs on the Ontario stage.

As environmental improvement, public education, and advocacy are all important aspects of our mission, Company X stands to offer a number of intangible benefits to the community that make this type of wind development opportunity attractive. The

44. http://www.opg.com/ir/reports/AIF_2003.pdf **45.** http://www.opg.com/ops/systems.asp successful development of the Toronto Renewable Energy Cooperative's turbine is a positive sign for Company X, and a demonstration that the community power model of wind energy development is one that will work in Ontario's market.

Development

The planning and execution of the wind farm development is a critical success factor for the project. The decisions, choices and actions at this stage will be the primary determinant of financial and environmental benefits—once the turbines are built and operational, the ongoing operations have less of an impact on project success.

There are a number of key development stages, outlined in the following sections.

Site Selection

As a general practice, Company X uses a number of essential criteria to determine suitability of a site for wind energy development. These criteria include:

- Exposure to clean winds with good fetch/exposure to direction of predominant energy bearing winds
- Average wind speed greater than 6 m/s at hub height (to ensure cost effectiveness and sufficient emissions reductions)
- Greater than 250 metres to the nearest residence (to satisfy noise regulations)
- Less than 400 metres to the nearest transmission line; with the transmission line being of adequate capacity to support the turbine without having to upgrade the lines
- Suitable soil and ground water conditions to support the turbine and minimize the foundation and cabling costs

In addition to the importance of the physical characteristics of the site, the success of a wind farm is contingent upon strong local support and local involvement/investment of the local community. A key principle of the cooperative model is that the project be embraced by the community, because it provides a range of social, environmental and economic benefits. In many cases, the visibility of the proposed site can be a criterion to consider (as it was with the original Flamborough site), as it may lead to an overall increase in support for wind energy.

Site Land Rights

Company X has secured Option Agreements with the landowners at both the Flamborough and Lake Erie sites to cover the time required for our feasibility and project development work required in preparation for Company X to exercise long-term easements that provide an initial term of 20 years, with an option for renewal.

The two Hamilton Conservation Authority (HCA) sites that are being proposed as an extension of the Flamborough project are owned outright by the HCA, and will not require a land option and easement agreement as the other sites do. Appropriate access to the land and compensation to the authority for their contributions to the project scientific work and use of the land has been outlined in a general partnership agreement between Company X and the HCA.

10. Site Assessment

Wind Resource Assessments

The Flamborough Wind Resource Assessment was initiated by Company X in November 2002 and was contracted to MK Ince and Associates. MK Ince and Associates is a wind resource assessment engineering firm that has been performing assessments in Ontario since 2002. Volunteer labour from Company X was utilized to reduce costs wherever possible, under supervision of MK Ince and Associates staff. The WRA installation took place over two weekends in March 2003. Data collection began 1 April 2003, and continued for 12 months until 31 March 2004.

Average Wind Speeds, Flamborough Site

Month	Average Wind Speed	Month	Average Wind Speed
April 2003	6.6 m/s	October 2003	5.9 m/s
May 2003	6.0 m/s	November 2003	6.5 m/s
June 2003	5.8 m/s	December 2003	6.7 m/s
July 2003	5.3 m/s	January 2004	7.4 m/s
August 2003	4.4 m/s	February 2004	6.5 m/s
September 2003	5.8 m/s	March 2004	6.4 m/s

12-month average wind speed = 5.6 m/s (at 50 m height)

At the Lake Erie site, Company X used the services of Zephyr North to oversee the installation of the tower and sensors during the last week of June 2004, and we began our formal collection of data for this project on July 1, 2004. The wind resource assessment will continue for at least 12 full months. Company X will contract out the analysis of this data to a Wind Energy Expert to have our data correlated with local historical weather data, and predict the wind speed that can be used for various turbine heights in our financial models.

Average Wind Speeds, Lake Erie Site

Month	Average Wind Speed	Month	Average Wind Speed
July 2004	4.7 m/s	March 2005	5.7 m/s
August 2004	5.0 m/s	April 2005	6.2 m/s
September 2004	4.7 m/s	May 2005	5.2 m/s
October 2004	6.1 m/s	June 2005	4.6 m/s
November 2004	6.3 m/s	July 2005	4.9 m/s
December 2004	7.2 m/s	August 2005	5.0 m/s
January 2005	5.9 m/s	September 2005	5.3 m/s
February 2005	5.0 m/s	October 2005	5.4 m/s

12-month (July to July) average wind speed = 5.6 m/s (at 50 m height)

Note: We are aware that the recorded average wind speeds across Canada for January through March of 2005 are lower than the average historical weather data would indiate. We therefore expect that our predicted average annual wind speed will be higher than the number indicated above. Our financial model assumes an average wind speed of 6.6 m/s at a height of 80 meters, which was an estimate provided by Zephyr North, based on the data collected at the site.

Site Permitting and Approvals

For a multi-turbine project like this, there are several approvals that Company X will be required to obtain over the next 12 months.

Environmental Assessment

Although the project sites are being partially bundled together for financing and operational support purposes, the geographic distance between the two locations means that the environmental assessment processes will be carried out separately. In the case of the Flamborough project, the capacity for the original site will not exceed the 2 MW provincial environmental assessment threshold. However, with the addition of the two additional sites owned by the Conservation Authority, the 2MW threshold will be exceeded. It is also Company X's intention to apply for the Wind Power Production Incentive for this project, which acts as a trigger for the federal environmental assessment process, regardless of project size. The Lake Erie site has a proposed initial capacity of 4 MW, with potential for total capacity of approximately 18 MW. This exceeds the exemption threshold for the provincial environmental assessment process and we again will be seeking the Wind Power Production Incentive for this project, which will trigger the federal EA requirements. Company X has developed a tendering process and a Request for Proposals template employed these in order to select an outside consultant for the EA work on the Flamborough locations, and they will also be contracted for the Lake Erie site.

Municipal Land Use Permitting

In addition to the provincial and federal level Environmental Assessments, some municipal approvals will be required. For example, a zoning bylaw change is a common requirement and a site plan application is also generally required. Haldimand County is in the process of updating their official plan to incorporate wind power projects, which may negate the need for a zoning bylaw change, or facilitate the application to Haldimand County's planning department. Company X has submitted comments to the planning department and if they are implemented in a manner that is reasonably close to the draft versions circulated, Company X anticipates little to no problem in complying with the requirements. Hamilton's official plan (where the Flamborough sites reside) is also undergoing revision, and initial meetings with the planning staff have indicated that a zoning bylaw change and site plan will be required for approval.

Education is an integral part of Company X's mandate, and in-depth community consultation will be part of any process we undertake, which will help ensure full-fledged support of the community. As the cooperative model also offers direct economic benefits to the community, this is likely to be a factor that increases community support of the project during any and all necessary approval processes.

Power Purchase Agreements

The Power Purchase Agreement (PPA) is a critical milestone in the course of the project. A signed PPA is needed to obtain traditional debt financing and any necessary bridge financing or investment required for the development phase of the project. The price obtained for power is the key factor in the determination of revenue and financial sustainability for the cooperative. At this time, it is Company X's intention to participate in the Ontario Power Authority's Standard Offer Contract program. This will provide a long-term guaranteed price that will allow for financial security around revenue figures during the planning process.

Equipment Procurement

Over the past 10-15 years, wind technology has been steadily improving, with more reliable and larger machines being available for purchase. The larger size leads to great efficiencies, and greater economies of scale. As the industry grows in North America and particularly in Canada, there is likely to be further decreases in costs due to additional local production capabilities, and lowered costs in the operations and maintenance portions of the project due to greater availability of service personnel. In recent months, however, currency and commodity pricing (ex. increase of the Euro, steel price increases of 15 percent) have tempered the drop in equipment pricing, as has the demand for equipment as a result of the renewed production tax credit in the United States.

At this time, Company X plans to use a modified version of its internally approved Request for Proposals for the turbine construction and installation. In advance of the tender, Company X will continue to investigate the technology of several manufacturers to determine suitability. To date, GE, Enercon, Gamesa and Vestas have been contacted to obtain more information about their multiple megawatt class turbines and we have been modelling with GE's 1.5MW model, and the Enercon 2.0MW as our primary choices. However, as Company X continues the work on the sites and the details of the Standard Offer Contract system are announced, other turbine models may prove to be the preferred model. Generally, the key selection criteria that Company X will be using to determine the make and model of turbine include:

- Total price
- Suitability for wind regime
- Record of performance and reliability
- Service and maintenance capabilities—are there other installations in the vicinity that could potentially reduce the cost of onsite visits, or the ability to remote monitor the installation
- Expected ongoing operational costs
- Ability to use local content, firms and expertise wherever possible
- Suitability of turbine for interconnection to the electricity grid

The record of performance and potential for local supply will be of particular importance when evaluating proposals to ensure a consistent level of service and parts at a reasonable cost. The willingness of manufacturers to design innovative approaches that take into account our relatively unique structure as a community cooperative may also have some impact on the final decision.

Construction

Initial site surveys have indicated that road access for both sites is adequate. The geotechnical and engineering studies that will be done as part of both the EA process and also the municipal site plan process in advance of construction will determine the appropriate foundation and roadway needs for the site.

Wherever possible, Company X will endeavour to use local (i.e., within the catchment area, or at least within southern Ontario) engineering and consulting firms to complement the staff provided by the turbine manufacturer. This will also assist in developing the local economy and adding to the development of the wind energy industry in this area.

Interconnection and Commissioning

The safety and regulatory requirements for projects of this magnitude (as opposed to a home-based wind system) dictate that Company X must be classified as a generator, and must be connected to the electricity grid. As part of this process, there are a number of applications and studies that must be done to ensure that safety is maintained and that the project does not adversely impact the electricity grid, and vice versa.

For a project of this scale there are two options for interconnecting, either to the Independent Electricity System Operator (IESO) controlled transmission grid or to a local distribution grid (LDC). Depending on the scale of project a full IESO System Impact Assessment and a Customer Impact Assessment application to the LDC is required. There are two different processes, depending upon whether the project is above or below 10 MVA (approximately 9 MW) in size:

- For projects below 10 MVA, a Distributor Connection Impact Assessment may suffice. This would be conducted by the LDC. Although not strictly required, an external consultant can be retained to complete the assessment.

- For projects above 10 MVA, an IESO System Impact Assessment (SIA), Hydro-One Connection Impact Assessment and Customer Impact Assessment will likely be required. An external consultant is usually required to complete the SIA required by the IESO. If one is connecting to the Transmission System, an IESO System Impact Assessment must be completed, in addition, a Customer Impact Assessment would be carried out by the Transmission Company, in this case Hydro-One Networks.

Site Impact Assessment Requirements

Requirement	Flamborough site	Lake Erie site
Assessment	Customer Impact Assessment	Customer Impact Assessment for 1st phase (under 5 MW) IESO System Impact Assessment may be required for subsequent phases
Connecting to transmission or distribution network?	Distribution	Distribution
LDC	Hydro One	Haldimand County Hydro

Once both CIAs have been completed, Company X will know what the costs are to interconnect to the grid, including the cost of all necessary safety equipment. Company X can then contract a third party electrical expert to prepare the sites for connection to the grid, and once construction is complete, the interconnection can be completed and the turbines can begin supplying power to the grid.

EcoLogo Certification
Company X plans to sell the power produced at the sites as green power, and as such, we will be applying for certification under the EcoLogo program. Certification involves an initial application and audit to verify adherence to certification guidelines. There is also an annual fee to maintain certification. EcoLogo certification provides labelling rights, which is a valuable marketing and public relations tool for both Company X and its partners.

11. Project Financing

The total identified cost for the entire project is $8.8 million. At this time, Company X is dividing the financing into two phases, with a first phase community bond offering of $2 million to finance the development phase work, the down payments on 2 turbines, the feasibility work for the Conservation Authority sites, and the operational support required to develop the projects. The second phase will finance the bulk of the equipment costs, and the construction costs and will consist of both expanded community investment offerings as well as traditional debt financing

Community Bond Offering
For more details on the specific investment offering implemented by Company X, please see the full Offering Statement plus attachments, available under separate cover. An overview that includes the most relevant information has been provided below.

Minimum and Maximum Offering

1. The minimum series A Bond purchase is $500.00. The maximum subscription for series A Bond for any Member is $5,000.00. The maximum total subscription for series A Bonds is $500,000.00.
2. The minimum series B Bond purchase is $5,000.00. The maximum total subscription for series B Bond is $1,500,000.00.
3. The minimum series C Bond purchase is $10,000.00. The maximum total subscription for series C Bonds is $6,800,000.00.

For all funds arising under this Offering Statement, there is no commission or discount to any persons or agents. The Series A Bonds are available only to Members within the Bond of Association catchment area. The series B Bonds and the series C Bonds are available to both Members and nonMembers resident within the Province of Ontario.

While the series C Bonds are targeted to commercial lenders in the Province of Ontario, they are avialable to any resident of Ontario. Series C Bonds will not be made available until series A and B have been fully subscribed.

The mechanism of “sale” for all Bonds will be by assigned staff and the accounting systems of the Cooperative are the infrastructure involved in the recording. All transfers of series A Bonds and series B Bonds amounts between bondholders are contingent on the approval of the Board of Directors.

Budget for Project Financing

Bonds	Budget Items	Amount [C$]
Series A ($500,000) and **Series B** ($1,500.000)	**Feasibility Studies** *(feasibility studies for two newly identifed sites in Flamborough, identifcation of new sites)*	75,000
	Development *(complete scientific and technical studies for Lake Erie Site, partial work for Flamborough site, operational costs to support development phase)*	465,000
	Engineering *(foundation study and development work)*	110,000
Bonds	Down Payments on wind turbines – 2 turbines, Lake Erie Site	1,350,000
	Subtotal Series A & B	**2,000,000**
Series C ($6,800.000)	Balance of equipment costs (incl spare parts, transport)	5,360,000
	Construction and commissioning costs	900,000
Bonds	Contingencies	540,000
	Subtotal Series C	**6,800,000**
	Total BOND ISSUES	**8,800,000**

Description of Securities (Bonds)

Unsecured Bonds – Series A

- Series A Bonds are available only to a member of the Cooperative. Membership is open to any resident of the Bond of Association catchment area
- Available beginning year 1 (2006)
- Minimum purchase per Bond: $500.00
- Maximum purchase per Bondholder: $5,000.00
- Interest rate of 6.5 percent per annum and fixed for the entire term of the Bond
- Interest calculated and declared annually
- Term: 5 years
- Repayment: accrued interest is due on anniversary; principal is due on maturity
- The Board of Directors retains the option to redeem at any time
- All transfers of Series A Bond(s) to a new Bondholder requires the approval of the Board of Directors.

No commissions or fees are earned upon the sale of any Bond. The financial plan conservatively commits full repayment on maturity with no reinvestment. Reissue of Series A Bonds will be determined for Year 6 and following.

Ranking: The Bonds will be direct unsecured obligations of the Cooperative and will rank pari passu (equally) with each other and rank subordinate to Series B and Series C bondholders.

Unsecured Bonds – Series B

- Series B Bonds are available to any resident of Ontario
- Available beginning year 1 (2006)]
- Minimum purchase per Bond: $5,000.00
- Maximum purchase per Bondholder: limited by full subscription
- Interest rate of 6 percent per annum and fixed for the entire term of the Bond
- Interest calculated and declared annually
- Term: 5 years
- Repayment: accrued interest is due on anniversary; principal is due on maturity
- The interest rate is fixed for the entire term of the Bond.
- The Board of Directors retains the option to redeem at any time
- All transfers of Series B Bond(s) to a new Bondholder require the approval of the Board of Directors

No commissions or fees are earned upon the sale of any Bond. The financial plan conservatively commits full repayment on maturity with no reinvestment.
Reissue of Series B Bonds will be determined for Year 6 and following.

Ranking: The Bonds will be direct unsecured obligations of the Cooperative and will rank pari passu (equally) with each other and rank subordinate to Series C bondholders.

Secured Bonds – Series C

- Series C Bonds are available to any resident of Ontario
- Available beginning year 1 (2006)
- Minimum purchase per Bond: $10,000.00
- Maximum purchase per Bondholder: limited by full subscription
- Coupon rate of 7 percent per annum and yield rate determined at time of sale
- Interest calculated and declared annually
- Term: 15 years
- Repayment: accrued interest is due on anniversary; principal is due on maturity
- The coupon rate is fixed for the entire term of the Bond.
- The Board of Directors retains the option to redeem at any time

No commissions or fees are earned upon the sale of any Bond. Series C Bonds are secured by the assets of the Cooperative and shared with any syndication members.

Ranking: The Bonds will be direct obligations secured by the assets of the Cooperative and will rank pari passu (equally) with each other and rank superior to Series A and Series B bondholders.

Grants

Company X will be seeking a number of grants from foundations and the public sector to assist with the educational and community consultation aspect of the development phase of the project. This fits well with the traditional funding sector mandate and focus to fund public activities that have a clear and direct benefit to the community. Applications are currently being developed and submitted to various funding agents within the Company X catchment area.

12. Marketing of Investment Offering

Company X's current financial modelling places the total project cost at approximately $8.8 million, and the first phase bond offering will be seeking $2 million dollars. As a community based cooperative, we wish to optimize the investment from the community as much as possible while ensuring that the cooperative is able to effectively administer the cooperative membership and operations. The administration around a bond offering will mean that the cooperative will need to price the bonds appropriately to ensure that the maximum number of investors can participate while keeping the total number of cooperative members to a reasonable limit.

At this time, the cooperative has designed a bond offering to cover the costs associated with the development phase, turbine down payments and community investment, which leads to the following estimated breakdown.

Community investment targets

Sector	Bond series	Number of investors	Average investment (C$)	Total investment (C$)
Consumer	A	250	$ 1,000	$250,000
Small Business	A	250	$ 1,000	$250,000
Series A TOTALS		**500**		**$500,000**
Consumer	B	50	$ 5,000	$250,000
Corporate/Industrial	B	150	$ 5,000	$750,000
Institutional	B	50	$10,000	$500,000
Series B TOTALS		**250**		**$1,500,000**
				TOTAL $2,000,000

Key Assumptions:

- The rural communities that directly supports the turbine (Haldimand County and Flamborough) will be most directly impacted by the developments and will be given special consideration during the community investment process
- The success of this project has a number of wider ranging economic benefits for the rural population as a whole in our catchment area, so engaging the rural community is critical
- The current co-op membership and the general public is the first and most important sector to target for investment in the A series, followed by the Corporate/Industrial and the MUSH sector through the B series.
  - Series A investment will help to leverage larger dollar figures in Series B
- Company X bonds will be RRSP eligible, which may also provide a market among individuals and households for the B series, not just the MUSH and corporate sectors.
- The average investment for consumers is viewed as realistic given that the average for WindShare was $1900/investor.

Consumer Market Penetration

Generally, the experience in other markets in both the US and Canada is that anywhere from 1–5 percent of the consumer market will opt to support green power through investment or action. Given that there are over 330,000 households in the Haldimand-Halton-Hamilton regions, this figure translates into a potential investment base for the project of between 3,340 and 16,700 households.

The figure of 300 individuals or households, 250 small businesses (which would include those operating home or agricultural businesses) and 200 in the MUSH and corporate sectors mentioned previously as the target for investment is therefore viewed as very conservative when compared with this 1–5 percent range that is typical for environmental investments.

13. Operations

Maintenance and Repairs

With the improvements to wind turbine technology, reliability and automation have been increased, and major repairs are minimal. There are some necessary downtimes (between 2–5 percent per turbine) needed annually for regular maintenance or due to icing or weather conditions. However, these are normally accounted for in the modeling of the project production and revenue streams.

Most manufacturers offer service and warranty packages for the first few years of operations, which will facilitate the management of operations.

General and Administrative

Although a great deal of work for this project has been and will continue to be provided through volunteer labour, Company X has realized the importance of having a full-time staff person to co-ordinate the operations of the cooperative as well as further project development, and has included a staff person as part of the planning process when considering the operational phase of the project.

The General Manager of Company X will oversee the development of the project and once construction has been completed and the turbine is commissioned will be responsible for day-to-day administration of the project and the cooperative. Member management and communications, management of administrative staff and volunteer operations, planning for the Annual General Meeting, dealing with partners, vendors and suppliers, and general accounting and record keeping will be considered part of their duties, either directly or indirectly through the supervision of additional administrative staff people. Funding from more traditional sectors will also be sought to further develop the educational component of Company X's mission, including the potential hiring of additional staff positions devoted solely to educational work.

Metering/Verification
Monthly tracking and reporting on the energy delivered will be the responsibility of the General Manager and any subordinate staff hired for this responsibility, and reports will be submitted to the Board of the cooperative and appropriate documentation prepared for the purchaser of the power.

14. Management and Organizational Structure

Organization
The overall organizational structure will be a non-profit cooperative, Company X, incorporated without share capital.

Management Team
Company X is a volunteer-based organization and will continue to involve volunteers in the development of new projects as part of the non-profit parent's activities in the community. Most of the work opportunities for volunteers will be in the development phase, and Company X is fortunate enough to have had on its Board and within its volunteer base people with particular expertise in finance, organizational structure, capacity building, accounting, law, education and engineering. This expertise will serve us well in the planning phase of the project, but also as Company X moves into the operational phase of the project. Although the General Manager and associated administrative staff will take on the lion's share of responsibility for completing and implementing operational and project plans, volunteers with a particular expertise will continue to contribute, either in the development of new projects, as Directors or in service delivery programs in the areas of education and advocacy.

Board of Directors
Company X is governed by an eight-member Board of Directors, contributing a variety of skills and experience to the project.

Advisory Board
Wherever possible as part of its annual renewal process, Company X works to recruit Directors from various sectors within the community that can address a particular area of expertise or link to a particular community or sector of interest.

Company X has been developing an Advisory Board that will represent a pool of expertise that can provide assistance and guidance through project development and implementation. The Company X Advisory Board will not have any governance responsibility, which will ease concerns around conflict of interest and time commitments for those key individuals that may wish to devote their time to the success of this project but have professional obligations that prevent them from taking on governance roles.

Third Party Suppliers
At various points throughout the development, professional third party suppliers will be engaged to execute specific aspects of the project. This will ensure a rigorous level of professional service and quality to various deliverables as the project proceeds. Where appropriate a formal RFP process will be utilized to select these suppliers.

15. Summary of Climate Change Impacts

Forecasted generation in kWh/year
The stated maximum theoretical capacity of the project is 10,383,200 kWh per year for the initial turbine installations. However, losses due to factors such as routine maintenance or icing will result in an estimated energy delivered of 10,383,200 kWh per year.

GHG Emissions Reduction
Over 9.43 tonnes of CO_2 will be displaced per year and, over the lifetime of the turbines, this will grow to over 188.6 tonnes.

Benefits
The increased production of clean wind energy will offset the requirement for traditional fossil fuel sources, and the cooperative model will lead to a more educated community with a greater awareness and commitment to green technologies as well as to energy conservation. This will facilitate the development of future projects, which in turn will reinforce these values within the community.

16. Summary of Financials

(For projected budget, see page A-14)

Key Assumptions

Base Case

Equipment:	2 turbines, manufacturer undecided, Enercon favored
Capacity:	4 MW (2 MW each)
Annual Average Wind Speed:	6.6 m/s (at hub height) – Lake Erie
PPA Price:	$0.133/kwh
Wind Power Production Incentive:	$0.01kwh
Inflation:	2.0%
Total Capital Expenditure:	**$8.8 million**

Key Financial Performance Indicators

IRR (Internal Rate of Return)	9.2%
NPV:	(using IRR instead of ROI, NPV is 0)
20 year cumulative AT cash flow:	million
Renewable Energy Delivered/year:	10,383,200 kWh
Net GHG emission reduction/year:	9.42 tonnes CO_2/year
Net GHG emission reductions/20 years:	188.16 tonnes CO_2

17. Additional Financial Information

(Note: A typical business plan would insert additional financial information at this point in appendixes, as indicated below.)

Project Timing
(omitted from this example)

Appendix A: Financials – Capital Costs, Income Statements, Cash Flow Summary, Balance Sheet
(omitted from this example)

Appendix B: Audited Statements
(omitted from this example)

Appendix C: Sale of Electricity via Standard Offer Contracts
A more detailed overview of the Standard Offer Contract system that was developed by the Ontario Sustainable Energy Association and proposed to the Ontario Power Authority can be found in the "Powering Ontario's Communities" Report found on the Ontario Sustainable Energy Association at http://www.ontario-sea.org/

Standard Offer Contracts (SOCs), more commonly referred to in Europe as Adanced Renewable Tariffs, are the single most successful mechanism for stimulating the rapid development of renewable energy technologies worldwide. Equally important, SOCs are the most egalitarian method for determining where, when, and how much renewable energy capacity will be installed by enabling farmers, cooperatives, and First Nations to participate on an equal footing with large developers.

SOCs are rates paid for electricity per kilowatt-hour consumed, or in this case, generated. The term is commonly used in electric utility rate making in North America. SOCs permit the interconnection of renewable sources of electricity with the electric-utility network and at the same time specify how much the renewable generator is paid for their electricity.

SOCs are the modern version of Electricity Feed Laws. They are widely used in northern Europe and they differ from feed laws in several important ways. Feed laws set the price paid for renewable energy as a simple percentage of the retail tariff. For example, the German feed law stipulated that renewable sources of energy would be paid 90% of the retail rate. SOCs, on the other hand, are more sophisticated than feed laws and can be tailored to different renewable technologies and to different regions of a country. There are often several tiers or tranches of payments, depending upon technology and how long the generator has been in service.

Key Elements of Proposal before the Ontario Power Authority:

- Contracts (tariffs) open to all players
- Contracts for 20 years
- Cost of renewable tariffs (contracts) spread across entire rate base
- Different tariffs or Standard Offer Contracts for different technologies (omitted from this example)-for wind, solar PV, low-impact hydro, & biomass
  - Specific tariffs (prices) determined by transparent process that includes n technology participants, technical advisers, & political staff
  - Initial tariff (price) equal for all players within each technology band
  - Tariff (price) reduced after a period of time sufficient for capital recovery (high price first 5 years, lower price thereafter to adjust for profitability)
- Reduced tariff in years after capital recovery (years 6 to 20) but sufficient for reasonable rate of return
  - Tariffs (prices) sufficient to drive development (to avoid tokenism)
- No Caps or limits (to avoid speculation)
- Allocation of contracts by first come, first served
- Allocation of contracts to those with site control (to avoid speculation)
- Approval or rejection of interconnection request within 90 days
- Three tiers or tranches for wind energy: low, medium, and high wind
  - Wind tariffs for first five years fixed for all tranches
  - Wind tariffs for remaining 15 years dependent upon relative productivity in units of annual specific yield (kWh/m^2/yr) averaged over three years after high and low years removed
  - Capacity factor not used except as reference only (to avoid gaming)

Example
Model Business Plan for a Biomass Cogeneration Plant

Note: This business plan is written as if you wanted to submit it to an investor to raise money for the project. However, even if you have all the money necessary to finance the project yourself, it is still a very useful exercise to complete a business plan in order to make sure you have identified all the risks and costs related to the project. This plan is made for an imaginary cogeneration plant. A business plan for a biomass facility that only produces power or heat will be somewhat simpler than this one. Note that a biomass plant is more complex than many other renewable energy technologies due to the need to source a fuel, increased maintenance, and air emissions. It will be necessary to show that your project income is guaranteed by providing copies of contracts for the sale of electricity and heat.

Do not just take over the cost parameters in this example, but determine your own costs. Some of the parameters used here are only rough estimates and may differ considerably for your project. Also, you may identify other parameters than those used in this example. Some models will suggest costs for various items, but again you should insert your actual costs based on engineer's estimates or even better, actual company quotes.

1. Summary

Treetown Community Group wants to develop a biomass cogeneration plant that uses woodwaste from a nearby sawmill. The sawmill produces more woodwaste than the plant can process. Power produced by the plant will be fed into the public power grid, and the heat energy is used for heating 512 residences, a church and a sports/community hall building. Compared to the use of heating oil, the cogeneration plant will offer the community the advantage of a guaranteed heat supply at a fixed price, and will be able to work profitably due to the sales of both heat and electricity. The project will be financed 13% by the community group, 12% through a grant, 50% through a bank loan and 25% through an equity investor. Counting in the capital and operational cost of the project, an ROI of 18% is offered to the equity investor.

2. Business Description

Treetown residents currently use heating oil to heat their dwellings. With recent increases in prices for fossil fuels, residents have decided to invest in a biomass project in order to reduce their fuel costs and improve the economic situation of the community. Since a sawmill operates nearby and cannot use the sawmill waste it produces, the community intends to use this waste to produce both heat and electricity. Because the local utility company pays $90 per MWh for electricity fed into the public power grid, the planned facility will be able to both stabilize heating costs and generate a profit from the sale of heat and electricity. The plant will have a capacity of 1.5 MW_{el}, producing more than 8,500 MWh of electricity per year. The plant will also produce all the hot water for the 500 households in the community, as well as 98% of space heating needs (electric secondary heaters are provided for very cold nights when the district heating system may not be sufficient to heat homes as desired).

The woodwaste from the sawmill can be obtained for free, but must be transported to the power plant. The cogeneration plant will be operated by Treetown Community Group, and will be 75% owned by the group and 25% by an outside investor. With financing arranged and all necessary permits obtained, the plant will begin producing in May 2008.

3. Founders and Qualifications

Specify the legal type of business that will run the plant. Who will have which function in the organization, and what are their qualifications? This section is meant to show the potential investor that you are competent and able to carry this project through to completion. Concerning the legal entity, a limited partnership may be an advantageous option since it allows for several parties to cooperate in the project, and provides a lot of flexibility.

Treetown Commmunity Group is registered as a limited partnership. Its staff of five will be completed by additional staff to operate the cogeneration plant.

Geoff Brown: Director. Geoff is the director of a local logging company with a staff of 14. With his 20-year business experience he will be directing the current project. Geoff has a good working relationship with local banks and the sawmill, which will help secure financing and the biomass supply.

Larry Cash: Treasurer. Larry has been the treasurer of the Treetown Community for the past 19 years. He will also look after the finances of the cogeneration plant.

Sheila Cook: Secretary and accountant. Sheila is a certified general accountant and has helped with the completion of this business plan. She has five years of business experience and will be employed part-time to deal with invoicing and collections for the cogeneration plant.

Marlo Gates: Technical supervisor. Marlo is a retired engineer (age 65). He has a degree in mechanical engineering and was responsible for identifying and specifying the type of equipment needed for the cogeneration plant. He will be responsible for plant operation and maintenance to be carried out by trained members of the community.

Lara Kyles: Full-time lawyer with James & Kyles plc. and co-owner of the future cogeneration plant. Lara provides 10% of the capital needed to finance the cogeneration plant. She will also be the legal advisor for the project. Lara will be responsible for contractual issues to secure the long-term biomass supply from the sawmill, as well as for the sales of electricity to the local utility, and heat to the community.

Heatel: The technology provider is a company founded in 1987, and the cogeneration plant in its present concept has been offered on the market since 1999. Heatel has sales and service offices in North America and is currently assisting two other customers here with their cogeneration plants. Heatel guarantees that the cogeneration plant will function according to specifications for six months. After this period, a maintenance and repair contract will guarantee that plant operations will continue. Heatel technical personnel guarantees to be at the site within 48 hours in case of a major disturbance, if required. For the first 30 days, Heatel personnel will be available on-site to assure the proper working of the plant, as well as train local employees to operate the equipment.

NA Power Engineering Ltd.: The cogeneration plant will be installed by NA Power Engineering Ltd., a company with 28 years of experience in the power engineering field and that has implemented numerous projects all over North America. NA Power Engineering guarantees the successful completion and start of operation of the system, and will also supervise the installation of the heat distribution system and will deal with the technology provider as a proxy for Treetown Community Group.

4. Technical Description

> Include some technical information, but do not be too detailed as the Business Plan is intended for an investor, not a technical person. Describe the main features of the technology, the name of the provider, specific features and also risks of the technology. Why did you choose it, has it been used before, how is it innovative, and how did other users judge it? Will the technology be in compliance with current emission regulations? Is there third-party certification for this technology, or do you have an installer that guarantees it is working properly and commits to taking the necessary steps to deal with any technical problems and additional investment if need be? Specify the fuel needed per year and its availability from the sources envisaged.

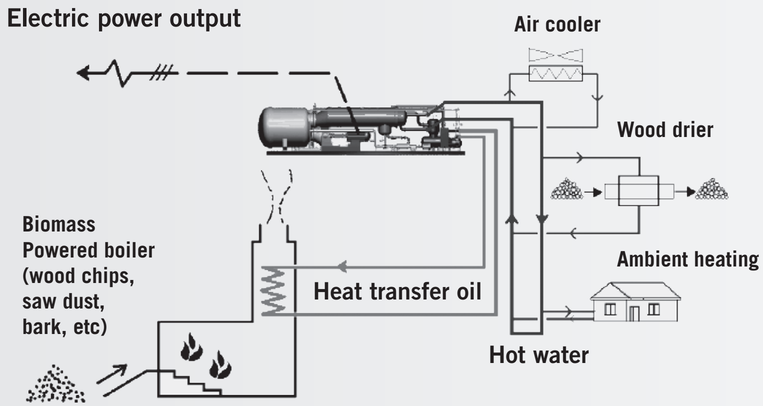
The technology selected for the cogeneration plant is the BioPower concept of European company Heatel Inc. (www.heatel.com). This plant is not a conventional steam plant and does therefore not require a certified steam operator. In fact, Heatel claims that only 3–5 hours per week are required to keep the plant running. The technology has been implemented successfully more than 20 times throughout the world and the experience has been positive. Treetown Community Group Ltd. has talked to two users of the technology in North America, who recommended it emphatically for the envisaged use in Treetown. The welding seams are certified by the German TÜV agency, a renowned safety inspection and certification authority. Several reports on operating experience and university evaluations of the technology are available on the Heatel web site. Some projects in Europe have been successfully operating for 8 years, and the two North American projects have been operating for two and three years.

Treetown Community Group Ltd. has selected the 1.5 MW unit, based on its peak heat output of 6,975 MWh_{th}. Table 4.1 shows that peak winter demand for space heating in Treetown is estimated at 5,120 MWh. The cogeneration plant can thus produce 36% more than the current demand, which leaves enough margin to expand the district heat system to include new buildings in the future (heat losses are estimated to be less than 5% since the district heating system is fairly short). During the remainder of the year, the district heat system will still provide hot water to all buildings. The remaining heat will be released into the air as it cannot be used, other than possibly for some wood feedstock drying (not envisaged for the sawmill waste). It may be used in the future for commercial purposes (e.g., drying).

Table 4.1 Heat Demand in Treetown (Winter peak)

Peak heat demand per home	Number of homes	Peak system heat demand	System Contingency
10 kW_{th}	512	5,120 kWh_{th}	36%

Figure 4.1 Cogeneration Plant Components



(courtesy Turboden s.r.l., Italy)

The technology provider claims an availability of 98% of the cogeneration plant based on operating experience with existing systems, but since the provider's guarantee only covers a 90% availability, this level was assumed for the feasibility study. The system's inherent safety is due to the use of an organic heat carrier instead of water, which avoids the need for a high-pressure boiler. It is a Rankine process that uses the steam produced to run a turbine. Electricity is produced at about 15% efficiency; most of the remaining energy is available as hot water (80°C). These units are available in sizes between 500 kW and 1.5 MW, which is the size selected for the Treetown Community. Four different systems were compared before this technology was selected for its advantages in terms of increased efficiency, capital cost, and reduced personnel needs and qualifications (see the Appendix for a consultant's comparison of the four systems, recommendations and a company brochure). Figure 4.1 provides an overview of the cogeneration plant components.

The cogeneration plant will be run at about 50% of its capacity during the summer months (due to reduced heat demand), and at 90–100% during the winter. Although Figure 4.1 indicates a drying unit, the sawmill waste is expected to have a moisture content of under 40%, and drying will not be necessary. The sawmill waste will be brought by truck and emptied into a silo that automatically feeds the cogeneration unit. The silo has a capacity of three days, i.e., refilling during the weekend is not required. In addition, a roofed fuel stockpile next to the cogeneration plant guarantees a 30-day fuel supply in case of a short-term supply interruption.

The federal flue gas dust emission limit value for biomass cogeneration plants is 50 mg/m^3, and initial consultations with the permitting authority suggest that no more stringent limits will be required for the Treetown location. The manufacturer guarantees that this limit will be met; actually, emissions will be lower than 50% of the limit value, which is also the opinion expressed in the consultant's technology comparison (see Appendix). Additional filtering equipment could be retrofitted in the years to come in order to achieve further reductions.

At peak production, the cogeneration plant will use 85 tonnes of sawmill waste per day. This corresponds to 4-5 truckloads, assuming a 40% moisture content. Over one year, the cogeneration plant will need a maximum of 22,500 tonnes of sawmill waste. Once a year, during the summer, the plant will undergo scheduled maintenance and will therefore not be in service for five days. It is assumed the plant may only be in use 90% of the year due to maintenance or repairs, although in reality the use factor may be higher (98%). Since the sawmill produces more than 32,000 tonnes of sawmill waste per year, there is no shortage of fuel for the cogeneration plant. The sawmill is at a one-way distance of 16 km from the planned plant location. Sawmill waste is stored in sufficient quantities at the mill, plus a 30-day storage will exist next to the cogeneration plant to account for fluctuations in sawmill output or periodic shutdowns of the mill.

Table 4.2 Plant Use and Corresponding Fuel Needs

	Capacity Factor	Fuel consumption	Power produced	Heat produced
Summer (May-Oct)	50%	7,450 tonnes	2,957 MWh	15,275 MWh
Winter (Nov-Apr)	95%	15,100 tonnes	5,617 MWh	29,023 MWh
Total		**22,550 tonnes**	**8,574 MWh**	**44,298 MWh**

Only part of the heat produced will be sold through the district heat system. An average Treetown household uses 31,000 kWh_{th} per year for both space heating and hot water. This demand is currently being covered with heating oil. The system produces around 44 GWh of heat per year. Only 16 GWh are needed for heating purposes, which is about one-third of the heat produced. Currently (heating oil price: $0.72 per litre, heating system efficiency: 70%) the price a household pays for one kWh is 9.6 cent per kWh (based on heating oil). The agreement with the community is to sell the heat from the biomass system at a fixed price of 8 cents per kWh for a period of 10 years (slightly less than current costs to account for some electricity used for secondary peak heating in the winter), after which the pricing level will be reviewed. The price will not be indexed for inflation, but remains at the same nominal level for the ten-year period. Figure 4.2 shows that the savings per kWh for Treetown residents increase over the years. They amount to $340 to almost $500 at the end of the ten-year period.

Figure 4.2 Projected Heating Cost Savings per kWh Due to Project

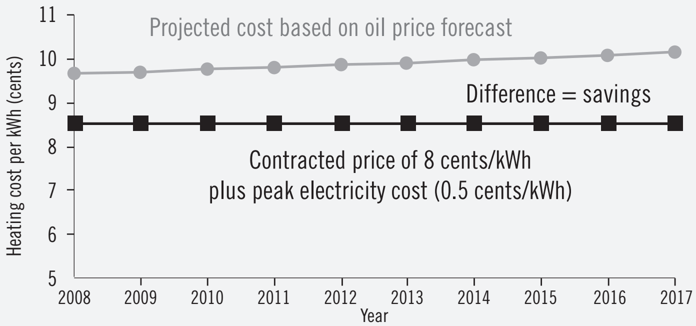


Table 4.3 shows the cogeneration plant parameters expressed as capacity. The manufacturer's electric nameplate capacity is given as 1,500 kW, which is reduced to 1,350 kW taking into account scheduled downtimes for repairs and maintenance, resulting in a minimum expected availability of 90%. Since the plant is not run at full capacity throughout the year, the annual capacity use is smaller than what could be technically achieved. The capacity sold for power is equal to that produced, since the power contract foresees that 100% of the electricity fed into the grid will be purchased. For heat, only about one-third of the amount produced throughout the year will be sold.

Table 4.3 Comparison of Nameplate Capacity, Availability, Annual Capacity Use and Capacity Value Sold

	Heat	Power
Nameplate Capacity	6,975 kW	1,500 kW
Actual Capacity/Availability (90%)	6,278 kW	1,350 kW
Annual Capacity Use	5,056 kW	979 kW
Capacity Sold	1,812 kW	979 kW

5. Business Risks and Contingency Plans

Identify at least three to four potential risks of the project, and discuss how you will mitigate those risks. At the point of writing the Business Plan, you should also have assurance that you can obtain the necessary permits (e.g., a positive letter from the permitting authority). Does the community fully support the project; could you have any NIMBY problems?

For a biomass plant, the supply of fuelwood is the prime risk for an investor. At least one alternative source of fuel must be available in case your main source is discontinued (this can also be a fossil fuel like oil or natural gas). You need to assure the investor that the business income is guaranteed (provide contracts and/or declarations of intent to buy the power and heat produced). Likewise, the price of the fuel should be guaranteed by contract. Contracts should, whenever possible, be in place for at least 150% of the time required to pay off project debt. A project web site will be necessary in most cases to inform stakeholders about the project and to create openness in order to reduce or eliminate local resistance to the planned project. Do present the facts, but do not draw any explicit conclusions yourself as this is up to the investor. Use official sources for any assumptions you make concerning inflation, future pricing of fossil fuels, etc.

5.1 Primary Risks

These risks are deemed most important as they could lead to an interruption of the cogeneration plant's operation.

Alternative fuel sources: A closure of the sawmill, or strongly reduced or interrupted production, would jeopardize the project. Since its inception, the mill has been operating profitably and there are no plans to close the plant. Should the plant nevertheless be closed, there are two main options to source wood fuel from other sources: a woodwaste landfill near the sawmill, and another sawmill in the region, which is 110 km away from the plant. The use of woodwaste (hog fuel) from the landfill would increase operational costs somewhat due to higher ash content and additional emission reduction equipment. Bringing in woodwaste from the other sawmill would increase fuel procurement costs by more than $140,000 per year. Some wood can also be obtained from a municipal landfill at a distance of 31 km from the plant, which collects demolition waste and produces wood chips from clean wood. This amount could cover about 15% of the plant's annual fuel requirement, thus reducing the amount of wood to be brought from the sawmill located further away. The sawmill has signed a three-year contract to provide the woodwaste at no cost (see copy of contract in the Appendix). Likewise, the mill signed a contract for the biomass plant to use up its hogfuel landfill at no cost. The landfilll has been used for the past 20 years and contains enough fuel to run the cogeneration plant for a period of at least 11 years (see consultant report in the Appendix for details). However, this contract is mainly designed for backup and the hog fuel will only be used in case the regular sawmill waste is insufficient or becomes unavailable to the plant. No other projects that might compete for the sawmill residue are known to be envisaged, according to both the sawmill owners and the local planning department. Treetown Community Group Ltd. will be given access to the sawmill waste storage at the mill at all times, even during interruption of mill operations in the summer. As a third option, a declaration of interest has been received from two local landowners that produce some 12,000 tonnes of forest thinnings per year.

Interruption of fuel supply: In case of an interruption of fuel supply due to sickness of the driver or unavailability of the truck, or other reasons, a 30-day fuel stockpile is kept on-site.

Material damage: Should the cogeneration plant or the district heating system be damaged or malfunction, a ten-year repair and maintenance plan with the system provider will guarantee that services are restored within at the most four business days (technicians will be on site within at the most 48 hours). Several spare parts will be kept on-site for emergencies, and annual scheduled maintenance of the plant will be carried out. The first six months of the project life are covered by a manufacturer's guarantee that the plant will run at a minimum of 90% availability (see Appendix for a Standard Contract and related conditions).

Installation risk: The company providing the cogeneration technology, the company installing the heat distribution system, and the company providing and installing the residential heat exchangers have all confirmed the availability of both material and installers for the construction period in 2008.

5.2 Secondary Risks

These risks are less significant either because they can be easily controlled or because they are unlikely to affect the operation of the cogeneration plant.

Permits: In the Appendix, a letter from the municipality of Treetown confirms that a construction permit for the plant is likely to be granted based on the technical parameters and plant specifications outlined in this Business Plan. Heatel guarantees that the federal air emission limit for dust emissions will be undercut by 50%.

NIMBY: Since there is an agreement within the community to switch from oil to biomass heat (see Appendix for a copy of the agreement), no NIMBY (not-in-my-backyard) problems are anticipated. Several townhall meetings have been held in 2005 and 2006 to reach agreement on the planned project. Likewise, consultations with biomass fuel providers and nearby industries have shown no resistance to the planned project. The project web site (www.treetownbiomass.com) informs all stakeholders about the plant, technology and past discussion results from townhall meetings. Treetown residents will benefit from the project as shown in Figure 4.2, since they will not experience any increase in heating cost. If this cost rises by 5% over the coming decade, as indicated, then households will save an average of $340 in the first year, increasing to $490 in the tenth year of operation.

Change of economic context: The project depends on parameters including fuel and operating costs, as well as the cost of electricity and fossil fuels. The local utility has signed a twenty-year contract for the electricity produced, at a fixed price of $90/MWh (see Appendix for a copy of the contract with the local utility). Likewise, individual contracts with community member households will be drawn up before construction of the district heat system. The community has agreed to collectively switch over to biomass heat once the cogeneration plant is operative (see copy of the Joint Declaration in the Appendix). This will mean that the members will pay Treetown Community Group instead of the heating oil companies for the heat services. Treetown Community Group will pay for the installation of the remote heat system, as well as residential hookups and heat exchangers. It is not expected that the price of heating oil will fall considerably under current levels of pricing.[46] The default rate for utility bills in the community has been low in the past (1%) and this is not expected to change since heat services are essential and could be cut off in case the subscriber defaults on monthly utility payments. In terms of capital costs, the installer's quote is firm for one year and includes all extra costs related to transport and installation at the Treetown location.

Personnel: No certified steam plant operator is required to operate the plant. The technology is automatic and only requires occasional adjustments (about 4 hours per week), as well as a driver that brings the sawmill waste to the plant, and removes ash occasionally. Mr. Gates and two additional people from the community will be trained by Heatel to operate the plant and to run emergency procedures. Heatel will have personnel on-site during the first 30 days of operation to ensure the plant runs as desired and to train locals.

Air pollution: the plant is equipped with pollution abatement technology to reduce dust emissions. Current federal emission limits will be undercut by 50–60%. Should more stringent legislation come into force in the future, then retrofitting a better dust filter can rectify the situation. The air emission permit will be valid for a period of ten years.

Insurance: Apart from the manufacturer's warranty and the installer's guarantee the technology will work to specifications, Treetown Community Group will present insurance against risks, such as fire, lightning damage, vandalism, personal liability, and accidents.

46. The US Energy Information Agency projects a 5% increase of fossil fuel pricing over the coming decade, see 2007 Oil Pricing Report.

6. Financial Planning

This section is the most important one of the Business Plan. Make sure you have covered all cost items, and that you use actual quotes and not estimates. Whenever you obtain a quote, make sure you think about extra costs, such as installation, taxes, certification, etc. Identify who will pay which costs – are community members meant to finance any items themselves? Will the utility pay for connections? What are your fuel costs? Do you need to treat the fuel (e.g., grinding) before you can use it? What are your transport and fuel handling costs? You can use certain computer models, such as RETScreen (no biomass cogen module was available when this Guide was completed, but a biomass heat module can be used for the calculations), to develop the financial aspects of the business plan. Include a softcopy of the model with your Business Plan so the investor can verify the parameters you used. You should consider inflation rates in your calculations, which is usually easily done using RETScreen or other models. Using RETScreen means you have a widely accepted model with enough detail to present the financial side of a project. Since the underlying calculations cannot be changed in RETScreen it is usually well accepted in the financing community. Include a first-year balance sheet for your business.

This example uses 50% debt financing, which appears to be a realistic model. Equity capital can be up to another 50%. This capital will usually have to be paid back to the investor in full after about 3-5 years (i.e., the project is then refinanced) if the equity is venture capital. Other higher-risk equity investors, such as investment funds or insurances, will remain with the project for longer, but refinancing the bank loan is still expected to occur after a few years to obtain a better interest rate. It is also possible to pay lower annual dividends to an equity investor but then pay back the equity with an added bonus, such that on average, the annual return to the investor is still in the 18-25% range. If equity is raised from the community, much lower returns may be acceptable (7-8%). Projects have successfully raised money for 20 MW projects just from the community.

Note that the bank will want to see that the equity investor can buffer potential cost overruns. The investor should thus be able to provide additional capital if needed since the bank will not be ready to be the only source to cover cost overruns.

Concerning emission reduction credits, you will usually obtain a contract for future delivery with whoever wants to buy these credits. This can only be done once the quantification of these credits has been verified; for the Clean Development Mechanism, the CDM Executive Office has this function.

Up-front costs: So far, most of the development cost was borne through in-kind contributions as work days by the project proponents. Consultant fees were so far covered by start-up capital procured internally. Obtaining all necessary permits for the project is estimated to cost a total of $4,700. The technology provider will provide plant layout and implantation study at no extra cost to the proponents. A list of cost items to be covered before start of operations is given in Table 6.1.

Table 6.1 Capital Cost Overview for the Treetown Cogeneration Plant

Cost Item	Cost in $	Comments
Project planning and permit process	0	In-kind contributions
Permits	4,700	
Connection to power grid	15,000	According to utility's transmission service
Cogeneration plant	3,200,000	Turnkey ready, including applicable taxes
Building & Yard for plant	37,750	
Heat distribution system	3,457,840	6.7 km, 512 hookups
Residential heat exchangers	1,251,852	512 units, installed
Consulting fees	37,500	For environmental assessment/ permitting/fuel study/technology selection
Wood chip truck	167,000	
Contingencies	1,225,746	15% of total investment
Total Investment Cost	**9,397,388**	

Drawdown schedule: Table 6.2 shows the drawdown schedule for the construction period. The hot water distribution system will be constructed over a period of nine months, i.e., the cogeneration plant will be completed before the heat distribution system and will be run on part-load to produce hot water for connected households, as well as electricity for the grid.

During the first three months of construction, no power or heat are produced. Starting in month 4, the cogeneration plant will be operative and will produce power and heat. Heat will only be sold to the customers connected to the first of three distribution loops at this point, and consumption will be about 1/6 of winter consumption since no space heating will be required during the summer months. The plant will only run at 50% of its capacity during the summer. The second heat loop will be operative three months later. The first payments for heat and power sales are only received during the month following first delivery. Only half the staff will be hired for the phase running up to full production after nine months. As can be seen from the table, the income from power and heat sales leads to a positive cash flow during months 5-9. There is thus no net cost to the delay in construction before the full operational level is reached.

A detailed first-year balance sheet is included in the Appendix, showing the expenses, income and budget for the first twelve months of the project. Construction is scheduled to start in January 2008 and would be completed in October 2008. Note that any costs incurred before construction (consulting fees, permit costs, grid connection and yard construction) will be covered from funds currently held by Treetown Community Group. Funds to cover capital costs will be sourced from the Group's own funds and the government grant first, then from the bank loan, the internal loan of Mrs. Kyle and finally from the equity investor. Due to the grant, no interest payments will be incurred during the first two months (the grant money is only eligible against capital costs, not development costs and feasibility studies).

Financial contributors: The community itself will contribute 13% of the total capital costs (3% from community funds, 10% from Mrs. Kyles). A grant of $1 million has been obtained from the government's Biomass Support Program (see Appendix). This grant was obtained in March 2007 and is valid for 12 months, but can be extended by another six months in case there are justifiable delays in the project development process. A bank loan (7.5% annual interest rate) will cover 50% of the capital cost (see Appendix for conditional bank loan offer). Treetown Community Group Ltd. will repay the loan from Mrs. Kyles at a rate of 12% over 10 years through a separate contractual agreement. Treetown Community Group is now looking for an investor to provide the remaining 25% required for the project to move ahead (see Table 6.3).

Table 6.2 Drawdown Schedule and Resulting Start-up Costs for the First Nine Months of Construction and Partial Operation

Month	1	2	3	4	5	6	7	8	9	Total $
Cogeneration plant	20%		80%							**3,500,000**
Heat distribution	11%	11%	11%	11%	11%	11%	11%	11%	12%	**5,039,090**
Heat exchangers			33%			33%			34%	**1,251,852**
Interest ($)	0	0	13,251	15,629	18,006	22,965	28,670	34,376	46,984	179,882
Salaries ($)	0	0	0	12,500	12,500	12,500	12,500	12,500	12,500	75,000
Income Power sales ($)	0	0	0	0	44,355	44,355	44,355	44,355	44,355	**221,775**
Income Heat sales ($)	0	0	0	0	11,315	11,315	11,315	22,630	22,630	**79,204**
Costs during start-up ($)	0	0	13,251	28,129	25,164	20,205	14,499	20,109	7,500	**46,097**

Table 6.3 Financial Contributors

Contributor	Amount	Comments
Treetown Community Group	$1,297,388	13% of total
Grant	$1,000,000	From Biomass Support Program
Bank loan	$4,700,000	Treetown Citibank (7.5% fixed rate over 10 years)
Investor	$2,400,000	25% of total
Total Investment Cost	**$9,397,388**	100% of up-front capital cost

Order of payment: Treetown Community Group is obliged to pay the bank for its loan first, should the cash-flow not allow for the payment of all debtors at the same time. Mrs. Kyles will be paid second, and then when profits are available, the dividend to the investor will be paid out. Before any debt service, operational costs have priority in order to maintain the cash flow.

Operational costs and revenues: The operational costs are composed of personnel costs, debt service, maintenance and insurance costs, and other items as detailed in Table 6.4. Revenues are generated from the sale of electricity to the local utility, as well as from heat sales to Treetown community.

Carbon credits: The sale of carbon credits from greenhouse gas emissions avoided by the project (displaced grid electricity and heating oil) has been arranged with the *Hema Electric* coal power plant (see copy of the Contract for Future Delivery of Credits in the Appendix). Based on the amount of credits as calculated by Carbon Offset Consulting (see audited quantification report in the Appendix), a total of 10,255 tonnes of CO_2e will be displaced each year, and sold for $5.50 per metric tonne under a ten-year contract.

Return on Investment: The revenue generated by the project (based on the cost of 75% of the investment only) is over $525,000 per year. In relation to the 25% of the investment to be covered by an equity investment ($2.4 million), this represents an ROI of 21.9%. An ROI of 18% is offered to the investor; the remaining profit will become part of Treetown Community Group's capital reserves.

Payout of the equity investor: The equity will be paid back in full at the end of the fourth year of full operation. Treetown Community Group will then refinance the project and the equity investment will become redundant. The ROI for the venture capital is therefore offered for a period of slightly over four years, since part of the investment will be drawn upon starting in the 6th month of operation.

Table 6.4 Annual Costs and Revenues for First Year of Full Operation

Cost Item	Amount	Comments
Debt service	$705,000	7.5% bank loan of $4.8 million
Debt service	$216,986	12% loan from Mrs. Kyles
Personnel	$300,000	1 driver, 1 admin for billing etc., part-time personnel (supervisor, accountant…)
Fuel	$20,000	Truck, secondary fuel for boiler
Insurance/property tax	$16,000	
Maintenance contract	$8,200	
Parts & Repairs	$70,000	Annual allowance for truck and cogen plant
Ash disposal	$7,893	Landfilling cost – 112 tonnes, $70/t
Utility costs	$3,500	Power and water
Total Annual Cost	**$1,347,579**	
Power sales	$771,660	8,574 MWh per year @ $90/MWh
Heat sales	$1,269,760	$0.08/kWhth; 15,872 MWh sold
GHG credits	$56,400	$5.50 per tonne of CO2e
Total Gross Revenue	**$750,241**	Op. cost less op. expenses
Corporate income tax	$225,072	30% of gross income
Total Net Revenue	**$525,169**	

Accelerated payback of bank financing: 20% of the profit remaining to Treetown Community Group (after paying dividends to the equity investor) will be used as a cash sweep against the bank loan. Complete refinancing of the bank loan is envisaged at the end of the fourth year of operation.

Sources and uses: Figure 6.1 compares funding sources and uses for the project, based on Tables 6.1 and 6.3 above.

Figure 6.1 Funding Sources and Uses

Sources	
Treetown Group:	$1.3 million
Grant:	$1.0 million
Bank loan:	$4.7 million
Equity:	$2.4 million
Total:	**$9.4 million**

USES	
Cogen Plant:	$3.2 million
Heat distribution:	$3.5 million
Heat exchangers:	$1.25 million
Miscellaneous:	$0.26 million
Contingency:	$1.2 million
Total:	**$9.4 million**

7. Sensitivity Analysis

How stable is your financial planning? What if certain parameters change, i.e., if salaries go up, fuel prices rise, or if the value of the electricity or heat you produce changes? Identify such "prime drivers" and rank them according to their importance.

Table 7.1 groups the cost parameters in terms of their potential impact on project returns. To rank each parameter, assumptions were made as to their variability. The underlying assumptions are explained in the paragraphs below. Multiplying the variability with the actual share in the annual expenses results in the actual budgetary impact for each parameter.

All items that are based on ten-year contracts cannot vary over time and a 0% budget impact has therefore been assigned. This includes the loans and the maintenance contract, all at fixed rates and amounts over the first ten years of the project.

The largest risk identified are increased maintenance and repair costs above the allowance made. Doubling this cost would increase the annual budget by more than 5%, reducing profit by one-seventh. Next, personnel cost could increase the expenses, but salary increases above the inflation rate would only be expected after the first few years of operation.

The revenue created is also a function of the cost of wood fuel. The fuel is provided for free by a nearby sawmill. Should this fuel source cease to exist during the project lifetime, fuel would have to be brought from other sources, which will increase the operational cost. In the best case scenario (Table 7.2), the woodwaste from the sawmill's biomass landfill will be used. This waste has a higher water and ash content, i.e., more fuel will be required to generate the same amount of heat, and the higher ash content of the hog fuel will also increase landfilling costs considerably.

Table 7.1 Ranking of Potential Impacts of Variability of Operational Cost Parameters for the First Ten Years of the Project

Parameter	Share of annual budget	Variability	Budget impact	Rank
Maintenance & repairs	5.1%	100%	5.1%	1
Personnel cost	22%	20%	4.4%	2
Ash disposal cost	0.6%	600%	3.6%	3
Profit from Heat & power sales	34.9%	10%	3.5%	4
Fuel & Transport	1.5%	100%	1.5%	5
Insurance	1.2%	50%	0.6%	6
Utility cost	0.25%	10%	0.03%	7
Bank loan	52.8%	0%	0%	-
Internal loan	15.9%	0%	0%	-
Maintenance contract	0.6%	0%	0%	-

The sawmill will guarantee the provision of sawmill waste over three years. In the worst case, after the initial three years, woodwaste would need to be obtained from another sawmill at 110 km distance. The cost of transporting this waste over a longer distance will increase the fuel costs for the project. Table 7.2 assesses the impact of this scenario. Note that this is a worst-case scenario and that a mitigation of this cost can be achieved by using wood from a nearby urban landfill and from the woodwaste landfill. Other fuel sources, such as forest thinnings, represent additional alternatives to make up for any shortfall of fuel coming from the nearby sawmill.

The profits from heat & power sales were calculated based on past oil consumption in the community. Power revenues are stable since the contract with the utility guarantees that 100% of the power produced over the next 20 years will be purchased at the set price of $90/MWh. Since the plant is meant to work at half its capacity during the summer, power sales during this period could be increased. Table 7.4 shows that this could increase the annual business income by 27% - enough to make up for potential cost increases identified in Table 7.1.

Table 7.2 Best-Case Impact of Ceasing Sawmill Waste Source after Third Year

Cost Parameter	Annual Cost	Comments
Current ROI		**21.9% (after tax)**
Additional fuel costs (one extra trip per day)	$2,125	$1 per litre of diesel; 25 litres per 100 km
Extra dust filter	$7,000	10% of $70,000
Additional landfilling cost	$39,465	Increased ash content
Total	**$48,590**	
Resulting ROI		**20.5% (after tax)**

Table 7.3 Worst-Case Impact of Ceasing Sawmill Waste Source after Third Year

Cost Parameter	Annual Cost	Comments
Current ROI		**21.9% (after tax)**
Second truck	$17,000	10% of purchasing price ($167,000)
Additional fuel costs (110 km, four trips per day)	$60,300	$1 per litre of diesel; 25 litres per 100 km
Second driver	$60,000	
Truck maintenance	$5,000	For second truck
Total	**$143,000**	
Resulting ROI		**17.7% (after tax)**

There is thus enough capacity to increase revenues in order to make up for any anticipated expenses above what is foreseen under normal operating conditions. The increase in production increases the amount of GHG credits produced, but since this is a small amount it is not sure that a buyer can be found and they are therefore left out of the calculation.

Table 7.4 Increasing Power Production During the Summer Months

Cost Parameter	Annual Cost	Comments
2,364 MWh produced extra	$212,760	(extra revenue from power sales)
Fuel cost	$5,514	27.6% higher
Ash disposal	$2,178	
Increased truck maintenance	$1,000	
Contingency	$20,000	For more frequent repairs/plant maintenance
Income tax	$55,215	
Total	**$128,853**	
Resulting Budget Impact	**27%**	

8. Future Prospects

Are you able to expand the project in the future, in case local demand increases, or to maximize your revenues? Will you be able to obtain the necessary permits? Do you have the resources to do so? Can you replicate the project elsewhere? Will you retain ownership or sell the plant to a third party?

The plant's heat capacity is 136% of peak winter use in the community. This means that future growth of the community can be accommodated without increasing the plant size; newly built residences will be hooked up to the existing district heat system. Should demand rise above the system margin, an additional (smaller) modular system of the same type could be purchased to increase overall system capacity.

The community will explore the possibility of self-harvesting forest thinnings in order to feed the cogeneration plant. This option may create several jobs and would decrease the fire hazard to the community, which is situated in a forested area, while reducing its dependence upon the nearby private sawmill. To depend on forest thinnings for 100% of the fuel may be feasible, but is not envisaged since the sawmill waste is easily available at no extra cost, apart from transport costs.

Since much of the heat produced is not used, especially in the summer, extra heat could be used to dry fish or other produce in a commercial application. Alternative uses for the surplus heat will be examined, but are not essential for the economics of the plant.

Once the bank loan is paid off after 10 years, the plant will be debt-free and can remain operational for about 30 years (estimated plant life). The heat distribution system is expected to last at least 50 years, i.e., refurbishing or replacing the cogeneration plant at the end of its lifetime is expected to be an attractive option.

Appendices

No appendices have been included in this Model Business Plan. However, they are listed here to show what information is likely to be required for an investor to make a decision about supporting a project.

Appendix 1
Copy of Document confirming a $1 million grant has been obtained from the Biomass Support Program

Appendix 2
Copy of bank loan offer for $4.8 at a rate of 7.5% from Citibank, valid for six months

Appendix 3
Price quotes
Cogeneration plant; heat distribution system; heat exchangers

Appendix 4
Treetown Community Group First Year Balance Sheet

Appendix 5
RETSCREEN Model (on CD)

Appendix 6
Copy of contract for power supply with the local utility

Appendix 7
Contract for fuel with WILLIAMS sawmill (hog fuel and sawmill waste)

Appendix 8
Declaration of Intent from local landowners about providing forest thinnings for fuel

Appendix 9
Standard Contract for Construction and Transition to Successful Operation of a Cogeneration Plant (Power Engineering Ltd.)

Appendix 10
Letter from Treetown Municipality declaring that a construction permit is likely to be granted

Appendix 11
Technology Comparison and Consultant's Recommendations; Heatel company brochure

Appendix 12
Contract with Hema Electric for future delivery carbon credits

Appendix 13
Quantification Report of Carbon Offsets, by Carbon Offset Consulting

Appendix 14
Standard Contract for Construction and Transition to Successful Operation of a Cogeneration Plant (Power Engineering Ltd.)

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Commission for Environmental Cooperation

393, rue St-Jacques Ouest, Bureau 200
Montreal (Quebec) Canada H2Y 1N9
t 514.350.4300 f 514.350.4314
info@cec.org / www.cec.org