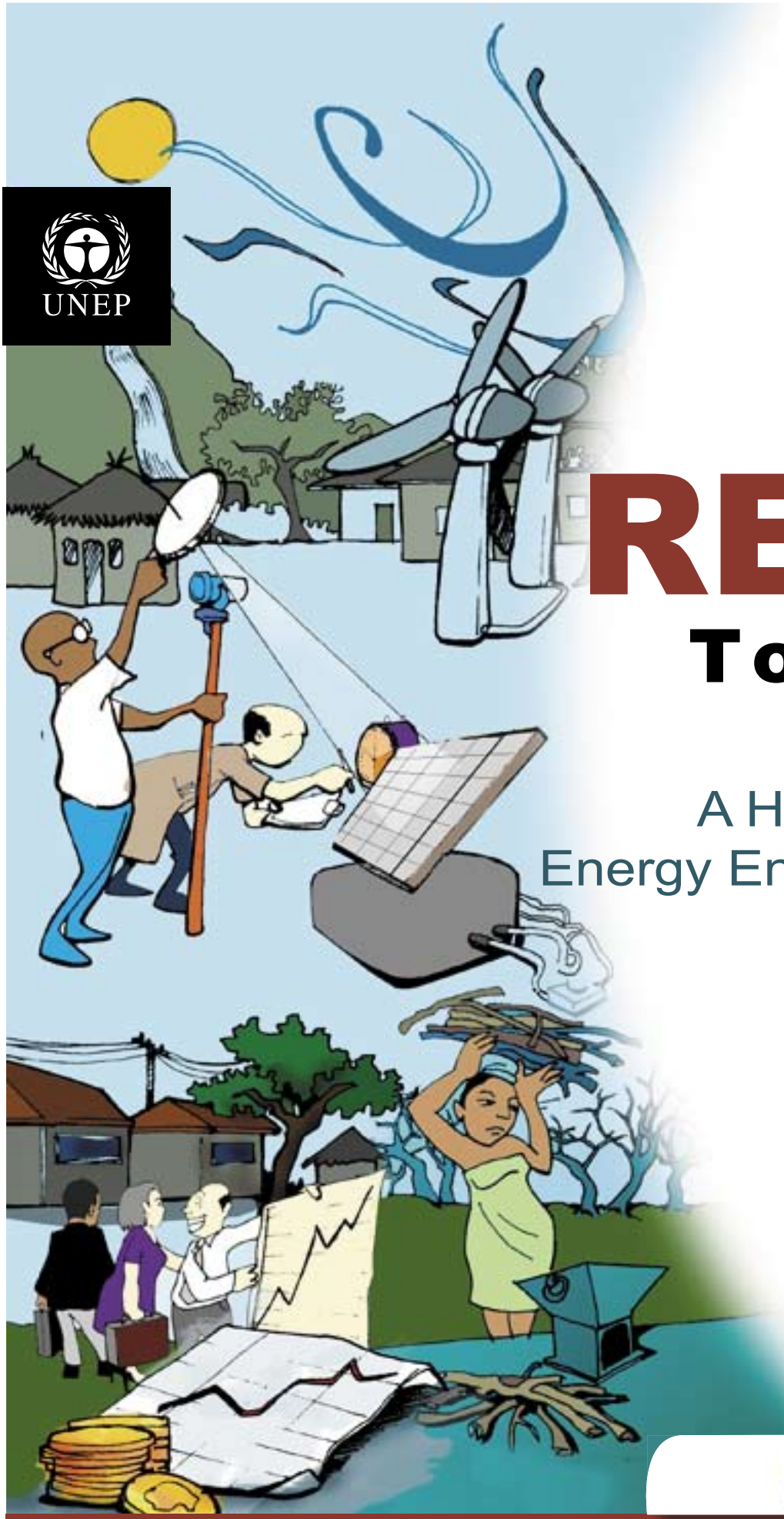

UNEP

REED
Toolkit

A Handbook for
Energy Entreprenuers

E+Co

Rural Energy Enterprise Development

Programme Partners

Country Partners

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REED

Toolkit

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Table of Contents

CHAPTER 1
Introduction to the Toolkit

PURPOSE OF THE TOOLKIT

This Toolkit is a step-by-step guide to turning your clean energy business idea into a reality. The topics covered range from defining your personal and business objectives to preparing financial analyses and determining your distribution strategy. In addition to explaining what information is needed in an effective Business Plan, the Toolkit will help you to gather that information, and then to present it in an informative and convincing manner. By the end, you will have a Business Plan you can use to attract financing and to guide the growth of your company.

The Toolkit covers the topics that must be addressed in a Business Plan for any clean energy business, it therefore takes a general approach to developing plans. Each step in the process is designed to make the final product—the Business Plan—as good as it can be, whether you are interested in selling electricity generated from hydropower to a national utility or manufacturing energy-efficient cook stoves.

HOW TO USE THE TOOLKIT

The first step in developing your business is to write a convincing Business Description. The Toolkit will help you do this and, once it is accomplished, will help you carry out research to test the feasibility of your idea. Thorough research is time-consuming, but it is vital. Research provides clear answers to critical questions like 'Can my customers afford my product or service?' and 'Can I generate revenues?' The final step is to write the formal Business Plan and present it to potential investors, partners and employees.

The Toolkit is designed to be read in its entirety. There are four chapters, each containing material that builds on the content of the previous one. Each chapter requires the entrepreneur to produce written documents that will be used in preparation of the Business Plan. In this way, completion of each chapter brings you a step closer to the final product. By the end of Chapter 3, writing the formal Business Plan will be easy.

A typical Business Plan contains the following elements and chapters:

Cover and Table of Contents
Business Description and Executive Summary
Opportunity Assessment
Marketing
Competition
Operations
Technology
Finance
Schedule
Risks & Mitigation Measures
Impacts of Business
Closing
Attachments

Once you have worked through Chapter 2 of the Toolkit, the Business Description section of your Business Plan will be completed; by the end of Chapter 3 more than half of the final Business Plan will be finished. The table below explains which sections of the Business Plan are completed in each chapter, and a guide at the bottom of each page helps you keep track of where you are in the process.

Toolkit Chapters:	Business Plan Section Titles:
Chapter 1	Business Description
Chapter 2	Opportunity
Chapter 3	Marketing
	Competition
	Operations
	Technology
	Finance
Chapter 4	Schedule
	Impacts
	Closing and Executive Summary

PURPOSE OF A BUSINESS PLAN

Starting and managing a business requires motivation, desire and talent. It also requires a great deal of research and planning. *Compiling the data and strategy into a Business Plan is the most important step in starting a successful business.*
A good Business Plan accomplishes the following:

- **draws a clear picture** of your business objectives and goals;
- **provides a thorough overview of the industry** and business you will be entering;
- **presents your strategy and the financial data** supporting it;
- **shows the potential strengths and weaknesses** of your business;
- **gives a timeline of events and financial milestones** against which you can compare your actual results; and finally
- **gives prospective partners and investors a means of determining whether your business warrants their interest—and their money**.

The primary objective of the Business Plan is to convince lenders and investors to give you financing. Your Business Plan must be written for the specific audience to whom you will eventually present it, and with the aim of persuading that audience that your business warrants their investment. Lenders and investors require a Business Plan in order to evaluate their risks and to assure them that they will get a fair return on their investment.

Let's get started!

HOW TO DESCRIBE YOUR IDEA

If you are starting a new business, there is a lot of research and analysis that must be done before writing the Business Plan. To begin with, you need to be able to describe the basic attributes of your business idea: status of the company, location of the company and operations, product or service being offered, type of customer targeted and, finally, the type of energy resource and technology used.

To get an idea of how advanced you are, write one or two sentences describing the following characteristics of your company (save this exercise as it will be built upon in later chapters):

Exercise 1-1
Describing your company

THE COMPANY NAME, ITS MISSION[1] AND A VERY BRIEF HISTORY:

LOCATION OF THE COMPANY AND ITS OPERATIONS:

PRODUCT OR SERVICE TO BE SOLD:

TECHNOLOGY AND RESOURCE TO BE USED:

CUSTOMERS:

[1] A mission statement describes what you want your company to do and to become-it defines the focus of your business.

Basically, a Business Plan can be divided into two sections: the Business Description, and everything that follows. The Business Description is the point in the Business Plan at which you say clearly what you want to do. It is the section that should make readers want to continue reading the document, so it must be compelling, thorough and well organized. The sections following the Business Description support your description and give details of how you intend to accomplish what you say you can do.
Let's review what should be included in the Business Description:

The Company: Provide a brief introduction to your company including basic information such as name, whether it is a new or existing company, when it was founded and its legal form. If the company is already operational, activities to date are described here. This is followed by the company's mission statement. Finally, a description of the management team is written, indicating technical and managerial experience, years working in the field, proposed involvement in the company, and who owns the company.

*Location: N*ame the location of your company's headquarters. If the location of operations will be different, state that location as well. If there will be a manufacturing or production plant, or if specific parcels of land or structures will be developed, include descriptions of them.

The Product or Service: Describe the product or service you will sell. Is this product sold retail, wholesale or is it manufactured? When writing your description, keep in mind that investors want to know about the customer need that your firm will satisfy. Describe the direct and indirect **benefits** your product or service will provide to its customers. Those benefits are the basic reason why your produce or service will be in demand.

Energy Technology: What type of energy technology will your business use and for what purpose? State whether this type of technology has proved viable elsewhere. Also define the scale of the project.

Customers: Who will be the customers for your product or service? Make sure the customer you describe is appropriate for the location indicated above. If known, indicate the ability and willingness of customers to pay. State what customers are currently buying to meet the need, indicate costs, and explain why they will switch to buy your product or service. Describe this in terms of the benefits your product or service will provide.

To learn more about energy technologies and to view examples of business descriptions, read **Annex A—Sustainable Energy Technologies**, and **Annex B—Business Description Examples**.

WRITING THE BUSINESS DESCRIPTION

Unless you did a perfect job a few pages back, it is time to polish your Business Description. Business descriptions can take many forms, but all of them convey the same basic information about the company, its leadership team, its operations and its customers. An example of how it may be presented follows:

Business Description

1. The company: (Name of company) is a(n) (existing or start-up) business. The company was established in (year) under the laws of (home country) . The company's mission is _____. (Company name) is a _____ type of company, meaning _____.
Since it was founded, (company name) has accomplished the following:
_____
The management team is comprised of the following people: (include names and experience)
_____.
The company is owned by _____. Its profits are distributed between_____.

2. Location: Location of operation (country, region, village or nearest village and specific site—in terms of parcels of land as well as specific map location): _____. The headquarters is located in _____ region/province/department/area of (country name), ____ kilometres (km) from (mapped village, town). The business will operate in the following areas, which are _____ km from the headquarters:
(List locations of operation, and indicate any local offices that are to be created)

3. Product (or) Service: (company name) will (manufacture, distribute, sell) _____. The main activities include _____. This is a good business opportunity because _____.

4. Technology: (this section outlines the technology used in terms of type, size, conversion process, suppliers, etc.) The business will use _____ technology and be about _____ in size (kilowatts, megawatts, numbers of households served, etc.). The _____ technology converts (wind, water, biomass, sunlight) by _____ (describe process). This technology (has/has not) been used before in this country.

5. **Energy Resource:** (by type, sources of supply, availability of supply and the competition for the supply): The technology will use (type of resource) which comes from (sources) and will be available to the business because _____.

Examples of technology description:

- 'The business will use ___ pressure boilers to convert bagasse to _____ of steam and ___ MW of electricity. Such boilers are in use in __ other business in the country. The proposed business will use bagasse from sugar cane processing, obtained from five sugar mills within 18 kilometres of the location. The bagasse will be purchased through a contract between the company and the sugar mill.'
- 'The business will use ___ hydroelectric turbines to produce ___ kW of electricity. Turbines of this size and type have not been used before in this part of the country. The proposed business will use water from the _____ River, which will be diverted to a canal and delivered to the power house. Rights to use the water will be obtained through the awarding of a concession from the government.'
- 'The business will use ___ type solar panels connected to _____ type water pumps, which will provide irrigation for about ___ hectares of land for each pump set sold, replacing diesel pump sets. Solar pump sets have been used successfully in a pilot programme of ___ installations.'
- 'The proposed business will use wind/sunlight available in sufficient quantities in the region. The business will install ___ and ___ watt solar panels, and hardware in _____ households and businesses. These photovoltaic panels will be of the _____ type, which are already supplied by _____and are installed in ___ other commercial businesses in the country. Solar insolation of __ is documented.'

5. '**Customers:** (Company name) will sell its product to (name/type of customer or customers). The targeted customer(s) currently meets this need by purchasing _____ at a cost of _____. Targeted customers would be willing to buy my product or service because _____. The targeted customer is located _____km from our headquarters or field office. There are roughly (number) of customers in our target segment.'

Specific examples:

- 'The proposed business will sell its electricity to _____, the national utility under a power purchase agreement.'
- 'The proposed business will install a local area grid and sell its electricity to the Village Cooperative, which will provide electricity to the 150 households in the village of _____.'
- 'The proposed business will sell pump sets to farmers within the _____ region of the country. Between ___ and ___ pump sets will be sold each year.'
- 'The proposed business will sell small-scale solar electric systems to ___ households and businesses per year in the ____ region. It is estimated that ___ systems will be sold in the first three years.'
- 'The proposed business will install ____ solar home systems and collect monthly fees from these households through a network of local collection agents.'

CONGRATULATIONS!! You have completed the first version of your Business Description.

Chapter 2: Fact-finding

INTRODUCTION

Turning a business idea into a company requires that the following questions be addressed:

- How is my company's product/service different from that of competitors?
- What is my company's competitive advantage? In other words: What characteristics give my company a good chance for success in a competitive market?
- How will my product be marketed and distributed most successfully?
- Who will supply the product or parts?
- What is the market and who are the target customers?
- How much money will be required to start and operate the business?
- How will the money be used?
- How will the business make money?
- Why will it succeed?

At this point, the answers to all of these questions are not known with certainty—they are **assumptions**. That is appropriate for this stage in a company's development. As you go forward with the Business Plan and with the company itself, the focus will be on **testing these assumptions**. Every successful test should be considered a milestone in the development of your company. *Testing assumptions is how you determine that your idea is truly viable.*

This chapter will elaborate on the Business Description written in Chapter 1 and add the next section of the Business Plan—the Opportunity. It will also indicate ways in which you can gain insight into your own motivations for starting a company, and will set reasonable expectations you should have of your new business.

SELF-EVALUATION

Personal Objectives

Why are you starting this business? Is it to produce a regular income, to create a valuable infrastructure project you can sell, to build a company that will grow and take on many projects, or to gain experience?

It is important to know why you want to start a business, since *different objectives imply different business strategies or altogether different types of businesses*. For example, building a rural energy services company supplying a product or service to many households is a way to create regular income. That type of business can be grown over time. Alternatively, if your business objective is to develop an energy project and then sell it for a one-time payment, a hydroelectric project supplying power to the national grid would be a better idea.

Think about your goals, and then review the following list of typical business objectives. As you develop the business idea, consider the basic guidelines provided next to each objective and how you can integrate those strategies into your plan.

Exercise 2-1 Personal Objectives	
Create a valuable business over time by growing it slowly	Use all available income to reduce debt and maintain the project's operating condition. Look for loans not investment partners. Be careful about the financial health of the company. Place emphasis on a smaller, easier to complete first project. Reduce pay out to owners and use cash flow to attract and reward key members of the team and for working capital to grow business.
Produce a regular income	Include a salary line in operating expenses. Keep debt to a minimum and thereby increase cash flow available for regular dividends to owners. Requires more equity and less debt.
Earn a one-time fee or lump-sum payment	Increase the value of the project with minimum cash outlays. Line up buyers early. Evaluate options for the best time to sell.
Improve the well-being of a particular community	Incorporate local training and capacity building into project cost. Include 'buy-in' options to transfer responsibilities to local residents. Incorporate social benefits into businesses (e.g. community water pump or solar refrigerator for community clinic).
Gain experience	Partner with an experienced firm, sacrificing a larger ownership stake for the chance to gain experience quickly and move on independently.
Be involved day-to-day	Include a position within the team, provided your qualifications match needs. If appropriate and needed, include a salary line in operating expenses.
Be involved only part-time	Include each position and salary required within the team. Recruit a qualified general manager. Organize reporting relationships but place emphasis on plan and policy approval combined with reporting systems, all of which must be funded. Consider owner-engineer or project manager to protect owner's interests.

What Are Your Strengths and Weaknesses?

Business development and implementation are tasks for entrepreneurial personalities. There are many variables in business development and implementation—an ill-suited personality can spell doom for a solid idea and lead to great frustration. Entrepreneurs need to take stock of their personality and their skill sets.

What are the characteristics that define an entrepreneur? This is a highly speculative and subjective topic—and certainly not a test—but some patterns seem to emerge:

- Entrepreneurs are usually given high marks for high energy level and determination; independence and resourcefulness; originality; curiosity; and flexibility.
- Self-confidence and courage are attributes which are given lower but still important marks. Entrepreneurs tend to be self-demanding, self-starting and thorough.

Of course a person who does not possess all of these entrepreneurial characteristics can be successful in developing an energy business. *The crucial step for the entrepreneur is to understand his or her weaknesses and to use the choice of project and team to balance the equation.* For instance, a central supply business selling to the grid through

a power purchase arrangement is a more straightforward type of business than installing household solar systems in hundreds of locations. Also, some entrepreneurial shortcomings (e.g. a dislike of negotiation, a lack of long-term experience with the technology) can be overcome by choosing a certain type of business partner or hiring the right kind of advisor.

Now it is time to evaluate your personal strengths and weaknesses. This will help you to define the gaps that must be filled by your business team.

Exercise 2-2
Self-evaluation

Answer the following questions (be honest!):

- What are my strengths and skills? (Examples include hard worker, good people skills, and technical capacity)

- What financial resources can I bring to a new business?

- Why do I think this will work for me?

- What is going to be the hardest part for me? (For example, writing a Business Plan, finding a location, accessing finance, or finding an honest partner)

- Why would these activities be hard for me?

- Can I overcome these obstacles? How?

What Skills Will Your Business Require?

Before you can start a business, certain skill sets must be acquired. All successful businesses have included people with the necessary skills. Even if the skill sets do not exist at this stage, it is important to know what skills the team will need to establish your business successfully.

- **Marketing and Sales:** Identify customers for the product or services of the business and develop a pricing, advertising and promotion strategy to attract them. *A person needs to determine and make use of the business's competitive advantage.*
- **Operation:** Operate and maintain the business in a cost-effective manner.
- **Distribution:** Select the most efficient and effective method of delivering your product or service to customers.
- **Financial Planning:** *Estimate the financial requirements of a business and prepare a mix of financing alternatives*, including financial analyses such as Cash Flows, Income Statements and Balance Sheets (explained in later chapters).
- **Management:** Oversee and coordinate all of the participants in the business, with respect to the company's mission, performance, schedule and budget.
- **Permitting, Legal and Regulatory Matters:** Understand and comply with the relevant rules and regulations governing your business.
- **Negotiations:** Reach agreements with all of the parties with whom the business interacts—contractors, customers, government authorities, employees.
- **Bank and Investor Relationships**: Raise debt and equity and build business relationships that result in cost effective capital sources for the project.

- **Management Reporting (Monitoring and Evaluation):** *Maintain a system of performance measurement and evaluate performance against original plans and benchmarks.* Confer with lenders, investors and stakeholders regarding performance against this plan.
- **Pre-operational** (these requirements are for grid-connected projects only)
  - **Design:** Spell out the requirements of a physical project or product and correlate available resources to achieve desired performance.
  - **Engineering:** Prepare the detailed civil, mechanical, structural and electrical specifications of a product or project and supervise its physical implementation in a way that achieves desired performance at reasonable cost.
  - **Procurement:** Buy equipment, products and services needed to implement a project in a cost-effective manner.
  - **Construction:** Prepare the site, install equipment and

prepare for operations in accordance with project specifications, budget and schedule.

Whether proposing to produce electricity for sale to a national grid, or to start a small business providing energy services to individual households and businesses, **the quality of the business team** will most likely be *THE* critical element of the business on which partners, lenders and investors will base their decisions. For some investors, it will be absolutely essential that the team include someone with very direct experience—successful experience—in a closely related activity. For others, it will be important that the team has substantial money at risk in the business from the very beginning. These requirements may not be as crucial for some parties, but these will tend to be early stage lenders and investors who will provide small amounts of money on the basis of 'one step at a time'. The message here is clear— *you must assemble the best possible team to plan and implement the best possible business*. As lenders and investors are reviewing your Business Plan they will be evaluating the business team by looking for answers to the types of questions given in Exercise 2-3. Go through the questions now, and answer them for your business idea.

Exercise 2-3
Does Your Business Team Have All the Skills?

Technical: Are there specific engineering or mechanical challenges that require specific technical skills on the team on a permanent basis? What are those challenges and skills? Can these needs be met through a contract relationship or must one of the core team be an expert?

Operation: How complicated is the day-to-day management? Are there many employees and partners to oversee?

Financial: What are the financial aspects of the business? How will the ongoing financial requirements be met over the life of the business? Can a chief financial officer be hired later or should the team include a financial expert from the outset? What are the accounting practices?

Negotiations and Sales: Will there be a need to regularly update the terms and conditions of ongoing business relationships with suppliers and customers? Will the business always be seeking new customers and relationships or will this be a one-time event?

Legal: Will the regulations and contractual relationships governing the business be fixed or will they change over time, requiring regular attention?

Political: Will regulations and policies affecting performance be evolving and require attention and lobbying?

Funding: What is the minimum amount of funding needed to complete work underway and make the business attractive to lenders and investors? How much has the team spent already (time and money) and on what? What, realistically, will be needed to complete all of the tasks identified? Then, how much cash equity is needed to assure that the team retains a substantial portion of ownership and control? How much cash equity does the team have? Is that enough to be credible when negotiating with lenders and investors? Is there an early stage financial source available to supply these funds? What will the team be giving up and gaining by taking a financial partner?

Entrepreneur Skill, Experience and Resources: Of the qualifications needed for the team, what skills does the team possess? Are there partners who round out this skill set? Are there advisors who can be hired to assure that all the skills needed are represented? Does the team have an experience base that will 'impress' lenders and investors? If not, is there an addition to the team that could solve this problem? Is it possible to contract with an experienced party as part of the team? If not, how does the entrepreneur propose to convince lenders and investors that all the skills and experience needed are at hand? Does the team have the time and money needed to complete the work identified?

GATHERING INFORMATION = FACT-FINDING

The goal of your Business Plan is to convince the reader that your business objectives and strategy will succeed. In order to do this, you need to know as much as possible about your potential customers and existing competition, by acquiring as much accurate and specific information about them as possible. The type of customer and market assessment you will do depends on the type of business that you're pursuing. The research for developing a small power station selling to a utility is different from that required to develop a company selling solar dried food to retailers. *Collecting information on customers and competition requires physically going into the area in which you wish to operate and collecting the data*. Additional information can be found in libraries or by telephone. The list below gives some ideas.

Customer Data Collection Methods:

Phone interviews
Face-to-face
Mail surveys
Large group meetings
Desk studies - information gathering sources include existing studies, libraries, trade magazines)

Competition Data Collection Methods:

Store visits
Test goods
Competitor reports
Desk studies - information gathering sources include the Internet, trade magazines, libraries, chambers of commerce, boards of trade

Sources of Market and Political Information:

Magazines: The Economist, Foreign Affairs
Library
Internet-USAID and UN websites

Successfully collecting market data is difficult and time consuming. For instance, research shows that only 5 per cent of people surveyed respond to mail surveys. Travelling through villages asking questions can also take a long time and the validity of the responses is often questionable. However, it is still essential that adequate market research be completed to convince a lender, investor or partner that the business concept has been analysed and that you can demonstrate why this business will work. There are several tactics for collecting information. For example, a great deal of information can be gathered by visiting or telephoning competitors and asking them about the product or services they offer, what they charge, their guarantees, etc.

A successful method for organizing customer information is to develop a questionnaire. A questionnaire allows you to ask a sample of your potential customers the same questions in order to draw reasonable conclusions about their demand for your product or service. It is likely that a lender or investor will ask you how you determined that your customers would be willing and able to purchase your product. Don't forget to cite resources used in fact-finding. A sample questionnaire is included as **Annex C** of the Toolkit.

The types of information that must be gathered can be divided into four categories, all discussed in detail in the following pages:

1. **Market factors and trends:** What is currently affecting the proposed area of operations or product? Consider macro-economic trends,

energy plans and trends, government policy, and legal and regulatory issues. Summarize the major trends in the marketplace.

2. **Customers:** To whom will you sell your product or service, and why will they purchase it? Compile demographic statistics such as how they ***will and can*** pay for your product or service ('ability and willingness to pay'), where they live, source and amount of income, age, etc. As always, consider the direct and indirect benefits the customers will obtain from your product or service. Why will the customer be better off buying your products?

3. **Size:** Estimate the total size of the target market for your product or service both in terms of numbers of customers and gross sales and units of product or service sold (from competitors if necessary).

4. **Competition:** Compare competitors' products or services with those you are proposing in terms of quality, price, service, warranties, image, etc. *Be sure to describe your direct competition, but don't forget your indirect competition.* Your indirect competitors are the businesses that sell a product that is not the same as yours but could be used as an alternative by your customer. For example, if you want to sell solar lanterns for lighting to households near your village and they are currently using kerosene, an analysis of the kerosene market must be completed. Include estimates of their market share (do all customers buy from them, why or why not?) and your sense of their financial health (are they profitable or about to go out of business?).

Each of these categories is now discussed in more detail, to assist you in gathering your own data.

MARKET FACTORS

The proposed business must be aware of, and take into account, market factors in the target area and in the region or country. The likelihood of a business succeeding is determined not just by factors under its control. It is important that general market factors—economic, commercial, political, social, and environmental—instil confidence in the stakeholders needed to run a business (lenders, investors, suppliers, contractors, insurers, etc.). The most important general market factors that need to be favourable for an investor or lender are the following:

- **Energy policy:** meaning the overall interest in and energy-related activities of government or international communities. Are there plans to extend the electric utility grid into your area of operations? When? By whom? How will they fund this activity? Are there plans to undertake or develop other non-grid connected energy projects in the operations area? Are there international or government supported programmes under way? What impact will these have on the business's ability to sell its product? Are there plans to change the current energy sale and purchase policy (perhaps switching from a power purchase agreement (PPA) to a wholesale market)? When is this to take place? What is the long-term outlook for the energy industry or proposed product/service?

- **Macro-economic:** inflation, general economic stability and growth, currency stability, and employment growth. While these conditions need not be perfect, it is important to assess the general trend of the economy (improving versus declining) and the general perception of the regional and world economic community. Sometimes—and this is very frustrating for an entrepreneur to hear—it is just better to put an idea aside and wait until conditions improve.

- **Commercial factors: Are** the rules for doing business, establishing a company, making investments, recovering investments and importing goods and services clear? What are the appropriate banking, investing and trading laws and regulations? Is there a history of businesses, such as the proposed one, being successfully implemented from a commercial perspective? Are in-country banks and investors involved in such businesses? Is there a 'commercial discipline' based on the general principles of socially responsible entrepreneurship and return on investment (versus top-down planning and state implementation)?

- **Politics:** in the broadest sense of the term. Are laws and regulations transparent and enforced in a reasonable

manner? Is power transferred between political parties or factions in an orderly and predictable manner? Are policies transferred from one political appointee to another or does every appointment of a minister or election mean that a business is back to the beginning of the development process? Is corruption—payoffs, favours and conflicts of interest—part of the process of starting a business? Is there political support for the proposed business? Is it needed and will it be helpful (sometimes it is not)? What evidence exists of this political support, if needed and helpful, at the national or local level?

- **Social factors: w**ill the target area benefit from the proposed business? What are the needs in the area? Is the business compatible with local conditions and plans? Is there social support for the business or product/service? How is this support demonstrated?

- **Environmental factors: t**here may be requirements for environmental impact assessments (for grid connected projects), otherwise this information is important to the types of investors that are interested in energy projects and not to the viability of the project. In other words, this can act as a positive characteristic of the business and should be included in the 'Impacts' section of the final Business Plan. What is the environmental impact of your product/service? Does the product/service have a positive environmental impact? Is it displacing wood burning, kerosene and/or candles? Is carbon use being mitigated?

- **General:** what is the trend in your industry? Is demand increasing or decreasing? What is the total size of your market?

Every business has its own characteristics. It is important to determine, at the earliest possible point, the complete list of permits required and conditions to be met to obtain approvals. It is not necessary to acquire them at this stage, but if they are necessary and not available it may be the end of the business idea. The following questions should be addressed to the appropriate government agency:

- Must the business be registered? With what entity or entities? Must share capital be at a certain level?
- What are the requirements to obtain environmental permits and approvals? Must the consent of local communities and neighbours be obtained? Must a formal environmental impact assessment be prepared? Is there a public hearing or consultation process?
- What permits and approvals are needed to use natural resources, undertake construction, operate a business, interconnect with the electric grid or build a local grid and sell energy (e.g. generation and training permits or, if a spot market, permission from regulatory entity)?
- What licenses, permits or authorizations are needed to import equipment? What tariffs apply?
- Are there health and safety procedures to be followed? Must these be documented?
- Must the owners and managers register and report activities concerning their participation in the business?
- Must permission or a concession be obtained to provide energy services 'off the grid?'
- Has the opinion of an independent qualified advisor been obtained to document that the list of permits and their requirements is complete?
- What, if any, restrictions exist to securing international investors? Can dividends be repatriated to investors?

The following exercise will help you focus your business idea and will help you organize some of the information you are gathering. It covers the following topics:

- Existing and Proposed Energy Plans and Projects
- Macroeconomic Conditions
- National, Local Laws and Permits
- Research Materials Used

Exercise 2-4
General Market Conditions

Existing and Proposed Energy Plans and Projects	
Type of Clean Energy (e.g. solar, energy efficiency, biomass) *E.g. Solar* Type of traditional energy to be replaced (e.g. petrol, gas, diesel) National grid? (if no, specify nearest location of use) *Other Notes*	Description (current and future uses and development plans) *Example: International Funded solar energy project to begin* January 2003 that will donate half of the cost of equipment to the customer.

Macroeconomic Data-see **Annex D f**or country-specific macro-economic information.	
Country Size	
Population	
Per Capita GDP (in US$)	
Per Capita Income (in US$)	
Exchange Rate / US$	
Inflation (Annual)	
Interest Rates: Local Currency Deposits	
What has been the performance of the national currency in the past five years?	
What has been the performance of inflation in the past five years?	
Unemployment (urban data)	
Total Installed Grid Capacity (MW)	
Percent of Population Serviced by the Grid	
Per Capita Energy Consumption	
Energy Related Carbon Emissions, if applicable (mt)	
Local regulations for start-up energy companies (briefly describe legal norms and standards that apply to the energy sector, including taxes and incentives-such as subsidies-to small and medium enterprises):	

Laws, Regulations and Required Permits

Permits Needed to Start a Business:

Title	Issuer	Process and Requirements	Comments

Permits or Permissions Needed to Study a Project or Undertake a Feasibility Study:

Title	Issuer	Process and Requirements	Comments

Permits Needed to Obtain a Concession or Right to Use Natural Resources:

Title	Issuer	Process and Requirements	Comments

Permits Needed to Construct:

Title	Issuer	Process and Requirements	Comments

Permits Needed to Assure Environmental Compliance:

Title	Issuer	Process and Requirements	Comments

Permits Needed to Produce, Sell or Distribute Energy:

Title	Issuer	Process and Requirements	Comments

Permits Needed to Operate a Project:			
Title	Issuer	Process and Requirements	Comments

Other Permits:			
Title	Issuer	Process and Requirements	Comments
-			

Research Materials used	
Region name researched:	
Author, source and date of energy studies:	
Author, source and date of economic studies:	
Author, source and date of social studies:	

CUSTOMERS

For energy businesses there are basically two types of customers: businesses selling products or services to *multiple customers* (households and other businesses) and businesses serving a *single or a small number of customers* (national utility or a large industrial company). There are far more types of energy businesses with multiple customers. The following is a list, by product or service, giving examples of businesses that serve multiple customers:

- Solar home systems for individual households.
- Solar hot water systems for individual households.
- Energy-efficient cook stoves for households or to be sold wholesale.
- Energy efficiency lighting products for sale to individuals, industries or wholesale.
- Small wind turbines for a household or community.
- Community water pumping or mini-hydro.
- Alternative cooking briquettes for sale to individuals or wholesale.
- Food products made from solar drying, cooking or freezer technologies for sale to individuals or wholesale.
- Products produced from technologies that use alternative energy as the input (such as nuts, oils, etc.) for sale to individuals or wholesale.

Businesses Selling to Multiple Customers

The rationale for these types of businesses is that the product or service will be sold directly to a household or wholesale to another business such as a supermarket or export market. In all of these cases it is imperative to conduct market research that will prove that a market exists for your product (now as well as in the future) and that you are capable of carving out a niche for your business. As already mentioned, **Annex C** provides a questionnaire that can be used for conducting research for multiple customers in an effective manner and should be completed by all prospective entrepreneurs.

The primary goal of customer research is to collect data to prove to your audience that customers are willing and

able to pay for your product or service. One way to do this is to find out what they are doing now to meet their needs and how much they pay for it. Then ask yourself, how will their life change if my business meets this need? Is it more or less expensive than what they previously used? Is it as reliable, available, and accepted? Would my new service or product require a major behaviour change for the customers? If so, what systems do I have in place to make that change easier for them? Will my product or service be technologically complicated for the end-user?

Answering the following questions will help you to address these issues:

Customer Questions	
Types of customer targeted (individual, household, local government or community that may sell to households or individuals, industry) *Total estimated number of customers to be interviewed (e.g. 100 households, 5 communities, 20 industries)* *What is the average customer's source of income?* *Does income generation fluctuate through the year?* *What do customers spend most of their income on?* *How much do they spend on energy needs?* *How do they meet their energy needs?* *How do they meet their water needs?* *How are the customers currently filling the need your business hopes to meet?* *How much does it cost?* *Are they satisfied with the other source?* *How much are they willing to pay for your product or service?* *What sort of behaviour change, if any, would be required for customers to use your product?* *How will your business ease the behaviour change for them?*	

Business Selling to a Single Customer

The second category is a business serving a single (or a few) customer(s) usually under a contract for service. Examples of such customers are electricity utility companies and large industrial firms with a significant demand. These types of businesses generally do not require significant research of potential customers because the single most important element in determining whether or not the business idea will work is to find and secure the buyer, rather than to assess demand. The most common type of agreement between businesses and these types of customers is a power purchasing agreement (PPA). PPAs are contracts under which the buyer (usually the local utility or industrial facility) formally commits to purchase a specific amount of electricity at an agreed rate for a stated period of time.

Most PPAs cover payment for the purchase of capacity and energy separately. 'Capacity' is the assured supply of the project (measured in kilowatts or megawatts) being sold to the utility or industrial firm. 'Energy' is the actual output of the project, measured in kilowatt-hours or megawatt-hours actually produced and delivered. As electricity utility companies become more competitive through the elimination of monopolies, long-term PPAs are being replaced with Wholesale Market Mechanisms, which buy the energy output from projects based on its price compared to other

energy projects supplying the same electricity system (or grid) at the same time. Regardless of the size of the utility or industrial customer, it must be established that this customer can and will pay for the capacity and energy provided. Many utility companies are technically bankrupt and depend on government subsidies to meet their obligations. These companies (and others) tend to be very poor payers. It is therefore essential to determine that the buyer of energy and capacity can and will pay for the service provided over the life of the contract. The basic message here is this: just because the buyer is a large company do not assume that it will be a good payer.

Some of the things to check are as follows:

- What is the potential client's core business?
- Is information about it public or private?
- What is the buyer's net worth (the excess of its assets over their liabilities)?
- How much money does it owe (compared to its gross revenues and its total assets), and how has this changed in the last 5 years?
- What is its revenue and profit performance over the last few years?
- How well is its core business doing?
- What is its track record in borrowing and paying back loans?
- How much has it been able to borrow in the last five years? In the case of a utility owned by the government, has this debt been guaranteed by the government or is the credit of the utility itself good enough?
- In order to make a reliable assessment of your buyer's ability to pay, you may contact local banks or the local World Bank or IFC office. Local offices of well-respected international accounting firms or bilateral chambers of commerce are also good sources of information.
- If you are dealing with a private company that does not publish information, ask the company to supply information and ask them to let you speak with their bank.
- What is its credit rating?
- Has it been involved in any similar projects? What do these other projects have to say about its performance?
- How secure might a potential contract with these large customers be?
- What external factors may negatively affect the company's or utility's profitability?

COMPETITION

Whether proposing a rural energy business supplying electricity to a house, business, community or national grid, or starting a business selling fruit dried by the sun, a smart and easy way to conduct research is to find one or two similar businesses that have received financing or are operational and collecting revenues and study them. **Investors are not pioneers if they can avoid it. M**ost choose to avoid it and lenders are almost never pioneers. So a good place to begin in the business development process is to answer the question, "Have others done this before?"

This is easiest, of course, if one or two businesses similar to the one you are proposing *have* been started. You need to do some research and document what happened to your competitor (and when). While everyone likes to think that is to her business is unique, uniqueness is definitely not an asset when trying to convince others to make loans or an investment.

If nothing like the proposed business has been built—and all too often this is the case—then the entrepreneur needs to build as many arguments as possible to *reduce the perception of 'pioneering risk' (when an investor funds a business for the first time).*

For example, similar businesses may have been constructed and operated, albeit by the government or through an NGO programme using grant funds. This helps to reduce any perception that there are no qualified contractors or workers; that equipment is unknown, and so on. By citing such examples the entrepreneur confines the "newness" of the transaction to the fact that a private company is going to build this business (instead of the government).

There are cases, however, where the entrepreneur will be the pioneer (the authors have been involved in a few). In these cases it must be proven that even though no such business presently exists, there is demand for the product or service, and that sales and profits will be realized. Is this easy to argue from this starting point? No. Can it be done? Yes—through thorough documentation, step-by-step market research and cross checking of the validity of your assumptions.

The most effective way to define your competition is to think of similar businesses that compete for your customer's money. When thinking of competitors, it is essential to consider both your direct and indirect competition. Remember, direct competitors are those that sell exactly the same type of product or service as your business, indirect competitors are those that sell a product or service that provides the same benefit for the customer.

For this section, information must be gathered regarding the numbers of competitors and details of their operations and financial stability. Completing this task will help you to understand your competitor's strengths and weaknesses, the potential demand for your product and this information will eventually be used to develop your competitive advantage and build barriers between your business and your competitors.

Figuring out who are competitors can be done in several ways. One of the simplest is to consider the situation from the customer's point of view and to think of all of the possible ways in which customers can solve their purchasing need. A way to learn about competitors while developing your business strategy is to keep records of them. Put together a file on each of your competitors and include copies of their advertising and promotional materials. Continue to add to the file and review it often—it will help you when you are determining your strategy for attracting customers. Now that you know your competition, complete the following exercise

Exercise 2-5
Competitors

1. Who are your five nearest direct competitors? What do they do?

2. Who are your indirect competitors? What do they do?

3. How are their businesses: steady? growing? declining?

4. What have you learned from their operations? from their advertising?

5. What are their strengths and weaknesses?

6. How does their product or service differ from yours?

7. From where/whom do they source their product?

8. What is the sales price of their product or service?

9. How far is the nearest competitor from where you hope to sell your product or service?

BUSINESS RELATIONSHIPS

In the first part of this chapter we discussed the types of skills that a business needs to succeed. These can be acquired either by hiring someone as an employee or through a contractor or supplier relationship. Remember some relationships can be solidified later, but it is not advisable to wait to find suppliers and contractors.

Good suppliers and contractors have choices as to the markets they serve. *Availability and reliability of suppliers is crucial for both large and small businesses*. Whether a company needs to buy 50 photovoltaic panels a month, 20 water pumps a year, 300 batteries every six months, ceramic liners for gasifiers and stoves, or a 25 MW hydroelectric turbine generator set, sources of supply are crucial. A components inventory and supplier network needs to be established as soon as practical and back-up sources identified. The inability to get replacement or spare parts in time can destroy a company trying to establish itself in the marketplace.

Suppliers will provide quotes for credible business proposals. Getting as much fact-finding and feasibility analysis work documented as possible, and presenting it well, will therefore get the attention of suppliers and contractors. Be cautious not to commit to purchasing anything until the financing is secured. The exercise at the end of this section suggests calling several possible suppliers and determining their availability, terms, costs, etc.

For businesses with a single client, lenders and investors will want to avoid 'Completion Risk'—meaning that once

construction has commenced, the lenders and investors want assurances that the project will be completed and will commence operation. Contracts known as EPC (engineering, procurement and construction), EPC-lump sum, Fixed Price or Turnkey are attractive to lenders and investors. Under an EPC contract, a contractor will handle all of the tasks needed to design and build a project according to a set, pre-quoted, price and will deliver the project fully operational. In these cases, the completion risk belongs to the EPC contractor and is secured by a performance bond. The EPC Contractor, in turn, contracts with sub-contractors and coordinates all the tasks involved. As an alternative to this, the business team itself can act as the prime contractor (the role of the EPC), hiring all the engineering, procurement and construction contractors. However, it needs to demonstrate conclusively that the project will be completed and that funds exist to handle cost overruns. A third choice is for the business team to hire a Project Management firm to coordinate the project. Once again, overruns need to be funded and completion assured.

On a larger project it is often a requirement that an operating and maintenance company be employed to run the project once construction is completed. Complete the Supplier Relationship questions on the following page to organize your research.

Exercise 2-6
Supplier Research

Write down a component inventory-what you need to purchase to sell your product.

Component Inventory:

What types of materials or products do you need to purchase for the sale of one product?

From which possible suppliers? Where are they located?

Which currency do they accept?

Write down possible suppliers and contact them to understand their terms, availability and process.

Supplier 1: supplies_____

Name:

Location:

Product type(s):

Sales price:

What are the payment conditions? (30-day credit, 90-day credit, in advance):

Payment is made in what form? (cheque, wire, money order, dollars, local currency)

When can the product be shipped? How long will it take to arrive?

Supplier 2: supplies_____

Name:

Location:

Product type(s):

Sales price:

What are the payment conditions? (30-day credit, 90-day credit, in advance):

Payment is made in what form? (cheque, wire, money order, dollars, local currency)

When can the product ship? How long will it take to arrive?

Supplier 3: supplies_____

Name:

Location:

Product type(s):

Sales price:

What are the payment conditions? (30-day credit, 90-day credit, in advance):

Payment is made in what form? (cheque, wire, money order, dollars, local currency)

When can the product be shipped? How long will it take to arrive?

ENERGY RESOURCES AND TECHNOLOGY

This Toolkit deals with four types of natural resources—wind, water, biomass and sunlight. The goal of this section is to explain how you must prove to partners and investors that the technology you plan to use is proven and appropriate, and that the resource exists in sufficient quantities.

When an investor or lender reads your Business Plan it must be clear that you have answered the following questions and that the sources of your information are reliable.

Energy Resources

- **Water**: What data exists regarding the flow of water and the 'head' (proposed elevation drop)? For how long has this data been collected? By whom? How has it been documented? Has the water data been independently evaluated? Have seasonal and year-to-year variations been estimated? Have the site conditions been studied and integrated with the water data? What documentation exists to prove that sufficient water resources exist?
- **Biomass:** What is the proposed biomass source? Has the biomass source been evaluated for its energy content (BTU/joule), moisture levels, collection, transport and storage characteristics? What quantities of this biomass source are available? Are there seasonal variations? How have the energy characteristics and quantities been documented? Has this biomass source been used before in this region in the manner proposed?
- **Sunlight:** What solar insolation data exist for the proposed project area? Have solar panels and balance of systems been installed in the project area? Is there any documentation of performance? Are there seasonal variations or extended periods of sub-optimal performance? How is the information documented?
- **Wind:** What wind speed measurements have been made? What data exist? For what period of time? Are the measurements site specific, using reliable equipment and accepted techniques? Have the results of these measurements been examined by a qualified and independent professional? What documentation exists to prove that sufficient wind resources exist?

Technology

Having established that natural resources exist in sufficient quantities, the next step is to determine if the wind, water, biomass or sunlight can be converted into energy at the proposed project site on the scale envisioned. In other words: Is the technology appropriate given the business assumptions?

- What type of technology will be used?
- Has this particular technology been used with this particular energy resource (e.g. rice husks)?
- Is the technology available at the targeted location? If not, can it be imported?
- Have suppliers of the basic conversion technology—wind turbine manufacturers, hydro turbine manufacturers, biomass conversion equipment manufacturers and PV systems integrators—reviewed the wind, water, biomass and sunlight data and confirmed that their equipment can produce the desired energy output?
- What other components are needed to assure energy output?

It is not enough that sufficient natural resources exist and that the technology is available. In the case of water and biomass energy projects, the right to use these resources must be assured, generally through a contract, with either fuel suppliers or with the government (e.g. through a concession for water rights).

- **Water:** What agreements are needed to secure the use of water at the proposed project site? Will a payment be required? What are the conditions of such a contract? For example, what percentage of water flow is allowed to be diverted? What is the term of the contract? What is the expiration date of this contract if the project is not operational within the term? What other related contracts are required?
- **Biomass:** What is the length and what are the terms of the proposed contract(s)? What percentage of the project's biomass requirement will be met by this contract(s)? What assurances exist that the biomass supply will be continuous? What is the financial condition of the supplier and the underlying soundness of the industry? What penalties exist for the buyer and seller for non-performance? What backup and supplementary supplies are available and on what terms?

In order for a business idea to become an opportunity, the choice of technology and energy resource must be justified. Answer the applicable questions above and verify the technical information from a qualified technical source. Suppliers may be a source for this information or may be able to direct you to other sources.

Is the information in this chapter too much to ask for? There is little point in proceeding with planning a business until this degree of specificity exists.

At this point all exercises should be complete and ready to be assembled into the first two sections of the Business Plan.

1 It is possible to buy biomass in an open market at the then current 'spot' price but most lenders and investors are uncomfortable with the uncertainty this implies.

2 For example, a sugar mill may be able to supply all the bagasse needed for a cogeneration project, but the mill may not be competitive due to factors linked to the world market for sugar rather than productivity within the mill itself.

SUMMARIZING WHAT HAS BEEN LEARNED

What have you learned thus far? Chapter 1 was an introduction to a Business Description, which is the section of the Business Plan where you convince your reader that this is an excellent business opportunity. You should be improving your Business Description throughout the entire Business Plan writing process. This chapter started by explaining characteristics often found in an entrepreneur— an exercise that was provided to help you assess your own qualities. Next, the reasons for collecting sufficient amounts of high-quality data were outlined, followed by a list of the types of data to collect (market, customers, competition, business relationships, and technology). At this point you should stop reading and collect as much data as possible pertaining to your idea. Then, you can move on to the final section of this chapter and compile your information into a comprehensible format that will be incorporated into the final Business Plan.

Before starting on your Business Plan, complete the checklist on the next page to identify gaps where information still needs to be collected. For each question, put a checkmark next to items that have been completed. For items that are incomplete write what needs to be done and when it will be completed.

Fact-finding Checklist

Has information on energy plans and other energy projects at the national/regional/local level been collected?

- All the information has been collected. ___
- The following information is still needed. _____

Have data on the macroeconomic, legal and political situation been researched?

- All the information has been collected. ___
- The following information is still needed. _____

How much is known about the quantity of natural resources-wind, water, biomass, sunlight-proposed to be used?

- All the information has been collected. ___
- The following information is still needed. _____

Has the information on what is required to obtain the exclusive use of water or biomass for the project been gathered?

- All the information has been collected. ___
- The following information is still needed. _____

Is the information regarding the use of the land on the site(s) known?

- All the information has been collected. ___
- The following information is still needed. _____

Have all the permits needed been identified?

- All the information has been collected. ___
- The following information is still needed. _____

Is the research completed on whether the technology is appropriate?

- All the information has been collected. ___
- The following information is still needed. _____

Have customers been identified? Have their particular characteristics (in terms of ability and willingness to pay) been assessed?

- All the information has been collected. ___
- The following information is still needed. _____

Has information on possible direct and indirect competition been collected?

- All the information has been collected. ___
- The following information is still needed. _____

Has an examination been made of the skills needed to implement this project and has this been compared with the skills and experience of the project team?

- All the information has been collected. ___
- The following information is still needed. _____

Now you are ready to assemble all the relevant information into the first two sections of the Business Plan.

What should be included in these sections? Answers to the exercises and issues raised throughout the chapter should be organized in a convincing way and presented in each section of the study. One way to organize this is explained here. Annex B also provides examples. Remember, this is a research document thus far, there is no analysis of the demand for your product or service or the business opportunity until Chapter 3.

Business Plan Outline

1. Title page: Business Name, physical and postal address, founder's name and contact information, and the date.

2. Business Description: review the Business Description from Chapter 1 in the light of the additional data col lected (especially on customers and technology). Update the description and ensure that the information presented is convincing and sufficiently detailed. Remember everything following this part of the Business Plan is intended to prove why this Business Description represents a good idea. Your description should cover information about the following:

- Company
- Location
- Product or Service
- Technology and Resource
- Customers

In addition to what you have already written, add two new topics based on information and instructions provided in this chapter.

- Market Factors: For example permits acquired or needed, country specific business, legal, social and environmental factors.
- Business Relationships: Who are the potential equipment or product suppliers? Contractors? What are the required business relationships with the equipment or product suppliers or contractors? What are the terms for purchasing from equipment or product suppliers? Cost of freight and shipping?

3. Opportunity: write a section including information about your customers and competition. The goal is to illustrate that this is a good business opportunity.

- Customers: explain who will buy your product or service and why. This section can be completed using the exercises in the 'Customers' section and completed questionnaires (Annex C, for example) and turning the

data into a written document. Be clear and convincing. The goal is to show that you understand your customers' ability and willingness to pay.

° Competition: turn the exercise in the 'Competition' section into a written document. The result should be an overview of your direct and indirect competition.

Congratulations!

You have completed the first two sections of your Business Plan.

Chapter 3: Feasibility Analysis

INTRODUCTION

The purpose of a Feasibility Analysis is to assess the viability of a business. In Chapter 1 you collected information about your business idea and wrote your first draft of the Business Description. Chapter 2 explained why data collection was important before writing a Business Plan and then provided methods for gathering vital information. In this chapter you will analyse the data from Chapter 2 in order to determine if the business will work. This will help you to see if your expected revenues will fall short of, meet or exceed your costs. To address this issue, you will develop a marketing plan, operational strategy, schedule, and initial financial calculations.

FEASIBILITY DEFINED

What are the characteristics that indicate an energy business is feasible?

When land, fuel, technology, team, customers and permits are available and when putting these ingredients together makes financial, social and environmental sense, then a business is feasible. Determining the feasibility of a business doesn't guarantee that it will be funded or implemented-too many other things outside of your control can go wrong-but it does set the stage for presenting the business to reasonable people for technical and financial participation. The goal of a Feasibility Analysis is for you to demonstrate that the pieces of the business can be put together well enough to present it to others.

OPPORTUNITY ANALYSIS

In Chapter 1 you defined your potential customers and gathered information about them. This included details of their location, income, ability to pay, needs, and usage. The goal of this section is to prove that there are sufficient customers willing and able to buy your product. In order to prove this, it is necessary for you to analyse the data you collected and then draw reasonable conclusions. The following exercise takes you through the process:

1. How much do potential customers currently pay to meet the need you will fill? List the need.

_____per_____for_____

Example: US$10 per month for candles, kerosene and battery charging.

2. How many customers said they would be willing to purchase your product or service? What is the total market size?

_____

Example: 75 households (equal to 25 per cent of those interviewed) said they could afford my product. There are 1 000 households in the proposed area of operation.

3. How much do potential customers say they can afford to pay for your product or service?

_____per_____for_____

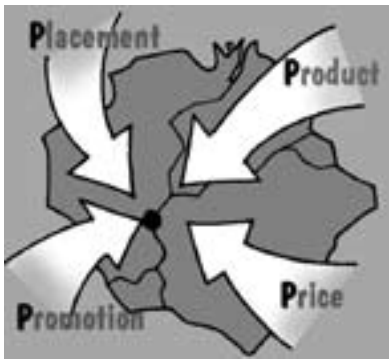
Example: US$12 per month for a 50-watt solar home system for 3 years. This is equal to a total of US$432 without interest for providing the system on credit.

From the estimates you have, you can project your **total potential sales**. Start by multiplying the percentage of customers that said they would buy your product by the total number of households or customers in your area of operation. The result is an estimate of the number of customers to whom you can sell. It makes sense that not everyone in your area of operation is a potential customer, and it is important to have an idea of what percentage of nearby residents might buy your product.

Then, multiply that estimate of your potential customers by the average price customers would pay for your product to obtain a rough estimate of your **total potential sales**. This is a very early estimate but it will be useful later on, when we discuss pricing in the next section.

Total Potential Sales estimate: _____

MARKET ANALYSIS



Many people associate marketing only with advertising. Though advertising is a part of marketing, there are other important elements in a marketing strategy besides promotion, including pricing, placement (distribution) and product. Collectively, these are called *'the four P's,'* and every new business has to have a strategy for each 'P'. Since you have already decided on the product, this section covers pricing, placement (distribution) and promotion.

Pricing

How much to charge for a product or service is a difficult question. If priced too low, you give up potential revenue that would help pay your expenses. If priced too high, your customers may buy from a competitor. There are several ways to determine an appropriate price for your product, but keep in mind that businesses change their prices often as market conditions change.

The first thing to do is to compute the costs of your business-overhead, labour, capital equipment-so that you have an idea of how much you need to earn to avoid being in debt. The point where your company is neither losing money nor making a profit is called the 'break-even point'. It is an important milestone in the development of a new company.

Below you will find definitions of terms that you need to know to develop your price and eventually to prepare your financial analyses. Lenders and investors will expect you to be familiar with these terms:

Cost of Goods Sold
The Cost of Goods Sold, also called the Cost of Sales, refers to the cost to you of purchasing materials or products from suppliers for resale or manufacturing. The cost of freight and delivery charges should also be included in this estimate.

Operating Expenses
Operating expenses include the following:

- Labour expenses, which are the hourly fees or salaries paid to employees of your company. Payroll taxes and benefits, such as medical insurance or vacation time, should be included here.
- Professional services, which are fees paid to people who do not work for the company, e.g. contractors, consultants, attorneys, accountants, etc.
- Overhead expenses, which are all of the recurring costs incurred in operating the business. Typically they include all or some of the following:
- Rent
- Utilities
- Vehicles

- Travel and Entertainment
- Maintenance and Repair
- Equipment leases
- Supplies
- Packaging and Shipping
- Insurance
- Permits and Licenses

Capital Costs

This is the amount of money required to purchase equipment to start and maintain operations for a period of time. It also will be used to determine how much Depreciation your company will incur each year on equipment that lasts longer than a year. Depreciation simply means that an item of capital equipment-e.g. a machine, a piece of furniture, a computer, a building, etc.-loses value over time. For example, a computer you buy today for US$500 is worth less than US$500 after three years. Depreciation, which is an amount listed in your company's financial reports, accounts for that gradual erosion of value.

If you are starting a new business, Capital Costs generally include office equipment, manufacturing equipment, vehicles, etc. *Remember to keep receipts for all of your equipment purchases* so you are able to calculate your depreciation expenses. *This is important for your accounting records and for tax purposes.*

The following exercise will help clarify the total costs of starting and running your company. It will provide you with insight into what is often called your 'cost structure'.

Calculating your Operating Expenses

1. List your labour expenses per month and annually

Staff Name	Cost per month	Cost per year
Total		

2. List your professional expenses per month and annually:

Professional Service E.g. Accountant	Cost per month	Cost per year
Total		

3. List your overhead expenses per month and annually

Expense	Cost per month	Cost per Year
Rent		
Utilities		
Vehicles		
Travel and Entertainment		
Maintenance and Repair		
Equipment leases		
Supplies		
Packaging and Shipping		
Insurance		
Licenses and Permits		
Other		
Total		

4. List items of capital equipment necessary to start the business and their costs:

Item name	Cost
Total	

Calculating your Cost of Goods Sold

What is the average total purchase cost of your products based on quotes from suppliers you contacted? Or what is the average cost of materials if you manufacture your product or service?

_____

E.g.: US$350 for a 50-watt solar home system.

5. List the Cost of Goods Sold per month and then annually-ensure that this correlates with your assumptions and findings in the Opportunity Section.

Equipment Name/Type	Amount purchased per month	Cost per month	Cost per year
Total			

Insert the total of labour, services and overhead items here: US$ .....

Insert the cost of the goods sold here: US$.....

Add the two numbers. Your eventual sales price must cover at least this amount, but remember loan and interest payments, depreciation and taxes are not built into this number.

Sales Projections

The next price-related element to be developed is an estimate of the amount of your product or service you expect to sell during the first 5 years. The aim is to be able to define, for example, how many systems you will sell per month and then show why this is reasonable. The projected sales for at least the first 5 years of business (depending on when your business will be profitable and has repaid any debts) must also be calculated.

Start with your estimate for the 'Total Potential Sales' from the 'Opportunity Analysis' section above. Since it would be impossible to sell to the whole market within the first year of your company's life, estimate realistically how many products you think you can sell each month for the first year.

If you have little direct experience in doing what your company will do, competitors can, once again, be a good source of information when making these estimates. Refer back to any notes from conversations with competitors in Chapter 1. Their figures can be used as a starting point or a measuring stick. For example, if a direct competitor is selling 150 products per year, it would not be reasonable to assume your business will sell 600 per year. Other sources of information are suppliers and target customers.

Like many estimates in this chapter, it is possible, even likely, that your sales estimate will not be accurate. That is to be expected-the aim here is to get you to think critically about your market and your company, and to gather enough information for you to make sound business decisions.

Task: Think about how many products you can sell per month for the first year and annually thereafter. Base your projection on number of staff, availability of stock and parts, customer demand, and seasonal changes in your business.

You are now ready for the fun part! Pricing. Four methods of pricing are presented below with examples of when they should be employed. Examine these pricing strategies, and determine a price for your product or service. It is likely that the sales price you choose will change as you complete the Business Plan, however use this price as a starting point.

<u>Cost-plus Pricing</u>

This type of pricing computes the total cost of the product or service to your business, which includes cost of materials, purchases, labour, overheads, etc., and then adds a desired profit margin to determine the sales price. This method has the advantage of being simple, but it does not take into account what your competitors are charging. The following is an example:

Cost of Goods Sold (PV module plus balance of system):	US$400
Cost of labour (installation included):	US$50
Overhead:	US$50
Total Cost:	SU$500
Desired Profit (15%)	US$75
Required Sales Price:	US$575

<u>Competitive Pricing</u>

If there is a significant amount of competition in the market it is wise to keep the price of your product near the market price . Research has already been completed on each competitor, so the price of your product should be known. Does this price cover your Cost of goods sold and overheads? If not then your business structure is not feasible. Some research should also be done into the willingness of the customers to pay more for the product. Under what conditions would they pay more?

Markup Pricing
Some manufacturers, wholesalers and retailers simply add a set amount (the markup, usually expressed as a percentage of cost) to the cost of a product to reach the final price.

Value-Based Pricing
Value-based pricing is a useful strategy if your customer is going to either save money or be able to earn more money as a result of the product or service you provide. In other words, the customer will find financial gains in your product or service. The easiest way to price using a value-based strategy is to estimate the amount of money your product will enable the customer to save or earn, and then price your product below that amount so that the customer has a financial incentive to buy from you.

For example, if you sell solar power systems for homes, and the electricity produced from your solar panels powers a sewing machine that enables someone to generate US$10 per week in revenue, that would help you set your price. Of course you would want to charge less than US$10 per week for your product, but how much less would be your decision. If you sell into a competitive market, if you want to get more customers quickly, if you want to generate favourable word-of-mouth for your product or service or if your costs are fairly low relative to how much revenue the customer generates from your product, then you should charge lower prices.

Here are three basic rules about pricing:

1. Prices must be set to cover costs. Never price 'below cost'.
2. The simplest and most effective way to help you lower sales prices is to lower costs.
3. Prices must be evaluated and changed as necessary to reflect constant changes in cost, demand, changes in the market, and responses to competition.

After you have come up with a sales price, you are now ready to determine your Gross Margin and Markup using the following important formulas:

Gross Margin
The gross margin is defined as the difference between total sales and the Cost of Goods Sold during a given time period. Use estimates for your first year of business. The Gross Margin must be sufficient to cover all of your business expenses (the costs of labour, services, overhead and promotion) and hopefully also provide you with a profit.

The gross profit margin can also be expressed as a percentage. Simply subtract Cost of Goods Sold (which is the same as 'cost of sales') from total sales and divide that number by total sales.

(Total Sales - Cost of Sales) / Total Sales = Gross Margin.

Profit Margin, also called Net Margin, is similar to Gross Margin with one important difference. To find your Net Margin, you subtract all of your business's expenses from your total sales. The remainder is your profit, which you can either reinvest in the business, distribute to the company's owners as dividends or both. Profit Margin also can be expressed as a percentage:

(Total Sales - Total Expenses) / Total Sales = Net Margin.

Markup
This number is also similar to Gross Margin, but slightly different. The difference between Gross Margin and Markup is that the Gross Margin is computed as a percentage of your total sales, whereas Markup is computed as a percentage of the price you paid for the goods.

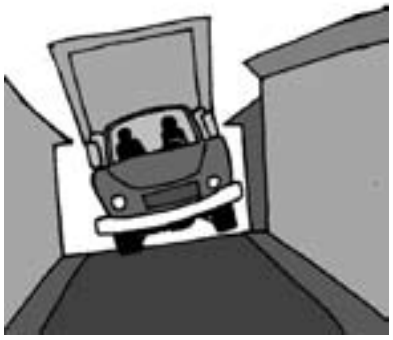
(Total Sales - Cost of Sales) / Cost of Sales = Markup

You can make some assumptions from these calculations. For example, if your business requires a 40 per cent margin in order to make a profit then your average Markup will have to be 66.7 per cent. So, although the two calculations refer to the same monetary value, they are two very different concepts with different meanings. If you assume the two are the same it will be impossible to reach your expected profits.

Margin: _____

Markup: _____

Placement (distribution)



Now that you have a sense of how many products you will sell in a given period, you should consider how you will distribute them to your customers. Distribution is the process of moving your product from the manufacturing site to the customer. The distribution channel you choose will depend on your projected sales and the characteristics of your business. *Consider competitors' distribution strategies as a starting point and decide if they would be right for your business* or if something else would be more appropriate. Examples of some distribution channels for energy businesses are:

Direct Sales: The simplest and most effective way to distribute if you are selling directly to customers is to have your business sell the product. An example is selling solar water heaters directly to households for cash or credit.

Salespeople: Salespeople will sell your product or service on your behalf. They often sell a variety of products and divide their time between them. This is also an effective way to distribute a product. An example includes selling a newly designed freezer using solar panels to a solar PV company's in-country distributor.

Wholesale Distributors: A manufacturer sells a product to a wholesaler who in turn sells it to a retailer for further distribution to customers. Selling solar dried food products to an export company which in turn sells it to a retail chain is an example of this distribution channel.

Retail Distributors: Another highly effective channel if the end-user is the general public, retail distribution involves selling bulk product directly to a retail store. An example is selling dried food to a grocery store.

At this point in the business planning process you should do some research on the distribution channel(s) of interest. Specifically, find out how you would go about distributing your product. For example, if you plan on selling to a retail chain, call a few and find out their criteria and process for accepting new products. Talk to competitors, both direct (those doing what you do) and indirect (those selling a complementary product).

When selecting the distribution strategy best suited for your business, consider the channels used by your competition, the successes and failures, personal strengths and weaknesses and the location of your business and customers. Transportation methods and costs are critical issues to think about.

Task: Think in detail about how to best serve your customer given your abilities and constraints. Clearly develop the idea for your distribution channel and strive for a higher quality of service compared with your competitors. You will have to describe this in writing in the Feasibility Analysis.

Promotion

Once you have considered and researched various distribution channels, the next step is to develop a promotion strategy for selling your product. The primary goal of promotion is for the public to learn about the benefits your product or service would provide.

For example, if your company sells solar power systems, in your promotion *you should emphasize all the ways customers can benefit* (lighting, etc.) from having solar panels. Promotional materials and advertising should be focused on customer benefits. This is a strategy that many entrepreneurs ignore, choosing to promote their company and their

product rather than promoting the ways their product benefits the customer. Those entrepreneurs rarely succeed. There are several standard options for promotion. Each should be considered, and then you should decide what sort of promotion mix would give you the most benefits for the costs involved. Examples of some marketing strategies are described below:

Advertising: This is loosely defined as any promotional activity you pay for. It includes print advertisements, radio interviews, television advertisements, or billboards.

Packaging: If you are selling your product retail, you should think about its packaging. Does the product need to be packaged to attract customers? If so, what do you say on the packaging?

Marketing Materials: This includes materials such as brochures, handouts, and mailing pieces.

Sales Promotions: Strategies used to support the message such as demonstration events, special sales, discounts, contests, and awards.

Another related issue is designing a logo. Companies often create logos to differentiate their products from those of competitors. Design a few logos and test them on friends and family-insist on an honest opinion!

Every company must have a marketing plan and must consider marketing as a priority. If you are starting a new business or expanding the products or services offered, it is always advisable to plan a marketing effort or event to launch the new business. For example, plan an event where you will demonstrate your product and hand out brochures or offer discounts, or organize a raffle with a free product as the prize. Appropriate day-to-day marketing differs from company to company and country to country. Some experimentation may be necessary to devise an appropriate marketing strategy for your business. Testing various options is often more efficient and less costly in the long run.

Marketing is extremely important, but it can be costly. Consider in great depth which types of marketing are necessary, and why and how the marketing will influence the customer to buy the product or service. Try to keep the costs down.

Task: Make a list of strategies you will consider, of their desired outcomes and of how each strategy will achieve the result. Think of a competitor's strategy and evaluate its success. Research the costs-call some media sources, printing companies, etc. Do not estimate the costs yet, as the figures must be incorporated into your early stage financial analysis. Put together a plan for testing whether the marketing plan works before rolling out a large production.

ANALYSIS OF COMPETITION

Lenders and investors want to make sure that you are going to be able to sell your product or service. Two ways for them to accomplish this are (a) to test how reasonable your assumptions in the 'Opportunity Analysis' section are and (b) to look at how you define your competitive advantage. For the purposes of this Business Plan, competitive advantage should be thought of as certain skills, aptitudes, assets and/or strategies that will give your company a unique advantage in its market. Remember, competitors can be both direct (they sell the same product or service as you) or indirect (different product or service that meets the same customer need).

The competition section of the Business Plan should start by introducing your primary competition. Discuss the products or services they offer, their location, price, management and skills, history and marketing strategy. If there are several competitors, it isn't necessary to discuss all of them-just say how many there are, select a few, and then compare your business with theirs. This analysis can easily be done in a chart that presents the information clearly. Again, compare your prices, distribution, quality of the product, skills and management, and marketing strategy. The following exercise gives an example of the type of chart that can be used.

Exercise 3-2
Competitive Advantage

Write your business name in the first column. Define up to three of your primary competitors and list them in the first three columns. Discuss the strengths and weaknesses of your company compared to each competitor for each of the assets and skills defined.

ASSET/SKILL	YOUR COMPANY	COMPETITOR #1	COMPETITOR #2	COMPETITOR #3
Management	E.g. The president of the company has been in this line of work for 15 years. Dedicated support staff.	E.g.. Started business with only 2 years experience and all other managers are new to the company.		
Technical Capacity				
Product(s)				
Distribution Channel				
Price(s)				
Promotion				
Advertising				

OPERATIONS PLANNING

The 'Operations' section of your Business Plan will describe how you intend to implement your business strategy. Furthermore, it presents the structure of the business in terms of management and employees and their functions. At the end of this section, lenders and investors should be able to describe how your business will achieve its mission, from both a day-to-day sales and longer-term perspective.

Operations
The 'Operations' section can be as complex as your business. If you will have only a few employees and one or two locations, this section is simple. If you have 50 employees and several locations then this section will be more detailed. The goal is to describe to lenders and investors what each department of your business will do. Depending on the type of business, the headings below can be used to for this purpose. Remember, one employee may fill more than one role or position in the company. Under each heading list key functions, names of personnel, responsibilities of each person and their relevant work experience.

Product Development
Regardless of whether you manufacture or purchase your product, you need to give a clear presentation of the process by which the product is developed or acquired. You have already collected data about suppliers. This is the place to describe how your business will interact with them. Use the information from the 'Business Relationships' section of the Fact-finding study (Chapter 2). In addition to describing the process, state how many people work in the department and their skills.

Manufacturing
If you will make your product rather than purchase it, describe the manufacturing process here. Present the process step-by-step in order to keep the description simple. Say where you get your materials from, how long it takes, what are the costs, what are the skills involved, and who are your staff. Describe your manufacturing facilities and include the costs of the entire process.

Stock and Distribution
Once you have purchased or manufactured your product where will you store it and what are the details for distributing it? Will you own or rent a warehouse? How much stock do you expect to have on hand? Some of this section can draw from the distribution strategy you developed earlier in this chapter.

Offices and Sales

The method by which customers will interact with your business is an important part of your Business Plan. Much of the information on your strategy for reaching customers was developed in the 'Marketing' section, you must now give details of how you will actually make that possible.

Will you have one office centrally located or several? What is the purpose of your office? Who will work there and what will they do? Will your sales team go to customers' houses to make sales? If yes, will you have company vehicles? How many? How often will your sales people be in the field? How will revenues be collected? How often? At the point of sale, monthly or in advance? Also, what sort of system will you have in place to account for sales and to manage your company's revenues and expenses?

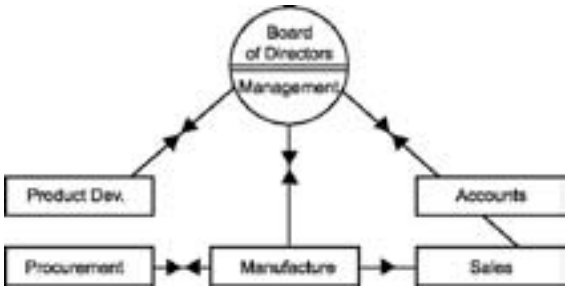
Technical

This part only needs to describe how your technical team will operate. What do technicians do? How will they reach and interact with the customers? How often? How many customers is each technician expected to service? How long does it take for the technician to complete an average job?

The question of product guarantees is also an issue that relates to operations and to the marketing of your product. Will you offer support or maintenance to customers after the initial sale? Will you charge for this service? How will customers contact you? Does your supplier (if any) guarantee the product?

Organization Structure

This part of the Business Plan should be straightforward and simple. It should *include an organization chart with a short introduction, and short biographies of the core management team.* The organization chart should include all department heads and managers, with names and titles, and only the number of support staff for each department. Be sure to include the names of the managers or department heads or if they have not been hired and include a sentence saying when they will be hired.



Full resumés or CVs should be included as the attachments to the Business Plan. If you have a Board of Directors or advisors, a paragraph should be included about each of them as well. The Business Description of the Business Plan gives information about the management team in order to reaffirm that your team has the necessary skills to run the business successfully.

Task: Draw up an organizational chart indicating positions that are filled, positions to be filled before starting operations, and positions to be filled over time. Write a draft of your Operations Plan-what will each department or division do, and what do they require to do this job.

TECHNICAL DETAILS

From a technology standpoint, an energy-business idea is feasible when natural resources are available in predictable and sufficient quantity and can be converted to energy using available proven technology. The only mention of the technological aspects so far has been in the Business Description where you described the type of resource and technology to be used and other minor details. *The 'Technology' section of the Business Plan defends the technology choice*. It addresses the following questions: Is machinery available for the type of energy technology your business will use? What is the acquisition process? Why is the project of the designated size, and how will all of the important processes (e.g. collection, transport and storage of fuel) be handled? How will the handling and conversion of fuel to energy happen? How will the energy be distributed to customers? Describe details of the type of energy resource to be used and, if possible, review what types of resource data exist and who compiled it during what period of time.

This section should provide a more thorough description of the technology, going into detail about how the technology and process will actually work. If the type of business you are proposing has been implemented and successful and if the technology itself is simple and proven, then this section will be short. For example, if your business distributes solar home systems and the PV technology is proven, this section would only include details of the types of panels and balance of system components being offered, the costs, supplier guarantees, etc. Then a paragraph affirming that the solar insolation is sufficient in the location of operation to charge the battery a certain number of days per year.

For a more elaborate business with a more complex technology process, such as a hydroelectric or biomass cogeneration project, the 'Technology' section will be extremely important to investors because they will use it to evaluate their risks. As stated previously, lenders and investors do not want to be pioneers, so if your company is proposing an energy project of a type that has not been implemented on a commercial basis either locally or successfully, then this section must provide a thorough explanation of how the technology will work.

Lastly, when the success of the business relies on a new or risky technology working, it is often necessary to have an expert analyst conclude that the proposed technology and energy resource will reach the business objectives. This analysis is typically included as a technical annex to the Business Plan.

INTRODUCTION TO FINANCIAL ANALSIS

In earlier sections you calculated your Cost of Goods Sold, Overhead Expenses and Capital Cost in order to help you determine the sales price of your product. In your Business Plan, however, the marketing section will not be as detailed-it will state what you will charge customers and then describe your marketing and distribution. The financials (i.e. financial statements) used to support your pricing decision will be included in the 'Finance' section of your Business Plan. For the Feasibility Analysis the only necessary financial information is a report of how much money you need to start your business, a description of what that money will be used for, and your businesses revenue projections in the form of an Income Statement[1] . The final Business Plan will include more figures and financial statements, such as a Balance Sheet and Cash Flow Statement, explained in Chapter 4. In addition, **Annex E** provides an introduction to basic financial terms and concepts.

How Much Money Do I Need?

Once the 'Marketing' and 'Operations' sections are complete, it should be clearer what capital goods need to be secured and what people need to be hired to start the business. Put together a list of the items to be purchased and their costs as well as a figure for operating expenses, employee salaries, professional fees, and taxes per month. Remember, planning and pre-operations need to be covered by invested capital, whereas the operating expenses need to be covered by revenue.

There is a relatively simple way to determine how much capital you need. First (using the table below), you must estimate all of your costs before you will receive cash from customers. These costs will include the payment of salaries and contractors and the purchase of goods needed in the planning of your enterprise, in its Pre-operations or Construction Phase and during its Operating Phase until revenues cover the daily-weekly-monthly expenses. You will borrow some of this money and you will put some of this money in as equity, but you need to know how much is required. Entrepreneurs too often simply estimate the cost of buying their product and equipping their facilities and forget that bills need to be paid until cash comes from customers. The amount of this 'Working Capital' requirement can be crucial in the success or failure of a business. Bear in mind that you must have sufficient funds to pay your bills until the customers pay you, which may be 30, 60 or even 90 days after you bill them. For instance, you may order equipment, furnish your office, and market your product for 6 months before your first sale. It will then take another 8 months to sell enough products to break-even. Furthermore, when you borrow funds you are required to at least begin paying interest within about 6 months. It is possible to use borrowed funds to cover initial operating costs.

[1] *If your business sells several types of products or services a revenue section should be included in addition to an Income Statement to clearly present how you generate your revenues and over what period.*

Working Capital Requirement

Phase	Costs
° Planning:	
° Pre-operations/construction:	
° Operating:	
Total:	

There is a simple way to see if you are borrowing enough using the Cash Flow Statement, one of the key financial statements that businesses rely on to give managers and investors a clear summary of what is happening at the company. You will learn about the Cash Flow Statement in Chapter 4, and you will then be able to play with your borrowing figure to see the effect on your payments, and profit or loss.

Financial statements-of which the most important, the Income Statement, is introduced here-are not as complicated as they might seem. Although they can be intimidating at first, you'll soon see that they are straightforward and extremely useful for getting up-to-the-minute information on your business's situation, for making projections, and for communicating with others.

Income Statement:
The purpose of an Income Statement is to present the business's performance during a given period in an organized fashion. To do this, the Income Statement lists the company's total revenue as its first line and then subtracts different expenses until arriving at profits, or 'the bottom line.' If profits are negative, then the business generated a loss during the period.

On the way from the top of the Income Statement to the bottom (from total revenue to profit), you will find your Gross Margin (the same as the one you computed earlier in the chapter), and 'Operating Income,' which is another important measure of a company's health. The Income Statement contains the information listed below, given here with definitions of each of the items:

Gross Revenues: All of your business's dollar sales for the listed period of time. Also referred to as Gross Sales, Total Revenue or Total Sales.

Returns: The cost to your business of any damaged or returned products.

Net Revenues: Difference between Gross Revenues and Returns. Sometimes called Net Sales.

Cost of Goods Sold: The cost to you of purchasing materials or products from suppliers for resale or manufactur ing. Commonly referred to as Cost of Sales.

Gross Profit: Calculated by subtracting Cost of Goods Sold from Net Revenues.

Gross Margin: Calculated by dividing your Gross Profit by Net Revenues.

Operating Expenses: All of your business costs including labour, capital equipment expenses, overhead, professional services, promotional costs, etc.

Net Operating Income: Calculated by subtracting Operating Expenses from Gross Profit. This represents your earnings before you deduct Interest, Taxes and Depreciation. It is a number investors will be looking at to see if your business's core costs are paid for by revenue.

Depreciation: Even though Depreciation is listed on your Income Statement like a regular expense, it is not the same sort of expense as salaries or rent. Depreciation is a method for re-valuing your capital goods (machines, vehicles, buildings, etc.) as they lose value with age. To determine the dollar-amount of Depreciation, take the original cost of the asset, spread out that cost over a number of years (see below) and, for each year, list that amount as your Depreciation expense. One benefit of Depreciation is that it reduces the profit your business ends up reporting, which reduces the amount that the business has to pay in income taxes.

The number of years over which you depreciate your capital assets is up to you. Generally, it is between 10 and 30. The number of years should be the same as your estimate of the 'useful life' of the asset. For solar-powered water pumps this could be 10-20 years. For a cogeneration business it could be 15-30 years.

Interest: Calculate the interest paid on loans over the given period of time. When putting together a forecast, this estimate is rather rough, but it should be finalized before presenting to a potential lender or investor.

Taxes: Calculate all Taxes the business must pay including employee and income taxes. At the business start-up level it is therefore only important to provide an 'allowance' for income taxes from the business on a simplified basis.

Net Profit (or Loss): Also called Net Earnings or Net Income, this is the total profit after Interest, Taxes and Depreciation are subtracted from Operating Profit.

Net Margin: Divide the Net Profit by Net Revenues to understand how much profit you are making in comparison to your sales. This is expressed as a percentage.

Example of an Income Statement

Company Name
Income Statement
For the period from DATE to DATE

Gross Revenues:	
Returns	
Net Revenues	
Cost of Goods Sold:	
Gross Profit:	
Gross Margin: (percentage)	
Operating Expenses:	
Labour:	
Professional Services:	
Overhead:	
Rent	
Utilities	

Vehicle	
Travel and Entertainment	
Maintenance and Repair	
Equipment leases	
Supplies	
Packaging and Shipping	
Insurance	
Licenses and Permits	
Other	
Total Operating Expenses:	
Net Operating Income	
Depreciation	
Net Profit Before Interest	
Interest	
Net Profit Before Taxes	
Taxes	
Net Profit (or Loss)	
Net Margin: (percentage)	

The above Income Statement is for the first year of operations. An income statement for what you expect (or 'project') to achieve in the coming years must also be completed. This type of Income Statement is called a Pro-forma Income Statement. The pro-forma statement should be presented in the same format but with additional columns for each year. Title the column according to the year.

Preparing financial projections is tricky because you must make assumptions about the future. Lenders and investors usually want to see your business grow but, for most businesses, that is not as simple as just increasing revenues each year. You must ask yourself what will be the ratio of increased expenses to increased revenues. For example, if you want to sell 150 units in year 1 and 250 units in year 2 how many more employees will you have to hire or how many additional vehicles will you need to purchase? Perhaps, your business will get more efficient in the future so you will not need to increase your expenses the same each year.

Task: Complete a worksheet detailing the funds you require, draw up an Income Statement for your business for year 1 and a Pro-forma Income Statement for years 2 through 5. Include these in your Feasibility Analysis.

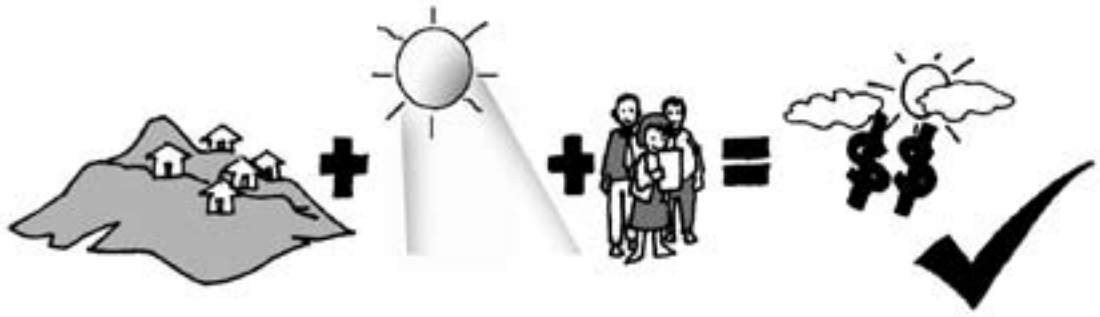
PUTTING IT TOGETHER

Below is a list of characteristics your business should have. Before going to the next chapter, review them and make sure each one is addressed by the information you have gathered so far in this process.

A renewable energy business makes sense and is feasible when:

1. The energy product produced can be sold to one or more credit-worthy customers.
2. A strategy has been developed to meet sufficient demand for the product or service.
3. A practical and efficient marketing and operation plan has been developed.
4. The business is compatible with local and country energy plans for energy service delivery.
5. The commercial, political and social setting of the business will instil confidence in suppliers, contractors, investors, lenders and insurers.
6. The team has sufficient experience and skills to design, build and operate the business.
7. Qualified suppliers, contractors and consultants are available and have expressed interest in the business.
8. Natural resources-wind, water, biomass, and sunlight-are available in predictable and sufficient quantities.
9. The available natural resources can be converted to energy using available proven technology.
10. Contractual rights to use these natural resources (water and biomass) can or have been obtained.
11. Land needed for the business (manufacturing site or generation site) can or has been secured and access to the site assured.

12. All the permits needed to design, build and operate the business can be obtained in a timely manner.
13. Reasonable estimates have been made of all revenue, capital and operating costs, including contingency allowances and taxes.
14. Revenues are sufficient to pay operating costs, repay loans and provide adequate returns to investors.
15. There is local or international interest in providing loans and investment capital.



When land, energy resource, technology, team, customers and permits are available and when putting these ingredients together makes financial, social and environmental sense, then a business is feasible.'

The purpose of this chapter was to take the facts gathered in Chapter 2 and your business ideas and to then demonstrate that they are appropriate and feasible. It should now be clear whether you can sell your product for a competitive price and sell a sufficient quantity to be profitable. The next step is to continue putting all of the information together in a coherent, organized fashion that can be shared with lenders, investors and partners.

The final step in the feasibility study is to present the information in a Business Proposal. This will form the backbone of your formal Business Plan, to be completed in Chapter 4.

The Business Proposal should be organized as follows:

a. Cover and Table of Contents
b. Business Description-take from Chapter 2, review and improve if necessary.
c. Opportunity-take from Chapter 2, but explain why the customers outlined in your Business Plan will be willing and able to purchase your product or service.
d. Marketing-what is the price of your product or service and how did you arrive at this figure, what is your proposed distribution process and how will you market your product or service.
e. Competition-state who are your competitors, what they do and how you will compete against them.
f. Operations-present the organizational structure of your business and say what each of its departments does.
g. Technology-describe the technology and energy resource including the process, appropriateness and track record.
h. Finance-detail the funds required to start and run the business and provide an Income Statement and Pro-forma Income Statement.

CONGRATULATIONS!
YOU HAVE COMPLETED A BUSINESS PROPOSAL

Chapter 4: Business Plan
Introduction
Lender and Investor Points of View
Financial Planning
Schedule of Activities
Risks and Mitigation Measures
Impacts
Summary of What Has Been Learned
Detailed Outline of an Energy Business Plan

INTRODUCTION

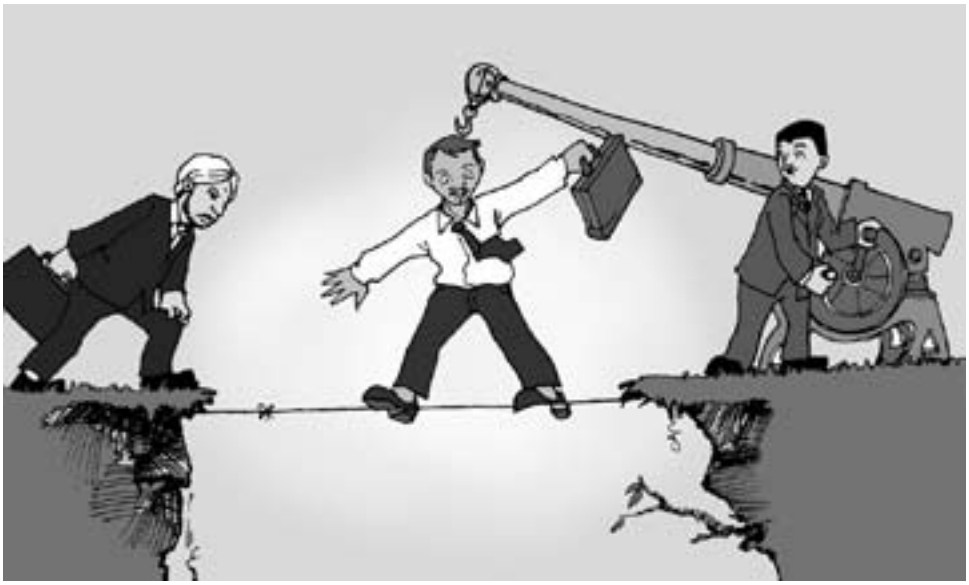
The Business Plan is the fundamental road map for any new business. This chapter presents the remaining topics to be included in your final Business Plan and provides a structure for presenting the material in a coherent form to potential lenders, investors and partners.

To reiterate, a good Business Plan does the following:

° Shows that the proposed business is a serious initiative, undertaken by capable entrepreneurs who under stand and have control of the essential elements that will ensure success.
° Increases the chances that an entrepreneur will be able to attract investors, lenders, partners, strategic allies, suppliers and key staff.
° Forces the entrepreneur to collect, in one place, all of the thinking and research that has gone into the development of a proposed business.

LENDER AND INVESTOR POINTS OF VIEWS

It is important to differentiate between lenders and investors.



Lenders (usually bankers) make loans (debt) with the expectation of receiving a very specific set of payments over time. Their requirements are usually well defined in terms of conditions that must be met in advance and over the course of the loan. *Lenders do not want to take risks* and they do not generally enjoy any benefits of a business being profitable. Lenders want to be repaid and, if the business cannot make that repayment, they want to know that others will make the payment or that assets of equivalent value are available to reimburse them.

Investors make equity investments in businesses. They expect a higher return than lenders and are willing to take more risk, but this should not be confused with being risk-takers. They are equally clear about what they are willing to do or not do. Their interests are in seeing a business succeed and in earning a return on their investment. If they become significant participants in a business, they tend to establish very specific (and stringent) targets to make sure that things are going well. When things are not going well, investors often have the ability to make significant changes in a business, including replacement of the management team.
It may sound as though the interests of lenders and investors are the same: to get paid. Sometimes this is true, especially when things are going well and especially in the early stages of a business. However, very few businesses

go exactly as planned and 'course corrections' are needed. Depending on the degree of correction, the interests of lenders and investors may become very different.

Why do Investors Invest? Investors provide equity to a business for a variety of reasons. It is important that entrepreneurs understand the goals and objectives of investors before going too far in discussions. Investors provide equity to:

- Produce income in the form of cash dividends (often in a particular pattern as in the case of an investment fund that has promised returns to its investors over a specific time period).
- Achieve capital growth (with or without specific time constraints; a traditional equity investor-partner is involved over the life of a business whereas a fund investor, as noted above may have a contractual obligation to liquidate its investment in 6, 8 or 10 years).
- Enter a market (and thereby avoid the start-up and market research costs and problems of entering a market alone, preferring instead to join forces with a business already developed).
- Sell a product (especially equipment).
- Form a partnership and thereby grow quickly (similar in appearance but substantively different from making an investment to enter a market).

In contrast, why do lenders make loans? The list of reasons tends to be shorter, but it is equally important, especially in a new field such as renewable energy, to understand the motives of a lender. Taking it for granted that all lenders make loans because that is an important part of their business and a source of profits, there are other reasons to consider. Lenders make loans (provide debt) to:

- Build relationships with clients who will be a source of future business.
- Enter new business areas that can expand their loan portfolio profitably and provide a competitive advantage to the bank.
- Contribute to economic and social growth and thereby stimulate greater lending activity.

It is important to note that many banks simply do not lend for 'projects' (bankers separate project finance-which includes loans secured by the infrastructure project itself-from corporate finance-in which the activities and assets of a company guarantee a loan-and many do not lend to groups without substantial experience and assets). Being aware of the interests of banks in advance can save a great deal of time.

What do lenders and investors look for? There are different degrees of emphasis placed on the following factors, but both lenders and investors look for:

- Strong sponsor (experience, credibility, skills, commitment of time and money).
- Solid business fundamentals and assumptions (raw materials, process, outputs).
- Clear competitive advantage and business strategy.
- Risk assumption by others (completion of business both from the standpoint of time and money, insurance for accidents, guarantees of performance of equipment).
- Clear legal and regulatory framework (energy sector, banking and investment sectors, tariffs, taxes, and incentives).
- Country stability (political, economic and disasters, especially climate driven).
- Exit mechanisms (for bankers: repayment backed up by security and guarantees; for investors: sale of assets or shares to third parties, buy-back by business, re-financing, dividends).

FINANCIAL PLANNING

In Chapter 3 you took the first step in preparing the Financial Statements to be included in your Business Plan-the Income Statement and Pro-forma Income Statement. Now it is time to prepare the Balance Sheet and Cash Flow Statement, the two remaining elements of your financial analysis.

Balance Sheet

The balance sheet is a financial presentation of what your business owns and what it owes at a specific date. It differs from the Income Statement in that it is like a snapshot of your assets and debts at a given point in time, whereas the Income Statement measures the flow of money in and out of your company over a given period.

Anything that your business owns is an Asset and anything your business owes is a Liability. The Balance Sheet traditionally splits a page into two columns, one for Assets and one for Liabilities. Broadly speaking, assets are anything

that will create future financial benefits for the company.

The company's assets are presented in order of **liquidity**, which is defined as the ease by which the asset can be converted into cash without a loss in value. For example, cash your company has in the bank would be listed before a building your company owns, because cash is a liquid asset and real estate is not. More generally, assets are divided into three categories:

Current Assets: includes any items that can be converted easily into cash over the next 12 months. Examples include cash, inventory, short-term investments and accounts receivable (which is the amount of money you are owned by customers, partners, etc., but that has not yet been paid).

Non-Current Assets any items that cannot be easily converted into cash within 12 months. May include land, buildings, equipment, furniture, and vehicles. Non-Current Assets are also referred to as Fixed Assets.

Long-term Investments: any commitments the company has made in terms of long-term investments. For example, if you own equity in another company, or if your company has made a loan to another company, that would be listed here as an asset.

Total Assets: The total of your company's Current and Fixed Assets.

Liabilities are promises or commitments by your business to pay some amount at some future date. Similar to the Assets section, the Liabilities section of the Balance Sheet is presented in the order in which the liabilities come due. It includes:

Current Liabilities: debts and monetary commitments payable within the next 12 months. This includes accounts payable (money you owe to suppliers and employees), short-term debt, interest and taxes.

Non-Current Liabilities: debts and monetary commitments payable over a period longer than 12 months, including taxes.

The Liabilities column also has a section called Owners' Equity. The Owners' Equity section keeps track of how much money the founders have contributed to the business, and also keeps track of how much money the company has earned and then put back into the business. Money invested by the founders is called 'Contributed Capital,' and money generated by the business and reinvested in the company is called 'Retained Earnings.'

Owners' Equity: this is the owners' investment in the company. Break into separate lines if there are multiple owners or shareholders. Also include a line for Retained Earnings if necessary.

It is imperative that *your company's Total Assets equal your Total Liabilities plus Owners' Equity*. This is commonly known as the Balance Sheet Equation.

Although it might sound complicated, it's actually quite simple. For example, if you invest US$1000 in your company, the value for Contributed Capital in the Owners' Equity section will be US$1000, but, on the Asset side, the value for cash will also be US$1000. Thus the equation holds, and the balance sheet 'balances'. In another example, if you take out a loan to buy equipment, the Liabilities side will show the value of the loan and the Assets side will show the value of the equipment. Again, the balance sheet balances.

An example of a balance sheet is given below.

Company Name
Balance Sheet
DATE

Assets		**Liabilities**	
Current Assets	**Value ($)**	**Current Liabilities**	**Value ($)**
Cash		Accounts Payable	
Accounts Receivable		Short-term Debt	
Inventory		Interest Payable	
Short-term Investments			
Other		Other	
Total Current Assets		**Total Current Liabilities**	
Non-Current Assets		**Non-Current Liabilities**	
Building		Long-term debt	
Equipment		Taxes Payable	
Land		Other	
Long-term Investments			
Other			
Total Assets (Current + Non Current)		**Total Liabilities (Current + Non Current)**	
		Equity	
		Contributed Capital	
		Retained Earnings	
Total Assets		*Total Liabilities + Owners' Equity*	

Cash Flow Statement

You now have all the information needed to prepare a Cash Flow Statement, which is basically designed to explain the change in your company's cash amount during a given period. In some ways, the Cash Flow Statement is similar to the Income Statement-both measure flows of money over time. But the Cash Flow Statement specifically deals only with cash transactions the company has completed. Money that the company owes but has not yet paid will not appear on the Cash Flow Statement, but will often appear on the Income Statement.

It is recommended that you prepare two Cash Flow Statements. The first should be monthly and should cover a year of operations. A monthly Cash Flow Statement illustrates when you generate revenue and whether or not you can pay your expenses each month. The second Cash Flow Statement should be annual and cover a five-year period or a period long enough to show that assets are used or that loans are paid. An annual Cash Flow Statement shows that you can pay your debts and gives a lender or investor an idea of how your business grows and what return they can expect for their money.

The easiest way to compile your first Cash Flow Statement is to look at your Income Statement and start with your Net Profit (or loss). Then:

Add back Depreciation: For the Income Statement, you deducted Depreciation but it was not a cash expense, so it must be added back to calculate your cash flow.

Add back Debt Payments: Deduct payments on loans because they were cash outlays.

Net Cash Flow: The total of Net Profit plus Depreciation and minus Debt Payments.

Internal Rate of Return: This calculation measures the extent to which investors earn money for their initial investment. The simplest way to calculate this is using Microsoft Excel or other software. The concept is explained in more detail below.

Example of a Cash Flow Statement:
Company Name
Statement of Cash Flows
From DATE to DATE

Cash Flow	Amount
Net Profit/Loss (From Income Statement)	
Add back Depreciation Expense (From Income	
Statement)	
Subtract all Debt Payments	
Net Cash Flow	
Internal Rate of Return	See below

Internal Rate of Return

The point of completing a Cash Flow Statement is that it helps you determine your company's Internal Rate of Return (IRR). IRR measures how much financial return you make on your company's investments. IRR is a critical number, because if your company's IRR is less than the interest rate it pays for loans, clearly the business will not be able to pay its debt. If your IRR is higher than the interest rate you pay on loans, that's very good.

Based on cash flow projections it is relatively easy-with the aid of a financial calculator or spreadsheet software-to determine the business's IRR. **See Annex E** for a guide.

Combined with a few pieces of additional information it will be possible to decide whether or not a business is generally sustainable from a financial perspective.

Once you know the business's IRR, answer the following questions:

* What is the current interest rate charged for loans in the local market?
* What is the current or projected interest rate for loans from outside the current market?
* What are investors demanding as a rate of return to make their funds available to business as equity?

If a business's IRR is 16 per cent and the cost of borrowing money in the local market is 20 per cent then there is little reason to borrow in the local market unless a large portion of the business capital will come from the entrepreneur or others who are willing to receive a low rate of return.

There are cases where lower-interest loans are available. Generally, concessionary finance programmes by governments or institutions offer loans at 'below-market' interest rates. Also, companies sometimes offer low-interest financing on the sale of their equipment or services. Such financing can serve to lower your company's *'hurdle rate,' which is the IRR a business needs to meet to be feasible.*

When is a business not feasible from a financial perspective?

* If a business has a negative IRR.
* If a business's IRR is too low for even the entrepreneur to invest his or her available cash.
* Assuming the entrepreneur does not have all the capital required, if the business IRR is too low to attract other equity investors to supply cash.

You should read **Annex E-Basic Concepts of Financial Analysis** for a review of the terminology and methods presented here.

The Hardest Task

This is the stage of analysis where many well-intentioned entrepreneurs refuse to see the reality staring at them from the numbers they have prepared. If your IRR is too low, the business idea, as it stands, is probably not viable. There is hope in 'financial engineering', higher revenues than estimated, lower costs, eliminated contingencies, subsidy programmes, lower loan costs, value increases and so on. It is OK (and normal) to refine estimates, but there is a point at which only the entrepreneur can determine if he or she is deluding himself or herself. It is easy to change assumptions and improve the IRR. There is an old saying that statistics do not lie; only statisticians do. Notwithstanding the ability to manipulate data-and with the help of spreadsheets it is as easy as 'point and click'-the entrepreneur needs to decide if refining the estimates and financial plan really makes sense.

At this point in the business analysis *there should be a great deal of room for error*. If the business is just barely financially feasible, if the business absolutely depends on convincing others to make loans and equity investments, if the business estimates have been gone over and over mostly to make the result better, if the entrepreneur has sought the opinion of others and it is still a very close call, then **continuing with the business is probably a bad use of the most valuable commodity an entrepreneur has: his or her time.**

SCHEDULE OF ACTIVITIES

If you've made it this far, the rest of the Business Plan is easy. Now it's time to put together a schedule, or timeline, of when you will implement the business strategies. The key milestones, such as hiring employees, receiving approvals for permits, acquiring stock, expansion activities and reaching profitability should be included here. Again, be thorough but keep it clear and simple.

A schedule helps you and your audience to understand how the business is planning to accomplish the goals and deliverables presented throughout the document. It shows that you have thought through the implementation, that you are organized and that you understand how to launch operations. A simple approach is to divide the schedule into the following categories: Planning, Pre-operations/Construction and Operations.

Start a draft timeline using the following table. Include a description of each activity under each category. Estimate a date when the activity will be pursued.

Category	Activity	Timeline
Planning		
Pre-Operations/ Construction		
Operations		
Expansion		

RISKS AND MITIGATION MEASURES

Every business, start-up or expansion has risks. This section of the Business Plan should present the risks and appropriate mitigation measures. A mitigation measure is a strategy for how your business will address a risk. Not every risk can be avoided and it is important to demonstrate that you are aware of this and have thought of how you will attempt to protect your business. *There is no benefit in hiding risks, as lenders and investors will do their own research, called 'due diligence', and uncover them anyway*. By not including them the investor may think the risks have not been considered, which may make the entrepreneur seem less knowledgeable. Types of risks facing an energy business are given below. For a more detailed analysis, see **Annex F-Final Risk Checklist.**

Country: Does the country have a history of political stability? Are regulations transparent and enforceable?

° Management Team: Does the management team have ade quate experience in the proposed line of business?

° Operations: Is the depth of the operating team sufficient to support the financial assumptions?

° Construction Completion: If construction time overruns the completion date, what are the legal implications outlined in the contracts?

° Technology: Is the technology proven?

° Competition: How will the business compete against another business selling the same product in the same region?

° Suppliers: If the supplier falls through, how many back ups are there?

IMPACTS

For energy businesses , this section of the Business Plan should highlight the positive impacts of the business. Many lenders and investors are looking to invest in businesses that are very profitable. Others, however, are looking for profitable businesses that benefit the environment or community. For example, delivering energy services to households which lack reliable access to such services may improve their quality of life. Improved cook stoves are more efficient than traditional metal stoves and use less charcoal or wood, thus helping to conserving these non-renewable resources. *There are lenders or investors that will support businesses that have positive impacts* , so it is advisable to highlight those impacts in your Business Plan. They can be competitive advantages for your company as you seek funding.

The impacts of the business should be analysed from a social, environmental and economic perspective. Social impacts affect the customers or people of a community or region. Examples can be income generation, reduced time fetching water or wood, access to education or reading, etc. Economic impacts are a result of an increase in income to the customers or community. An example is selling a lantern or solar home system to shop owners so that they can stay open in the evening and thus increase their sales. Finally, positive environmental impacts are those that preserve the environment. All renewable energy businesses have environmental benefits because the technology used is environmentally-friendly relative to traditional energy operations. Projects and services that offset or reduce dependence on wood or charcoal preserve forests and combat desertification, providing an important positive environmental impact.

It is not necessary for every business to have each of these three impacts. However, any positive social, environmental or economic impacts should be clearly expressed in the Business Plan as they are an asset.

SUMMARY OF WHAT HAS BEEN LEARNED

The aim of this Toolkit has been to break the Business Plan into building blocks to make the task of writing it less daunting. This chapter has introduced the final necessary elements of the Business Plan and all sections of the Business Plan and their contents have been covered. It is now time to compile all your written material into the Business Plan. The final step is to review the outline of the Business Plan format below, and compile your information into a descriptive, organized document that can be presented to possible lenders, investors or partners. **Annexes G, H, I and J** provide helpful examples and information to assist you in this final stage.

DETAILED OUTLINE OF AN ENERGY BUSINESS PLAN

A good Business Plan is built on solid information. That information can be organized in many different ways but the essential ingredients remain the same. These are listed and then described in more detail below. While certain businesses may require additional content, most business information can fit within this structure.

- COVER and TABLE OF CONTENTS
- EXECUTIVE SUMMARY
- BUSINESS DESCRIPTION
- OPPORTUNITY
- MARKETING
- COMPETITION
- OPERATIONS
- TECHNOLOGY
- FINANCE
- SCHEDULE
- RISKS
- IMPACTS
- CLOSING, which describes the business's proposed capitalization plan and what is being requested from lenders and investors
- A set of ATTACHMENTS, which provide details concerning some of the points made in the Business Plan

Cover and Table of Contents
- Business Title, Location, Technology, Size
- Contact Information
- Contents by Section and Page Number
- Disclaimer and Confidentiality Statement

Executive Summary
This tells the business's story in one page, providing a brief introduction of what's to come. It should present the most compelling aspects of your company and make potential investors want to learn more.

Section 1-Business Description
In this section of the Business Plan the product or service to be sold is described as well as the location. The goals for starting the business are presented. Finally, the business structure-retail, wholesale, manufacturing, project development-should be explained, as well as the ownership structure. How are profits to be distributed? Any permits or licenses that have or need to be acquired should also be presented. The section need not be long or detailed, concentrate rather on making it clear and concise. The Business Description completed in the Feasibility Analysis can be used in the Business Plan.

- Business location and Setting
- Product or service to be offered
- Goals and Objectives
- Business legal and ownership structure
- Permits and licenses

Section 2-Opportunity
Describe the customers that will buy your product or service and explain why they will do so. The goal of this section is to prove that there are sufficient customers that are willing and able to buy your product.

Section 3-Marketing
This section gives a detailed presentation of the strategy for selling the product or service. It should have been completed in Chapter 3 and presented in the Feasibility Analysis. Include the following:

- Pricing Strategy
- Distribution Plan
- Advertising and Promotion

Section 4-Competition
This section provides the opportunity to explain why there is and will continue to be demand for your product or ser-

vice in light of the competitors. It is also extremely important for you to understand your competition and it helps you learn about the market. Use the section created for the Feasibility Analysis, including the following:

- Names and description of competitors
- Strengths and weaknesses
- Competitive advantage

Section 5-Operations
This section describes how the business will operate. It describes your organizational structure and then how each department will operate. Again use the completed section from the Feasibility Analysis.

- Organization Structure
- Operations

Section 6 -Technology
This section describes in detail the technology and energy resource to be used. Explain the process, appropriateness and track record. Use section completed in Feasibility Analysis.

Section 7-Finance
In this section all of the financial features of the business are presented. The most important financial assumptions of the business are shown, the proposed financial plan is described and an analysis is made of the impact of various changes to the basic financial assumptions.

- Worksheet of funds required
- Income Statement
- Balance Sheet
- Cash Flow Statement

Section 8-Schedule
Present a schedule and timeline of major milestones to be reached.

Section 9-Risk Factors
This section describes the risks that the business faces and how the business plans to deal with these risks. Include the risks with possible mitigation measures.

Section 10-Impacts
Social, economic and environmental benefits of the business's implementation, and any other special features of the business, are described in this section.

- Local employment
- Economic activity stimulated
- Improvements to physical assets
- Social benefits
- Protection of environmental quality
- Pollution avoidance or elimination
- Greenhouse gas (carbon) benefits

Closing
The Closing section of the Business Plan summarizes the business's proposed capitalization plan and what is being requested from lenders and investors.

Attachments
- Complete financial statements
- Summary of technical and market studies
- Copies of authorization letters and permit approvals
- Detailed background and financial information about the sponsor

Annex G includes sample Business Plans for a:

- Grid-connected hydroelectric business;
- Solar enterprise selling both product and services to rural communities; and,
- Company providing income generating equipment dependent on energy supplies and efficiency.

You are done with the Business plan.

Congratulations and Good Luck!

ANNEX A:

Introduction to Sustainable Energy Technologies

In the information that follows an overview is provided for each of the following technologies:

- ❑ Solar PV
- ❑ Hydropower
- ❑ Biomass
- ❑ Wind and Hybrids
- ❑ Solar Hot Water Heaters

It is intended that this annex provide an introduction to each technology, outline the potential uses, indicate typical costs, highlight advantages and disadvantages and suggest additional sources for more detailed information.

Solar PV – Information and General Introduction

- ❑ Information on Solar PV can be found at:
    - http://www.shell.com
    - http://www.fsec.ucf.edu/PVT/index
    - http:// www.eren.doe.gov/pv
    - http://www.pvpower.com
    - http://www.solarpv.com
    - http://www.solarbuzz.com

- ❑ General Introduction

Solar panels collect sunlight, generate electricity and are connected to different components to form a solar system suitable for a specific application. The components connected to the solar panel are called balance of system components (BOS).

The most common application are lighting, water pumping, powering small appliances in households (e.g., TV) and powering productive use applications (e.g. sewing machine).

The direct current (DC) electricity generated by the solar panels during the day is generally stored. This allows 24-hour access to electricity. For this reason most solar systems are connected to a battery-bank.

In applications where alternating current (AC) is required to power certain appliances, an inverter is installed to transform the DC current available from the solar panel or the battery-bank to AC current.

The numerous configurations made possible by connecting different balance of system components to solar panels allows them to be used in many different ways.

<u>Households</u>
Solar Home Systems (SHSs) are used to power lighting, entertainment and information electronics (radio, television, cassette players, etc), and to a lesser extent productive or environment improvement appliances such as fans, sewing machines, soldering irons, hair clippers, etc.

<u>Community</u>
Solar PV Systems may be used for indoor or outdoor lighting such as streetlights or the powering of small hand tools in community centers or workshops.
Solar Water Pumping Systems provide small communities easy access to water.

<u>Health</u>
Solar PV Systems can power vaccine refrigeration, general facility and task lighting, and communication with district hospitals.

<u>Education</u>

The provision of solar power to rural schools allows the lighting of classrooms at night, which could aid programs providing basic adult education. Solar power systems also make the introduction of teaching aids such as computers, television, video and overhead projectors possible.

Manufacturing and Commercial
Numerous possibilities exist where solar power can be used in the manufacture or processing of product and the retailing of goods in rural communities. Examples include refrigeration, cash registers, small machine tools or appliance powering.

Tourism
Through the installation of solar power, accommodation facilities within nature reserves can be greatly improved.

Telecommunications
Solar power is used to power two-way radios and telephones but also the infrastructure backbone of these services. Service providers use solar power to relay messages through repeater towers instead of establishing direct wire links.

Transport
The high cost of providing grid power in remote sites made the transport sector one of the first to make use of solar power for road signs, railway signals and navigational buoys.

Agriculture
Agriculture in developing countries benefits from solar power through applications such as water pumping and electric fencing.

Solar PV Systems consist of a number of interconnected components. Typically a solar system would consist of a:

Solar Array – The solar array in a typical solar system consists of one or more solar panels. The size of the solar array is determined by the load (duration, quantity and size of appliances) to be powered. A solar home system (SHS) usually consists of one or more solar panels with a combined peak wattage of between 20 and 150 watt. larger arrays, a series of multiple panels, are used to meet the higher energy demands of clinics, schools, water pumps and other greater demands.

Mounting Structure – The solar array is normally mounted on a metal or wooden structure to secure it against wind gusts, at such a height as to allow minimum obstruction of the sun's rays and in such a position as to keep it out of harms way. The mounting structure is erected in such a way that the available daily sunlight on the solar array is maximized. For this reason solar panels face the equator and are tilted at an angle that allows optimal sun during all seasons of the year.

Charge Controller – The charge controller manages the charging process of the battery-bank. Batteries must not be overcharged or discharged too deeply as this can severely affect their life expectancy. The functions of the charge controller include the optimization of the charge current received from the solar array and the protection of the battery-bank from overcharging. Many charge controllers also provide a customer interface as to inform the user of battery-bank's state of charge.

Battery Bank – The energy produced by the solar array is stored in the battery bank for use at any time. The battery-bank typically consists of one or more lead-acid rechargeable batteries similar to that found in motor vehicles. The use of ordinary automotive batteries in solar PV systems is not recommended. Use should rather be made of batteries that are better suited to delivering smaller amounts of power for longer periods of time in order to increase the battery-banks life expectancy. Generally batteries are a costly item in a solar system and need to be selected with care.

Inverter – Solar arrays and battery-banks deliver direct current (DC) electricity. To make this electricity useful for the powering of electrical appliances it needs to be changed to alternating current (AC). The device used for the purpose of transforming low voltage DC current to 110 or 220VAC is called an inverter.

Other Balance of System (BOS) Components – To get the solar system to work, the components need to be interconnected. For this purpose wire and cable of appropriate size, which minimizes resistance and a potential drop in voltage, is used. Other components needed for installation purposes, to make the system operational, include connectors, sockets, power outlets, channeling and tubing, as well as mounting hardware and terminals.

A solar PV system's size is determined by the peak wattage of the solar array. The amount of power (watts) that is

available for consumption on a daily basis is however dependent on the average daily insolation (amount of sunlight measured in kWh/day/m²) that a region receives. For example, the daily average insolation in the arid semi-desert regions of the continent is significantly higher (as much as 33%) than that in the rainforests of the equator.

In practical terms, this means that if the same 50 Watt peak Solar Home System is installed in both regions, the people in the semi-desert would be able to consume 50% more power on a daily basis than their counterparts in the rainforest.

The average daily insolation in Africa per annum varies from around 4kWh/day/m² to 6.5 kWh/day/m². This is some of the best sunshine in the world and superior to the average of 2 kWh/day/m² to 4 kWh/day/m² received in northern Europe, Canada and the northern section of the United States of America.

Not all solar panels are of good quality. The best way to distinguish between solar panels is to look at the reputation of the manufacturer, its distributors and the warranty and after sale service that they are willing to attach to their product.

Solar Photovoltaic System Costs

Giving an indication of the cost of a solar PV system is extremely difficult, as it is dependent on the system's application and whether appliances are part of the system, such as a vaccine refrigerator in a health clinic system.

As a general rule it can be accepted that the smaller the solar PV system the higher the cost per peak watt installed. Larger solar PV systems therefore cost less per peak watt to install than the average Solar Home Systems. The installed cost of a Solar Home System of between 20 and 150 watt is typically in the region of US$10 to US$12 per peak watt. The prices for high power band (>70 Watts) solar modules has dropped from around $27 per Watt peak in 1982 to around $4 per Watt peak in 2003. The solar module only represents 40-50% of the total installed cost of a solar home system, the other 50% being the Balance of System costs.

Photovoltaics are now a proven technology that holds much promise for business. PV has the ability to bring about real change in rural unelectrified communities and create a business base for entrepreneurs in:

- Small-scale usage: Sale (cash or credit) and provision of services to homes for a fee, businesses and communities.
- Large scale uses: Water pumping, clinic and schools electrification and other productive uses.

Advantages:
- In rural markets that have no access to grid-connected electricity, life-cycle costs for photovoltaic systems are often equal to non-renewable alternatives now in use (kerosene, dry-cell batteries).
- Improved quality of life by increasing the number of productive hours, i.e. hours for education, income generation activities, etc.
- Proven technology with low operation and maintenance costs.
- Free abundant resource that is non-polluting.
- Self contained generating and distribution system.
- Modular

Disadvantages:
- Systems have high capital and transaction costs.
- Most rural families cannot afford to purchase for cash.
- Batteries contain hazardous materials and a means for careful recycling or disposal should be included in the long-term project design and funding scenario.
- Photovoltaic modules produce direct current (DC) electricity only; an inverter must be added to the system to run alternating current (AC) devices.
- Many governments have yet to realize the value of solar power and there are disincentives for its use due to high import duties, taxes, and subsidies for competing fuels.
- Information gaps exist. Updated information on the technology and availability is not readily available to all potential customers.

Business Traits:

Following is a brief description of the skills and relationships needed with contractors, suppliers, consultants and

others in order to start a solar business. The purpose is to stimulate the entrepreneur to identify all of the business relationships that will be required to implement his or her core idea and begin to consider all of the pieces that must be woven together.

Solar Photovoltaics **(PV)** applications combine solar panels with additional hardware (called BOS for balance of system) to supply electricity to homes, farms, businesses. The PV business typically requires:

- ❑ Expertise in the integration of solar home system components.
- ❑ Market research, customer relations and negotiating skills.
- ❑ Relationships with the suppliers of solar panels
- ❑ Relationships with the suppliers of batteries, controllers, inverters, wiring etc.
- ❑ Ability to negotiate supplier credit terms.
- ❑ Relationships with installers and maintenance providers, whether as employees or contractors
- ❑ Sales network
- ❑ Credit and collection network
- ❑ Relationships with providers of debt, equity and consumer finance.

Hydropower – Sources of Information and General Introduction

- ❑ Information on Hydropower can be found at:

    - http://www.microhydropower.net/klunne/
    - http://www.hydro.org
    - http://www.microhydro.com
    - http://www.domme.ntu.ac.uk/microhydro
    - http://www.eren.doe.gov/RE/hydropower

- ❑ General Introduction

Hydropower uses the energy of flowing water and variations in the altitude of the terrain to generate electricity. Typically, hydro plants include:

Dam: to accumulate water (in the case of small hydro this may be an "intake weir" that would ensure a high enough water level to keep water always entering the penstock).

Reservoir: where water is stored.

Penstock: pipes that carry water to the turbines inside the powerhouse.

Turbines: turned by the force of water in their blades.

Generators: driven by the turbines, they produce electricity. Two types of electricity are produced by generators, alternating current (AC) or Direct Current (DC). The choice between the two usually depends on the size of the system. AC is more common as DC is generally used in very small power systems of a few hundred watts.

Power House: actual building where electricity is generated and transformed to allow transmission to homes and businesses.

Transformer: Equipment that changes the AC voltage produced by the generator to a higher voltage for transmission.

Transmission lines: carry electricity local substations and to final users.

Small hydro plants usually do not require the construction of large dams. Facilities that actually require water storage will usually do little or no damming to the river's flow. This is seen as one of small-hydro's main benefits.

The power potential of water depends on the volume of water in the river (the "flow") and on the difference between the levels at which the water can flow down (the available "head").

The flow of the river is the amount of water (in cubic meters or liters) that passes from one point to another in the river, in a certain amount of time. Flows are normally given in cubic meters per second (m3/s) or in liters per second (l/s). The head can also be measured as the height from the turbines in the power plant to the water surface created by the

dam.

The quantity of water available and the flow at different times in the year will produce different amounts of electricity.

Theoretical power equation:
P = Q * H * e * 9.81
Where:
P: power at the generator (in kilowatts)
Q: flow (in m3/sec)
H: head (in m)
e: efficiency of the plant considering losses (in decimal points, 85% efficiency level is entered as 0.85)
9.81: constant value (in kilowatts) for converting flow and head into kilowatts.

There are generally two categories of hydro power plants: run-of-river and storage plants.

Run-of-river plants generally use some or most of the flow in a stream to ensure the necessary amount of water to run the turbines. A run-of-river project normally does not have a dam, except for an intake weir. This storage facility keeps the water at a specific altitude and enables the pipes to be filled at all times.

Storage plants are usually larger hydroelectric plants that have a dam where water is stored to offset fluctuations in water flow. These fluctuations are generally caused by seasonal changes (different levels of rainfall). Storage facilities can be designed to provide daily and/or weekly storage needs. This is mainly done to satisfy energy demand in “peak” demand hours, and to conserve the water during low demand hours. “Peak” demand hours are those hours in which homes and businesses need electricity the most.

Kaplan, Francis, Pelton, Turgo Impulse and cross flow turbines are the most common turbines used in small hydroelectric facilities.

All power systems produce less power than is theoretically available because losses in energy take place as a result of changes in flow, when water enters and runs through the penstock, and also because of inefficiencies in the turbines. This is why the “e”, efficiency term is used in the above calculation.

As the head decreases, to achieve the same amount of power output the flow must increase. Generally, the cost of the turbine is determined by its diameter. The lower the head, the higher the flow and the higher the cost of the machinery and powerhouse. This cost may be offset by the cost of the civil works required to build tunnels or high dams. Overall, the technologies involved in the development of small hydro facilities are proven.

Plant capacity factor: this is a commonly used term. It is the ratio of the actual power produced in a year to the power that could be produced in a year if the equipment ran at full capacity for the whole year. Normally, the plant capacity factor is in the range of 30% (for plants that have specifically been built to supply power during “peak” hours) to 75% for stations with either large storage capacity or a very steady water flow throughout the year.

System Costs

Estimating the average capital cost of small hydro plants is difficult because the type of plants can vary (depending on the flow and head and also depending on environmental considerations). The following average data corresponds to small hydro plants of 125kW and 32.4 MW in size.

Turbine Cost: $450 - $600/kW
Total Project Cost: $1,000 - $2,100/kW
Cost Breakdown:

Civil works	15 - 40%
Equipment	30 - 60%
Infrastructure	10 - 15%
Development Costs	10 - 15%

Average Construction Time: 2-3 years
Operating & Maintenance Cost: $0.01 - 0.02/kWhr

Advantages
The environmental and industrial advantages of small-hydro power generation are often disputed because they are grouped with the problems associated with large-scale hydroelectric plants. However, in favorable sites, small-scale hydroelectric plants remain a very valuable form of energy both in environmental as well as in financial terms when compared to other forms of energy investments.

Some of the advantages commonly linked to small-hydro power generation include:

- The fuel source is essentially "free", it can be reused (as the fuel is not consumed) and it is non-polluting.
- The system can be integrated with water flows used for irrigation and potable supply.
- Systems can have a 50-year or more useful life and provide continuous power as long as water resources are sufficient.
- Limited maintenance (compared with diesel power) is required.
- The conversion of the potential energy of water into mechanical energy is highly efficient, if compared to thermal power stations.

Disadvantages
- Flows often vary throughout the year, affecting the availability of water in certain seasons or time periods (as in the case of El Niño or Monsoon climates);
- It is a site specific technology, meaning that the necessary conditions for power generation in terms of flow and "head" need to be present for use. Locations where power can be economically exploited are limited;
- Water flow and "head" conditions limit the maximum level of power that can be generated. The level of expansion is therefore bounded.

Business Traits:

Following is a brief description of the skills and relationships needed with contractors, suppliers, consultants and others in order to start a hydro business. The purpose is to stimulate the entrepreneur to identify all of the business relationships that will be required to implement his or her core idea and begin to consider all of the pieces that must be woven together.

Hydropower uses the energy of flowing water and variations in the altitude of the terrain to generate electricity. Typically, hydro plants need to include the following:

- ❑ Geotechnical experts to evaluate site conditions.
- ❑ Hydrological experts to estimate the size and performance of the project based on the flow of water.
- ❑ Design engineers and others to lay out the project and estimate its impact from a performance, environmental, construction, interconnection, operating and cost perspective.
- ❑ Legal expertise to determine all the required permits and approvals and prepare the necessary documentation.
- ❑ Negotiating skills with suppliers, contractors, buyers of energy and regulators.
- ❑ Relationships with engineering, procurement and construction contractors.
- ❑ Relationships with operating and maintenance providers, whether contractors or employees.
- ❑ Relationships with financial institutions and investors.

Biomass – Sources of Information and General Introduction

- ❑ Information on Biomass can be found at::

    - http://www.eia.doe.gov/kids/renewable/biomass.html
    - http:// www.nrel.gov/research/industrial_tech/biomass.html
    - http:// www.ott.doe.gov/biofuels/what_is.html
    - http:// www.eren.doe.gov/re/bioenergy.html
    - http:// www.nrel.gov/lab/pao/biomass_energy.html
    - http://www.ciwmb.ca.gov/Organics/Conversion/Anaerobic/

- ❑ General Introduction

Biomass accounts for more than 10 percent of global energy use. In parts of the developing world it accounts for up to 90 percent. Biomass is an indigenous fuel source that is often readily available and inexpensive throughout much of Africa. It can also be effectively converted to electricity and heat due to recent technological developments. It

is because of these two factors that biomass will most certainly play a significant role in the development of energy sectors across the world.

The two most common types of biomass resources are p*lant biomass* which includes woody and non-woody biomass and processed waste and fuels; and, a*nimal biomass* which includes animal manure as a feedstock to generate energy using biogas technologies or directly as a cooking fuel.

Each type of biomass has unique characteristics that make it more or less suitable as a fuel source:

- *Moisture content:* This is simply the amount of water found in the resource expressed as a percentage of the total resource weight. The value can range from less than 10 percent, for some straws, up to 70 percent for forest residues. The percentage can be expressed as a portion of the wet, dry, or ash-free matter. Typically, it is measured on a wet basis, however it is important to know and cite the way in which the resource was measured.
- *Ash content:* Again, the ash content can be measured on all three bases - wet, dry or ash-free matter. The type used must be reported. It is most common to see the ash content measured as a percentage of the dry matter. In wood, the ash content is around 0.5 percent, for agricultural residues the percent ranges from 5 to 10, and for husks it can be as high as 40 percent. The amount of ash affects the biomass's behavior when exposed to the high temperatures necessary to convert it to electricity.
- *Volatile matter content:* This is the measurement of the amount of the biomass that escapes when heated up to 400 and 500 degrees Celsius. When exposed to high heat, the biomass decomposes into solid char and volatile gases. The volatile content can be as high as 80 percent.
- *Elemental composition:* The elements contained in biomass are typically carbon, oxygen and hydrogen with a small amount of nitrogen.
- *Heating value:* This property measures the amount of energy that is chemically bound in a standard environment. The heating value is a measurement of the energy (Joules; J) per amount of matter (kilograms; kg). The value cannot be measured directly so it is done according to reference states such as the lower heating value (LHV), measured in a gaseous state and the higher heating value (HHV) measured in its liquid state.
- *Bulk density:* This is the weight of the resource per unit of volume. This measurement can be found when the biomass is in zero (0) moisture content state (MC=0), termed the oven-dry-weight basis, or according to its given moisture content (MC_w). This property also shows extreme variations from as low as 150 to 200 kg/m^3 straws to 600 to 900 kg/m^3 for wood. The last two properties, heating value and moisture content together determine the biomass resource's *energy density*. The energy density is defined as the potential energy per unit volume. The result is typically one-tenth that of fossil fuels.

❑ Technology Options

The following provides a brief introduction to the various types of biomass technologies that are available for different biomass resources.

Direct Combustion: Biomass such as wood, garbage, manure, straw, and biogas can be burned without processing to produce hot gases for heat or steam. Burning the resource by direct heat is termed direct combustion. Examples of direct combustion range include burning wood in fireplaces, burning garbage in a fluidized bed boiler, producing heat or steam to generate electric power. This is the simplest, most widely used, and often most economical biomass technology especially if the biomass resource is within close proximity.

Pyrolysis: Pyrolysis is the thermal degradation of biomass by heat in the absence of oxygen. Biomass resources, such as wood or garbage, are heated to a temperature between 800 and 1400 degrees Fahrenheit, but no oxygen is introduced to support combustion. Pyrolysis results in three products: gas, fuel oil, and charcoal.

Anaerobic digestion: Anaerobic digestion converts organic matter to a mixture of methane, the major component of natural gas, and carbon dioxide. Biomass, such as wastewater (sewage), manure, or food processing wastes, is mixed with water and fed into a digester tank without air. Use of this type of technology results in biogas.

Gasification: Biomass can be used to produce methane through heating (800 Celsius) or anaerobic digestion. During gasification, about 65% of the energy is captured and converted into combustible gases. The gases are then converted into natural gas, which can be used to fuel vehicles, generate electricity, or again converted into synthetic fuels. This technology is not as commercially viable as direct combustion because it is more costly and more state of the art. The most commonly used types of gasifiers are fixed-bed and fluidized-bed. There are many advantages that gasification technologies have over direct combustion and the other converting technologies. The advantages include increased efficiencies by as much as 50%, variety of suitable biomass resources.

Alcohol Fermentation: Fuel alcohol is produced by converting starch to sugar, fermenting the sugar to alcohol, then separating the alcohol water mixture by distillation. Feedstocks such as wheat, barley, potatoes, waste paper, sawdust, and straw contain sugar, starch, or cellulose and can be converted to alcohol by fermentation with yeast. Ethanol, also called ethyl alcohol or grain alcohol, is the alcohol product of fermentation usable for various industrial purposes including alternative fuel for internal combustion engines.

Landfill Gas: Landfill gas is generated by the decay (anaerobic digestion) of buried trash and garbage in landfills. When the organic waste decomposes, it generates gas consisting of approximately 50 percent methane, the major component of natural gas.

Cogeneration: Cogeneration is the simultaneous production of more than one form of energy using a single fuel and facility. Furnaces, boilers, or engines fueled with biogas can cogenerate electricity for on-site use or sale. Biomass cogeneration has more potential growth than biomass generation alone because cogeneration produces both heat and electricity. Cogeneration results in net fuel use efficiencies of over 60 percent compared to about 37 percent for simple combustion. Electric power generators can become cogenerators by using residual heat from electric generation for process heat, however, waste heat recovery alone is not cogeneration.

Co-firing: Co-firing is only possible if using an existing coal-fired power plant. This process is possible by mixing biomass with coal and then burning them together or in different boiler feeds. Advantages of this technology are that it can be the least-cost option and can displace up to 15% of the coal. The typical biomass resources used in this case are wood products.

Overall, one of biomass's most attractive qualities is its versatility. It can be easily converted to electricity by burning or converted to liquid or gaseous fuel by physical or biological means.

- ❑ System Costs

Due to numerous variables, it is not reasonable to provide estimate costs for biomass projects. Issues to consider in determining the cost of using a biomass resource include:

- Crop selection and rotation: Biomass properties will often affect the attractiveness of the resource. For example, the energy density, leaf cover, productivity, water and nutrient requirements, soil erosion susceptibility to disease, effect on biodiversity may increase the cost of converting the resource;
- Cost and seasonal availability of resource;
- Storage: It may be possible that you have to collect and store the resource for a period of time, which may be costly;
- Transport: Costs to get the biomass to the conversion site; and
- Efficiency: The lower the efficiency of the biomass resource the more land is required. This cost may be a substantial percentage of the total project costs or the land may be economically suited for another activity.
- Plantation running costs: labor, fertilizer, and herbicides

Advantages

- Biomass is a renewable source as is receiving a great amount of attention as a possible fuel of the future to combat climate change. This could have a positive impact on the cost, etc.
- Biomass is often available in large supply in developing countries.
- Land requirement is not an issue because there is generally a large amount of land area in Africa that cannot be used for other productive uses, but can sustain biomass.
- A variety of conversion products are available with a wide range of uses.

Disadvantages

Biomass is often left out as a fuel for the future for the following reasons:

- Associated with health related problems in developing countries mainly from particulates released during burning and carbon monoxide. These problems lead to respiratory infections in children and complications during pregnancy;
- Biomass is often bulky and may have a high water content.
- Quantity of fuel is unpredictable and may be difficult to handle. Long-term fuel supply contracts ;
- Low energy density per unit of land, water, or per unit weight of raw product;
- Energy crops and dedicated biomass requires a large amount of dedicated land area. Unfortunately, dedicated areas may reduce the soil fertility, biodiversity, water level, landscape, displace food, and affect the leaching of nutrients.
- In developing country it is expensive as wood fuel costs 2 to 3 times higher than in Europe or the US. (Better

example)

Business Traits:

Following is a brief description of the skills and relationships needed with contractors, suppliers, consultants and others in order to start a business using biomass. The purpose is to stimulate the entrepreneur to identify all of the business relationships that will be required to implement his or her core idea and begin to consider all of the pieces that must be woven together.

Biomass energy projects use organic matter -- plants, trees, agricultural residue, animal waste – as an input in an energy conversion process. This process may be simple, as in a closed container using anaerobic digestion to produce a gas for burning. The process may also be mechanical, as in the conversion of sugar cane waste – bagasse – into energy through simple combustion, or the same process might be sophisticated through the use of high pressure boilers. The important relationships involved in a biomass project include:

- ❑ Design – biomass varies greatly and there are numerous conversion processes. As a result an entrepreneur needs to build solid relationships with design experts.
- ❑ Equipment suppliers – biomass projects tend to involve the integration of different components.
- ❑ Knowledge of the nature of the biomass input – moisture, seasonality, an alternative use (which may eliminate their availability as a fuel source) is crucial.
- ❑ Processing, Transport and Storage relationships with growers and truckers are crucial.
- ❑ Compatible and back-up fuels need to be understood and relationships built in case the primary biomass stream is interrupted.
- ❑ Relationships with providers of debt, equity and consumer finance.

Wind and Hybrids – Sources of Information and General Introduction

- ❑ Information on Wind and Hybrids can be found at:

    - http://www.windpower.org
    - http://www.bergey.com
    - http://www.energy.ca.gov/earthtext/wind.html
    - http://www.nrel.gov/clean_energy/wind.html
    - http://www.eren.doe.gov/wind/web
    - http://www.britishwindenergy.co.uk

- ❑ General Introduction

For many years, humans have used wind to crush grain, pump water and transport goods and people. Most recently wind machines have been developed that produce electricity. Wind is used to drive a rotor (blades) that is connected through a power shaft to an electric generator. Wind speed increases with height above the ground, so wind turbines are mounted on towers. The amount of energy a wind turbine produces depends on the wind speed and the diameter of the rotor.

Electricity produced from the wind represents the fastest growing energy sector in the world. Improved technology and larger wind energy machines have combined to make wind energy cost competitive with fossil fuel.

While large, grid-connected systems dominate the statistics of wind energy production, the improvement in smaller wind technologies has been equally dramatic. Wind energy, alone or combined with other means of energy production – such combinations are called “hybrids” – are in position to make significant contributions to rural energy supply.

These contributions can take the form of water pumping for drinking or irrigation, electricity for income producing activities, or household, health and community services. These services can be to individual buildings or groups of buildings or to a “mini-grid” covering a village or town.

The most common wind turbines in operation today have two or three blades that revolve around a horizontal axis. These “horizontal-axis wind turbines” (HAWT) also include a gearbox and generator, a tower, and other supporting mechanical and electrical equipment.

Wind turbines are rated by their maximum power output in kilowatts (kW) or megawatts (1000 kW). For commercial utility-sized projects, the most common turbines sold are in the range of 600 kW-1000 kW (one megawatt) – large enough to supply electricity to 600-1000 homes. The newest commercial turbines are rated at 1.5 megawatts or more.

If the goal is local energy production for local use – as is the case with most rural and smaller projects -- wind machines (turbines) and a tower need to be of a size suited to the prevailing winds and electricity demand in the area. Where larger projects (wind "farms") are involved, the electricity produced is usually for sale to the electricity grid. Project interconnections make these projects far more complicated from a technical perspective. Because of the need to technically integrate two complex systems.

Long-term wind data (wind maps) of an area are *absolutely critical* to ensure the average wind speed that can be expected. Once long-term wind averages are determined site specific data are equally essential and require specific measurement over time using devices known as wind anemometer.

❑ System Costs

Wind Turbine Size ranges:
- Large units – 250kW to 1500 kW each, cost $600/kW
- Medium sized units – 10 kW, cost $1,400/kW
- Small units – less than 500 W, cost $1,600/kW

Total Project Cost: $1,000 - $1,600/kW

Advantages
- Although the wind resource for any site is intermittent, it is predictable and its available power increases dramatically with an increase in available wind speed. Thus the output from a wind plant can be integrated with other energy supplies or into existing electrical grids with a high degree of confidence. A modern wind turbine's "capacity factor" (the percentage of time a wind turbine generates power) is in the range of 20-40 percent.
- Wind turbines require no fuel and operations are simple with low maintenance requirements.
- Wind turbines are rugged and reliable and the modularity of wind machines allows units to be sized to match existing energy needs and expanded as demand grows.
- A small windfarm can generally be constructed within a year.

Disadvantages
- Wind energy is very site specific with minimum wind speed requirements.
- Larger wind farms require land and may be visually unappealing and noisy. Such larger systems can not be sited close to centers of demand.

Business Traits:

Following is a brief description of the skills and relationships needed with contractors, suppliers, consultants and others in order to start a wind energy business. The purpose is to stimulate the entrepreneur to identify all of the business relationships that will be required to implement his or her core idea and begin to consider all of the pieces that must be woven together.

Wind projects, large and small, represent the fastest growing energy sector in the world. Alone or combined with PV or diesel, wind projects are a major undertaking. The technology is quickly becoming mature. Large wind projects are becoming even larger as a result of the growth of individual wind turbine size.

- ❑ The first priority in planning a wind project is accurate and reliable wind data, both generally for the area under consideration and particularly site specific.
- ❑ The list of suppliers is not a long one, depending on the size of project to be planned; therefore, the entrepreneur needs to build a detailed knowledge of both the products and the companies involved.
- ❑ Wind turbines consist of a variety of components but are sold as a package.
- ❑ In addition to the turbines, large wind projects involve civil works – site preparation—and interconnection with the electric grid. Relationships with civil and electrical engineering and construction firms are needed.
- ❑ Large wind projects sell to the grid; relationships with utilities are therefore crucial.
- ❑ Small and mid-sized wind projects can supply high quality power to local or so-called mini-grids. These projects require both technical and business relationships with the customer communities.
- ❑ Relationships with providers of debt, equity and consumer finance.

<u>Wind Hybrid Systems</u>

A hybrid system comprises components that produce, store and deliver electricity utilizing more than one energy generation technology. This could include a wind turbine, PV array and diesel generator. The most common combinations are wind and PV or a generator because wind energy production tends to be highly variable; therefore, wind turbines are often

best combined with PV panels or generators to ensure energy production during times of low wind speeds.

Many sites, particularly in northern latitudes have seasonally complementary wind and solar resources (strongest wind in winter, strongest solar in summer). Therefore, establishing a system using both wind and solar PV could address the energy needs year round. In addition, combining wind and PV can shrink the battery bank requirements and further reduce diesel consumption.

Utilizing a wind-hybrid system is very common in telecommunications applications. In addition, establishing a wind/diesel battery charging stations could address the need of carrying batteries to town for charging in developing countries. Offering wind/diesel power battery charging services at the village appears to be very cost effective ($2.50 - $5.00 per month).

Advantages of Hybrid Power Systems:
- Provide dependable, utility grade power 24 hours a day.
- Not dependent on a single source of energy
- Flexible, expandable and able to meet changing loads.
- Simple, quick, low cost installation.
- Low operating costs (O&M and Diesel fuel).
- Simple operation, low maintenance and service requirements.
- Lower life cycle costs of electricity for remote applications.

Disadvantages of Hybrid Power systems:
- High capital cost compared to diesel generators.
- Diesel and Hybrids have very different cost components.
- More Complex than stand-alone power systems; requires battery storage and power conditioning.
- Not yet in full commercial production/few suppliers.

Solar Thermal – Sources of Information and General Introduction

- ❑ Information on Solar Thermal can be found at:

    - http://www.eren.doe.gov/solarbuildings/ hotwater.htm
    - http://www.natenergy.org.uk/swh.html
    - http://www.nrel.gov/
    - http://www.epsea.org
    - http://www.eren.doe.gov/erec/factsheets/solrwatr.html
    - http://www.greenbuilder.com/sourcebook/heatcool.html#Define
    - http:// www.seia.org/sf/sfsolth.htm
    - http://infinitepower.com/fs10.html

- ❑ General Introduction

Solar thermal technologies enable us to produce hot water from the sun's energy for use in homes, factories, hotels and many other applications. Solar water heating is not only a suitable and economical alternative to water heating with electricity in towns, it can also provide hot water efficiently and reliably in rural off-grid areas.

Solar water heaters typically consist of a collector and an insulated water storage tank that is similar to a conventional electric hot water tank or geyser. The collector is a box with a see-through glass (or acrylic) cover containing a number of black coloured pipes attached to or laid on a black heat absorbing surface. Water or other liquid flows through these pipes and is warmed by the sun, and then stored in the water storage tank. This process is repeated over and over while the sun is shining; every time the fluid passes through the pipes a small amount of heat is added to it. Water typically reaches between 60°C and 80°C in solar water heating systems intended for human use.

Solar water heaters are available in various sizes, designs and for various applications. Small systems, with a hot water storage capacity of less than 500 litres, are called domestic systems. These systems are usually installed in residential homes or facilities such as visitor centres and campground showers. Larger size systems (more than a 500 litres per day) are normally referred to as industrial systems. Examples of the application of large systems are found in the agriculture, industrial, tourism and accommodation sectors of the economy.

Special systems that produce a water temperature of several hundred degrees are sometimes used in industry and for power generation. Another popular application of solar water heating is the heating of swimming pool water in less temperate climates.

Homeowners that install solar water heating systems to replace water heating by electricity could expect electricity cost saves in access of 40%. The use of solar water heating therefore not only makes environmental sense but also economical sense. Generally it is possible to recoup the capital expenditure on a solar water heater within 2 to 5 years out of the savings realised.

Solar water heating is a renewable energy technology that is well proven and reliable. Various types of Solar Water Heaters are produced in different sizes. Changes in design are required depending on the climate where the system is installed, the water quality and on the specific use for the hot water.

Systems can be very similar to traditional electric water heaters, where water is stored in a tank and then heated. The difference is basically that instead of heating the water with electricity or a gas flame, the water flows through a solar collector panel, where the sun's rays heat it.

The different designs of solar water heaters available on the market allow for their application in many sectors of a developing country's economy. Examples of these applications include:

Households

Water heater by solar is used for bathing, dish washing and laundering in numerous households. Pool heating is another popular application of solar in the houses of the more affluent in less temperate climates.

Health

Clinics and hospitals use solar heated water in ablutions and laundries. Hot water in access of 80°C can also be used for sterilisation purposes.

Education

Many dormitories at schools and universities use Solar Hot Water systems for the communal shower facilities.

Tourism and recreation

Hotels and accommodation in nature reserves use solar heated water in laundries, bathrooms and sometime for swimming pools.

Industry

Apart from the application of Solar Water Heating systems in worker ablutions, hot water is also required in many industrial processes. Solar hot water applications have been particularly popular in abattoirs due to the cost savings that it brings about. The water is used for the cleaning and sterilisation of the abattoir facility.

Agriculture

A wide range of uses is also found in agriculture. These range from heating water on crocodile farms to pasteurisation and sterilisation on dairy farms.

Solar Water Heater Components

Solar Collector: which is usually a flat metal box or frame with pipes. Collectors have:

Transparent covers that let solar energy in are either made of a special glass that resists breaking and scratching or ultra violet radiation resistant acrylics (plastic).

Absorber plates are dark surfaces that trap heat. These are generally metal sheets or containers filled with water, rocks or bricks that are painted black or another dark colour to retain the heat.

Insulation materials prevent heat from escaping to colder places.

Vents, tubes and pumps carry the heated water from the collector to the places where it can be used.

Storage tank: which stores the water to be heated. The storage tank is similar to most gas or electric water heaters. The tank is made of steel and sometimes copper or even plastic.

ANNEX A

The amount of hot water that is produced by a solar water heater depends on the size and type of the system and on the amount of sunlight available at the site. There are many types of solar water heaters, but generally, they can be classified as direct or indirect systems that employ either active or passive fluid flows in their design.

Domestic Solar Water Heaters usually have storage tanks with a capacity of 100, 150, 200 and sometime 300 litres. The size of system selected will depend on the expected household consumption and budget available.

❑ System Costs

The cost of solar water heaters varies depending on their size and type. Direct *passive* solar water heaters of between 100 and 200 litres usually cost between $750 and $1,250 including installation, while indirect passive heaters are usually in the $1,000-$2,000 price range depending on their size and level of sophistication. Active systems for domestic use are usually in the $2000 to $4000 price range.

Advantages

- Lower consumption of conventional energy that would otherwise involve the use of fossil fuels and cause environmental damage.
- Systems that can operate in any climate.
- Short construction and installation times.
- Modularity.
- For households already connected to the grid, substantial savings in electricity bills.
- Solar water heating is the least cost method of heating water if life cycle costs are calculated.
- Water heating by solar energy is highly efficient.
- Long-term benefits for users as the systems isolate them from future fuel shortages and price increases.
- Opportunities for local production and job creation.
- Hot water can make a valuable contribution to personal hygiene.

Disadvantages

- Ultra violet (UV) rays damage most materials after a few years in the sun. Good quality more expensive materials that are capable of withstanding the damaging effect of UV radiation need to be used.
- Systems of appropriate design and quality must be used if a medium to long-term cost saving is to be realised.
- Solar water heaters are more cost-effective than electric water heaters but less so if compared to gas water heaters.
- In places with cold weather, the solar water heater might require a back-up device (usually electric element) to ensure hot water provision at times of low solar energy. Electrically boosted solar water heaters can actually produce more air emissions than high-efficiency gas water heaters, in climates where solar systems are largely reliant on boosting.
- The initial cost of solar water heaters is generally higher than that of conventional water heaters. However, as the fuel is free, the energy costs over the life of the system offset the initial cost.

Business Traits:

Following is a brief description of the skills and relationships needed with contractors, suppliers, consultants and others in order to start a solar thermal business. The purpose is to stimulate the entrepreneur to identify all of the business relationships that will be required to implement his or her core idea and begin to consider all of the pieces that must be woven together.

❑ Relationships with providers of debt, equity and consumer finance.

Annex B

Rural Challenges International (RCI), Zambia

Henry Ngimbu has been interested in the use of jatropha oil as a fuel substitute since 1980, winning a research grant on jatropha oil seed production and use. In 1990, Henry joined an NGO to promote the use of indigenous oilseeds. It was here that Henry gained further insight into the potential of jatropha nuts as well as discovering his entrepreneurial interests. In 2001, he established RCI, a private Zambian company, to produce jatropha oil as a substitute for lamp oil and diesel fuel.

AREED received the first RCI proposal in January 2003 after Henry attended an AREED entrepreneurs training workshop. Initially the funding requested was extremely high with unrealistic manufacturing and sales targets. AREED analysis determined that the product was totally unknown in the market, was proposed for an area characterized by very low income households, and included a plan to grow all the required jatorpha directly, all of which were high risks to success.

First instinct was to reject the proposal. Then AREED met the entrepreneur, learned of his experience and commitment and his openness to learn through AREED's enterprise development services process. It was clear we had to help him. The proposal was restructured in phases. The first phase involves using Jatropha available from the existing hedges in the area, using oxen as transport instead of vehicles and sourcing a smaller pressing machine that can handle the available supply. AREED assisted in the development of a business plan. Once financial viability was established an initial US$12,000 loan was approved in August 2003 and monies disbursed in October 2003.

Once the anticipated sales targets have been reached, a second investment will be considered with a higher production capacity. The entrepreneur is current on all interest payments due, and while weather has delayed some of the work, it is expected that sales targets will be met.

Gladymanual, Ghana

Gladymanuel Trading Enterprises approached AREED in November 2001 for a loan to distribute energy efficient lamps and SMART solar PV power systems. The proposal was a 10 page typed document largely devoted to technical features, with an arbitrary request for $200,000 to enable the business to maintain adequate stocks for consistent availability of products on the market.

To start, AREED encouraged the entrepreneur to commence work electronically, both in terms of document preparation and also communications. This has been done and has had a positive impact in communications with suppliers, clients and freight forwarders, saving costs on telephone and fax communications.

The proposal was prepared from the perspective of the entrepreneur and did not reflect issues related to the market, or financial analysis that investors would be concerned about. AREED provided guidance to allow the entrepreneur to define his market, break it down into segments and specify the product sizes that would allow him to operate profitably. AREED guided the entrepreneur through a financial analysis of the business and demonstrated the impact of different assumptions such as the impact of cash and credit sales.

Through a series of dialogues on who was doing what in the current operations of the company, the entrepreneur was able to restructure and streamline the activities to foster accountability and linkage in the employees.

In October 2002, a $70,000 loan was approved to provide working capital to allow increased inventory for sale into the market. The entrepreneur is meeting business plan projections and is current on principal and interest repayments.

Operarias, Brazil

Operarias do Mel purchases bee pollen and processes it before selling to retail and wholesale markets. The business grew from informal activities of Rubia Barbalho and her daughter, Ana Paula. After three years experience in marketing and selling the product, the family decided to move into high quality pollen production and establish a vertically integrated company that will produce, process (including both cleaning and reducing humidity using solar dryers), package, and sell pollen. Operarias will link its processing with the the Association of Apiculture Workers of Pindorama, who works with local adolescents for the production of pollen in order to teach local youth a trade, provide economic opportunities and mitigate migration.

The entrepreneur participated in a B-REED Market Opening and Entrepreneur training program and B-REED played a critical role in assisting the start-up company define its business. Enterprise development services addressed critical issues such as financial planning, including an assessment of working capital needs, tax obligations, and advice on contract negotiations with its production partners.

B-REED also played a key role in providing contacts and technical guidance with respect to the design of the solar dryers used to reduce the humidity of the pollen. These combined services resulted in the development of a company business plan.

In October 2003, a R$78,300 Brazilian Reales loan was approved. The funds were disbursed in December 2003 and since that time, B-REED has assisted the Company in designing its implementation schedule, including the purchase of equipment.

Village Energia Ambiental, Brazil

Village Energia Ambiental Ltda., founded in March 1999 and based in Mato Grosso, Brazil, distributes, sells, installs and provides maintenance for renewable energy systems, including photovoltaic, micro hydro, small wind, and biomass systems.
Village wanted to strengthen its market position in the solar PV sector by developing a pilot consumer financing project for PV-powered water pumping systems for irrigation to ultimately serve an estimated market of 438 non-electrified rural properties.
Village first approached B-REED in May 2002, participating in the B-REED Bahia market-opening workshop. From then until April 2003, Village conducted a market study to identify opportunities for PV and other RE activities in its market area. Village was seeking working capital for a pilot project to sell, on credit, 8 PV-powered water pumping irrigation systems, to be repaid by its rural customers in monthly installments. Each system will be used to irrigate one hectare of corn and one hectare of cassava for each rural farmer, which will produce a substantial increase in the family's income.
B-REED provided enterprise development support to assess the most effective crop planting cycles for the farmers, taking advantage of much higher corn prices during the dry-season when only irrigated products are produced locally. A detailed financial model was developed helping the Company determine details ranging from the margin and payment schedule for the sale of the irrigation systems sold to the farmers, as well as creating an amortization schedule that mirrored the corn and manioc harvest cycles. The model built upon projected cash flows of each of the farmers, which then tied into the cash flow of Village. B-REED also provided guidance in setting up a solidarity credit mechanism amongst the farmers.
A US$55,000 loan was disbursed in September 2003. As a result of delays in the funds navigating the Brazilian banking system to the entrepreneur, implementation occurred slower than expected due and the first planting were done after the rainy season arrived. B-REED assisted the entrepreneur in re-structuring the amortization scheduled and adapting some of the irrigation applications.

Translegacy Ventures, Ghana

Translegacy Ventures Limited has been in operation for the past 8 years. Located in the Ghanaian capital of Accra, its business is the fabrication and sale of LPG cook stoves designed to accommodate traditional pots as well as cooking pots suited for both local and foreign dishes.
In March 2003, the entrepreneurs approached AREED with a plan to increase sales in its present market and expand to new territories in the Central, Volta and Eastern regions where there is current LPG distribution. AREED identified the gaps and areas that were not adequately covered in the plan, specifically in regard to marketing, their production process, an incomplete credit process (e.g. they didn't have the ability to track debtors), a bad record-keeping practice and little information about their competition. AREED guided the entrepreneur to address these issues and develop an acceptable business plan.
AREED provided a US$20,000 loan in November 2003 to allow the company to increase production of single burner LPG stoves from 90 to 250 stoves per month by the end of the first year in operation.
The company exceeded its projected sales for December 2003. An accounting system is to be put in place to ensure proper and efficient classification and recording of financial information.It is plans of diversifying their products to meet the needs of traditional restaurants.

ANNEX C

GATHERING INFORMATION ON LOCAL MARKET CONDITIONS

Community and Regional Data

The following questions are designed to assist in the gathering of information regarding the local area and communities targeted by the project. This information will provide specific data and enable an entrepreneur to assess the particular needs of the customers being targeted.

COMMUNITY AND REGION DATA	
Name and size (approximate in Km or miles) of area being surveyed:	
# Communities in area being surveyed:	
Total # Communities being surveyed:	
Approximate # of occupied houses in region that are not associated to a specific Community:	

COMMUNITY DESCRIPTION

	Community 1	Community 2	Community 3	Community 4
Community name:				
Location:				
Nearest large town:				
Distance from nearest large town:				
	Community 1	**Community 2**	**Community 3**	**Community 4**
Method of access and travel time:				
Temperature range:				
Approximate # of houses :				
# occupied houses:				
# houses under construction:				
# churches:				
# Health centers:				

# retail shops:				
# libraries:				
# government/ meeting buildings (i.e. Community Hall):				

	Community 1	**Community 2**	**Community 3**	**Community 4**
Where is water sourced from?				
Is irrigation used?	Yes No	Yes No	Yes No	Yes No
Is telephone/fax available?	Yes No	Yes No	Yes No	Yes No
Where is the service provided?				
Are there any TVs?	Yes No	Yes No	Yes No	Yes No
Is the signal strong and available?	Yes No	Yes No	Yes No	Yes No
Which banks are present:				
Which NGOs are present:				
Are there any cooperatives?	Yes No	Yes No	Yes No	Yes No

	Community 1	Community 2	Community 3	Community 4
Where is water sourced from?				
Is irrigation used?:	Yes No	Yes No	Yes No	Yes No
Is telephone/fax available?	Yes No	Yes No	Yes No	Yes No
Where is the service provided?				
Are there any TVs?	Yes No	Yes No	Yes No	Yes No
Is the signal strong and available?	Yes No	Yes No	Yes No	Yes No
Which banks are present:				
Which NGOs are present:				
Are there any cooperatives?	Yes No	Yes No	Yes No	Yes No

	Community 1	Community 2	Community 3	Community 4
What type of activities do cooperatives undertake?				
How are cooperatives organized?				
What policy/rule enforcement do cooperatives use?				
POPULATION DATA				
# households:				

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Is the population increasing or decreasing?				
Is the Community mainly male, female or balanced (circle one):	Male Female Balanced	Male Female Balanced	Male Female Balanced	Male Female Balanced
# of Primary schools:				
# of Secondary schools:				

TECHNICAL SKILL AVAILABILITY

	Community 1	**Community 2**	**Community 3**	**Community 4**
What electrical skills exist?	None Some Plenty	None Some Plenty	None Some Plenty	None Some Plenty
Where are the closest electrical skills located?				
What mechanical skills exist?	None Some Plenty	None Some Plenty	None Some Plenty	None Some Plenty
Where are the closest mechanical skills located?				

FINANCIAL AND INCOME INFORMATION				
	Community 1	**Community 2**	**Community 3**	**Community 4**
Type of businesses in region (enter approximate # per category				
Grain production:				
Vegetable cropping:				
Fruit farming:				
Chicken raising:				
Animal raising:				
Weaving/sewing:				
Cottage industry:				
Local retail businesses:				
Other (specify):				
	Community 1	**Community 2**	**Community 3**	**Community 4**
Average income per household:				
Top 5% of households:				
Bottom 5% of households:				

# of households per income group:				
# households with income in top 5%:				
# households with income in bottom 5%:				
Existing and available financing systems for:	Name of institution:			
Housing:	Terms:			
Retail business:	Name of institution:			
	Terms:			

	Community 1	**Community 2**	**Community 3**	**Community 4**
Cottage industries:	Name of institution:			
	Terms:			
Farming:	Name of institution:			
	Terms:			
Other (including energy):	Name of institution:			
	Terms:			
Do any subsidies exist for the above specified activities? If so, please specify structure.				

Are there any existing credit programs?	Yes No	Yes No	Yes No	Yes No
What are the credit practices?	Interest rate: Term of loan:	Interest rate: Term of loan:	Interest rate: Term of loan:	Interest rate: Term of loan:
What guarantees are normally requested?				

	Community 1	**Community 2**	**Community 3**	**Community 4**
What collateral is usually given?				
What type of financing do people Prefer (circle one):	Individual loans Self selected groups Large groups Community lending	Individual loans Self selected groups Large groups Community lending	Individual loans Self selected groups Large groups Community lending	Individual loans Self selected groups Large groups Community lending

Housing Description

The following table is directed at collecting specific information on the structure of the households you will target. This information will enable you to assess whether the proposed technology accommodates the specific characteristics of the community. The data will also facilitate the calculation of the number of components each household will require and assist with the development of a business plan. Please fill in the boxes describing and providing the specific information for each type of house in each of the communities targeted (four boxes corresponding to four different types of houses have been provided for each community, use additional pages if additional types or additional communities are present). If houses are similar in all communities, provide the information for all communities under Community 1.

HOUSING DESCRIPTION				
COMMUNITY 1	**Type 1:**	**Type 2:**	**Type 3:**	**Type 4:**
Approximate size of house (in square meters or feet):				
Number of buildings and rooms:				
Number of levels:				
Typical wall construction materials:				
Typical roof construction materials:				
COMMUNITY 2:				
Approximate size of house (in square meters or feet):				
Number of buildings and rooms:				
Number of levels:				
Typical wall construction materials:				
Typical roof construction materials:				
COMMUNITY 3	**Type 1:**	**Type 2:**	**Type 3:**	**Type 4:**
Approximate size of house (in square meters or feet):				

Number of buildings and rooms:				
Number of levels:				
Typical wall construction materials:				
Typical roof construction materials:				
COMMUNITY 4:				
Approximate size of house (in square meters or feet):				
Number of buildings and rooms:				
Number of levels:				
Typical wall construction materials:				
Typical roof construction materials:				

Energy Consumption

The tables below will assess the current energy consumption as well as the monthly energy expenditure of the communities being targeted. The information in each of the boxes below should include the level of consumption for households, institutions and businesses in the community.

HOUSEHOLD ENERGY CONSUMPTION (Monthly values)						
# Inhabitants per household Type of fuel	3 or less	4	5	6 or more	Unit Cost (Please specify if local currency or US$)	Total Cost (Please specify if local currency or US$)
Candles						
Dry cell batteries						
Lead acid battery recharges						
Kerosene						
Firewood						

# Inhabitants per household Type of fuel	3 or less	4	5	6 or more	Unit Cost (Please specify if local currency or US$)	Total Cost (Please specify if local currency or US$)
Bottled Gas						
Petrol/diesel						
Other (specify)						

COMMUNITY INSTITUTIONS ENERGY CONSUMPTION

(Total Cost per Month in local currency or US$)

Institutions / Type of fuel	Library	Community Hall	Medical Center	School	Church	Market
Candles:						
Dry cell batteries:						
Lead acid battery recharges						
Institutions / Type of fuel	Library	Community Hall	Medical Center	School	Church	Market
Kerosene						
Firewood						
Bottled Gas						
Petrol/diesel						
Other (specify):						

BUSINESS ENERGY CONSUMPTION

(Total Cost per Month in local currency or US$)

Institutions / Type of fuel	Shops	Bakery	Farming	Post Office/ Bank	Other (specify)
Candles					
Dry cell batteries					
Institutions / Type of fuel	Shops	Bakery	Farming	Post Office/ Bank	Other (specify)
Lead acid battery recharges					

Kerosene					
Firewood					
Bottled Gas					
Petrol/diesel					
Other (specify):					

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PRODUCTIVE USES ENERGY CONSUMPTION (Total cost per month in local currency or US$)								
Type of fuel Productive Use (describe)	Candles	Dry Cell Batteries	Lead Acid Battery Recharges	Kerosene	Firewood	Bottled Gas	Petrol/ Diesel	Other (specify)

Uses of Energy

To efficiently satisfy customers' needs and supply a service that fully satisfies a target market's energy demand, a clear understanding is needed of the customer's specific energy needs. The following tables will assist in the collection of information on the uses of energy at the customer level.

USES OF ENERGY HOUSEHOLD/COMMUNITY INSTITUTION			
Type of fuel	**Use (examples)**	**Use/ number of hours per day**	**Main problems (if any) linked to the type of fuel used (examples include smell, indoor smoke, time spent getting to supply source, etc.)**
Candles	Light for reading, cooking, crafts		
Dry cell batteries	Radio		
Lead acid battery Recharges	Light, TV		
Kerosene	Lamps,		
Firewood	Cooking, heating		
Bottled Gas	Cooking, refrigeration		
Petrol/diesel			
Other (specify)			

Current Energy Supply and Costs

The following table will enable an entrepreneur to break down the costs of each fuel being consumed by the target customers and assesses their availability. This will facilitate a market and competition analys

ANNEX D:

Basic Concepts of Financial Analysis

- ❑ Interest and Interest Rates
- ❑ Types of Loans
- ❑ Net Present Value
- ❑ Internal Rate of Return
- ❑ Debt Service Coverage

Interest and Interest Rates

Interest is the cost or value of money. An interest rate is the amount, usually stated as a percentage, demanded by a lender or an investor to make an amount of money available to a borrower.

- ❑ $1,000 borrowed for 1 year at 12% interest requires the repayment of $1,120, of which $1,000 is the principal (abbreviated capital or lower case P) and $120 is interest (I or i). Together they are called Principal and Interest (abbreviated P & I or p + i).

- ❑ $1,000 borrowed for 1 year at 1% per month, compounded (meaning paying interest on interest as well as principal) requires a payment of $1,127 at the end of the year. P= $1,000; I = $127.

- ❑ $1,000 borrowed for 2 years at 12% per year, compounded, requires a payment of $1,254 at the end of 2 years.

Interest is always compounded unless clearly specified to be Simple Interest (which means interest on principal only with no interest charged on interest).

An interest calculation based on borrowing $1,000 for 5 years at 12% interest per year follows:

Year 0 [1]*	$1000.00
Add: 12% for Year 1	120.00
End of Year 1	$1,120.00
Add 12% for Year 2	134.40
EOY [2] 2	$1,254.40
Add 12% for Year 3	150.53
EOY 3	$1,404.93
Add 12% for Year 4	168.59
EOY 4	$1,573.52
Add 12% for Year 5	188.82
EOY 5	$1,762.34

P = $1,000.00
I = $ 762.00

On a calculator:
PV = 1000;
I (i)= 12%
N (n) = 5
Solve for FV (future value)

On Excel or other spreadsheets:
Open *f** (function)
Choose Financial Functions
Choose FV
Rate = 12%
Nper = 5 (number of periods)
PMT = 0
PV = 1000
"OK"

Three Types of Loan Calculations (based on $1,000 at 12% for 5 years)

- ❑ Interest Only
- ❑ Equal Payment *(on Excel, choose Financial functions, PMT)*
- ❑ Equal Principal Payment *(principal amounts are the same, interest amount declines over time)*

Year→	1	2	3	4	5	Total
Interest Only	$ 120.00	$ 120.00	$ 120.00	$ 120.00	$1,120.00	$ 1,600
Equal Payment	$ 277.41	$ 277.41	$ 277.41	$ 277.41	$ 277.41	$ 1,387
Equal Principal	$ 320.00	$ 296.00	$ 272.00	$ 248.00	$ 224.00	$ 1,360

Net Present Value

An interest rate looks forward in time. It represents what someone expects to earn in the future.

A discount rate serves the same function, except that it works backwards in time, taking a future cash flow and giving it a value today.

Present Value (called Net Present Value or NPV) of three different future cash flows today (year 0), discounted at 12% follow.

0	1	2	3	4	5	Total
$1,000	$ 120.00	$ 120.00	$ 120.00	$ 120.00	$1,120.00	$ 1,600
$1,000	$ 277.41	$ 277.41	$ 277.41	$ 277.41	$ 277.41	$ 1,387
$1,000	$ 320.00	$ 296.00	$ 272.00	$ 248.00	$ 224.00	$ 1,360

On a Calculator:

I = 12%, enter PMTS in order, solve for PV

On Excel:

for each line, enter each value for year 1, 2, 3, 4, 5…*f**…financial…NPV…rate = 12%…values as entered…"OK"

Excel Spreadsheet:

12%	Discount Rate								
1	2	3	4	5	Total	NPV			
120.00	120.00	120.00	120.00	1120.00	1600.00	1000.00			
277.41	277.41	277.41	277.41	277.41	1387.05	1000.00			
320.00	296.00	272.00	248.00	224.00	1360.00	1000.00			

This small exercise demonstrates that from a mathematics perspective all three payment plans are the same. However, they are not the same when factors other than mathematics are considered.

For example, perhaps the lender expects inflation to occur. The first payment plan (interest only) "back end loads" the stream of revenue. During inflation periods money value declines; thus money earlier is better than money later. The opposite would be true for the borrower.

Another example might involve the needs of the lender to have cash available at certain points in the future (say Year 3) because of another opportunity or an obligation. Payment Plan #1 (Interest only) gets the lender only $360 in the first three years, while the other plans get the lender $832 and $888. While the mathematics are the same from an NPV perspective the cash flow is not if the lender needs $800 in 3 years.

Looked at from the borrower's perspective it is important that payment plans match ability to pay, on the one hand, and ability to borrow in the future, on the other. Thus, the back-end loaded payment plan might appear attractive (by pushing off large payment obligations); however, it will inhibit the borrower from making a second (perhaps larger and more important) loan more than would the other payment plans.

While an NPV calculation can demonstrate that these three payment plans are mathematically the same the reality is that from an entrepreneur's perspective "all loan payments are not created equal" even if the NPV is the same.

The real purpose of NPV analysis is to compare the present value of future investment opportunities. Theoretically, the present value of a future stream of cash (outgoing and incoming) must be positive to justify an investment. In other words, if a business is worth more than it costs its NPV will be positive. Three examples follow of similar cash flows, all adding to the same total cash flow over 5 years. A net present value analysis – also called discounted cash flow analysis – allows the entrepreneur to compare among these three choices.

							Year 0-5	NPV at
Year	0	1	2	3	4	5	Total	12%
Case A	$ (1,000)	$ 300	$ 240	$ 240	$ 270	$ 350	$ 400	$0.18
Case B	$ (1,000)	$ 350	$ 280	$ 350	$ 280	$ 140	$ 400	$37.70
Case C	$ (1,000)	$ 350	$ 350	$ 300	$ 200	$ 200	$ 400	$40.75

Note: outgoing cash (in Year zero) is always shown as a negative, as it would in a checkbook.

Looking at these three choices, only two have a positive NPV at a 12% discount rate (the third is actually slightly positive, a $0.18). Observe what happens if the discount rate changes.

First, if it is lowered from 12% to 8%:

						Year 0-5	NPV at
0	1	2	3	4	5	Total	8%
$(1,000)	$ 300	$ 240	$ 240	$ 270	$ 350	$ 400	$102.52
$(1,000)	$ 350	$ 280	$ 350	$ 280	$ 140	$ 400	$132.46
$(1,000)	$ 350	$ 350	$ 300	$ 200	$ 200	$ 400	$134.64

All of the choices have positive net present values.

Observe what happens, however, when our discount rate – the interest rate we need to recover in order to be profitable – rises to 16%:

						Year 0-5	NPV at
0	1	2	3	4	5	Total	16%
$ (1,000)	$ 300	$ 240	$ 240	$ 270	$ 350	$ 400	($80.61)
$ (1,000)	$ 350	$ 280	$ 350	$ 280	$ 140	$ 400	($38.50)
$ (1,000)	$ 350	$ 350	$ 300	$ 200	$ 200	$ 400	($34.73)

In this case all of the choices fail the test of having a positive net present value.
What does this short exercise demonstrate?

It demonstrates that in financial analysis, in general, and in net present value analysis in particular, the choice of discount rate is crucial.

What are the factors to be considered in selecting a discount rate to apply to a business? Though oversimplified, the following information needs to be estimated.

- For the business being evaluated what portion of the business will be financed with loans? Even the best of businesses rarely finance more than 70% of the cost with debt. 50%-60% is more likely.
- What will the expected interest rate be on this loan? This can usually be determined by taking the current rate offered to good credit companies and adding a few percentage points (2-6) for the additional risk of this business. Or, similar businesses can be researched and an interest rate inferred. An interest rate typically includes the following components:
  - Base cost of money
  - Allowance for inflation
  - Allowance for profit
  - Allowance for cost to administer the loan
  - Factor for the risk of the business.
- Expected return requirements of investors providing equity.

These three pieces of information can help determine a discount rate.

ANNEX D

- Assume debt from lenders will be 60% of the financing.
- Conversely, equity will be 40%.
- If loans for excellent businesses are being made at 7% per year in dollar terms and this business is moderately more risky than other businesses (because those businesses may have more creditworthy sponsors or contracts) then add 3% for additional risk.
- If investors demand 18% to provide equity (a reasonable estimate in a market where debt would cost 10-12%), then a discount rate can be estimated:
  - 60% * 10% = 6.0%
  - 40% * 18% = 7.2%
  - Combined = 13.2%

Applying this result to our previous three choices provides us with the following result.

						Year 0-5	NPV at
0	1	2	3	4	5	Total	13%
$ (1,000)	$ 300	$ 240	$ 240	$ 270	$ 350	$ 400	($26.07)
$ (1,000)	$ 350	$ 280	$ 350	$ 280	$ 140	$ 400	$13.09
$ (1,000)	$ 350	$ 350	$ 300	$ 200	$ 200	$ 400	$16.37

Two of the proposals produce a positive net present value.

Must you calculate a discount rate to analyze a business or set of business alternatives? The answer is no. A companion technique – internal rate of return – allows for business analysis or the comparison of business alternatives without having a specific discount rate.

Internal Rate of Return

An internal rate of return calculation allows you to determine the interest rate that a business will earn on the original amount of capital invested. In other words it provides the discount rate that a business produces rather than applying a discount rate determined from outside the business. Unfortunately, internal rate of return – IRR – requires a calculator or a computer, whereas NPV can be prepared, if needed, with a pencil and either a formula or an interest and discount rate table.

Calculator:

Enter Cfo (first year cash flow, which must be negative)
Enter Cf1, Cf2 etc
Solve for IRR

Excel:

Enter cash flows in cells
Open *f**
Choose Financial
Choose IRR
"OK"
Highlight values from Year 0 to Year 5
"OK"

							Year 0-5
Year	0	1	2	3	4	5	Total
Case A	$ (1,000)	$ 300	$ 240	$ 240	$ 270	$ 350	$ 400
Case B	$ (1,000)	$ 350	$ 280	$ 350	$ 280	$ 140	$ 400
Case C	$ (1,000)	$ 350	$ 350	$ 300	$ 200	$ 200	$ 400
IRR for A	12.0%						
IRR for B	13.9%						
IRR for C	14.1%						

Debt Service Coverage

Debt Service is the amount a business pays (or proposes to pay) each year for principal and interest. An important measure of a business's ability to pay is its Debt Service Coverage; that is, the amount of debt service to be paid when compared with the funds available to pay that debt service.

If a business's income is $1,000,000 and its operating expenses are $475,000 it has $525,000 available to pay principal and interest on loans (debt service). If the business borrows $2,200,000 for 12 years at 12% interest with equal payments every year, its obligation is $355,000. When compared to the $525,000 available for debt service the business has what is called a 1.5 times debt service coverage or debt service coverage ratio or DSCR (arrived at by dividing $525,000 by $355,000).

Rarely do businesss have such uniform debt service coverage calculations. For this reason analysts look at what is called Average Debt Service Coverage (the sum of all the year's available amounts divided by the sum of all the debt service payments) and examine the coverage ratios of each year. Usually, analysts will then focus on the lowest debt service coverage years as well as the average.

Year	1	2	3	4	5	6	
Income	$1,000	$1,000	$1,000	$1,000	$1,000	$1,100	
Operating	475	475	475	475	575	475	
Avail for D/S	$525	$525	$525	$525	$425	$625	
Debt Service	$355	$355	$355	$355	$355	$355	
DSCR	1.5	1.5	1.5	1.5	1.2	1.8	
Year	7	8	9	10	11	12	Total
Income	$1,100	$1,100	$1,100	$1,100	$1,100	$1,100	$6,100
Operating	475	475	475	575	475	475	$2,950
Avail for D/S	$625	$625	$625	$525	$625	$625	$3,150
Debt Service	$355	$355	$355	$355	$355	$355	$2,131
DSCR	1.8	1.8	1.8	1.5	1.8	1.8	1.5

Why are debt service coverage ratios important and how are they used? DSCRs are important because they tell a lender what excess exists in the event revenues or expenses are less or greater than estimated. Most lenders have a specific coverage "test" that must be met for both average and lowest year debt service coverage.

If a business cannot meet these tests then a number of options exist, including:

- Lowering the amount to be borrowed (thereby increasing the amount of equity that needs to be put in a business).
- Setting up reserves or credit agreements to pay the shortfall amount in the specific year (for example, setting aside $100,000 for this purpose to cover the shortfall in year 5 in the above example).

Essentially Debt Service Coverage calculations determine how much debt a business can afford. Combined with IRR, these two tools assist the entrepreneur to determine what is practical to propose to lenders and investors.

(Footnotes)

[1] * Year 0 is the point in time when a loan is made.

[2] EOY = end of year

ANNEX E

Risk Analysis and Due Diligence -- "Starter" Checklist

- ❑ Sponsor credentials.
- ❑ Country risk analysis.
- ❑ Credibility of feasibility study and business plan (including exit mechanisms).
- ❑ Environmental assessment and permitting requirements.
- ❑ Guidelines and record-keeping requirements for:
    - ❑ Effluent
    - ❑ Air
    - ❑ Hazardous materials
    - ❑ Solid waste
    - ❑ Noise
    - ❑ Relocation
    - ❑ End-use Efficiency
    - ❑ Greenhouse gases
    - ❑ Other _____
    - ❑ Resource studies (wind, hydrology, etc.).
- ❑ Market assessments (including affordability) and evaluation of company products and competitiveness.
- ❑ Competing companies and programs (including analysis of potential franchise infringement and market distorting "give-aways").
- ❑ Fuel and resource rights or contracts.
- ❑ Back-up fuel sources.
- ❑ Electricity generation rights and requirements.
- ❑ Interconnection terms and conditions.
- ❑ Site control and access.
- ❑ Advance access permission, insurance and mobilization plan.
- ❑ Conflict of interest analysis.
- ❑ Credit worthiness of customers.
- ❑ Back-up customer plan.
- ❑ Revenue collection, security interest and repossession methodology, if appropriate.
- ❑ Tax and incentive analysis.
- ❑ Tax and capitalization procedures.
- ❑ Construction risk analysis, EPC plan (and credentials, if appropriate) and insurance-performance bond plan.
- ❑ Operating risk analysis, O&M expense plan, major maintenance plan and schedule, and insurance program, including revenue interruption.
- ❑ Financing and re-financing plans and exit mechanisms.
- ❑ Major maintenance and replacement program.
- ❑ Working capital plan and cash flow analysis.
- ❑ Project marketing, promotion and communications plan.
- ❑ Community involvement and participation plan.
- ❑ Foreign exchange and currency depreciation analysis.
- ❑ Analysis of employment obligations and social security issues.
- ❑ Governance and control structure of company and allowable country governance and finance options.
- ❑ Project management, accounting and reporting systems.

RISK ANALYSIS AND ISSUES – BASIC CHECKLIST

Technological/Environmental

- A thorough analysis of environmental assessment and permitting requirements needs to be undertaken independently and linked back to fuel resource (water, biomass, etc.) energy generation, site access, construction mobilization and other issues in the public domain.
- Resource studies, especially involving wind and water, need to be site specific and based on as long-term data as possible.
- Where rural electrification is involved it must be clear that this activity is permitted, not constrained by third party or utility franchises or subject to non-economic tariffs.
- Water rights for hydroelectric projects need to be clear and long-term.

- Biomass resource contracts have to assure both predictability of supply and price.
- Back-up sources or plans are crucial if less resource is available than needed. This is especially true if resources are to be grown for the first time.
- "Waste" can become an economic value in the future project; assumptions that today's waste will continue to be tomorrow's free fuel are not viable.

Legal/Institutional/Political

- Electricity generation rights need to be clear and exceed the length of any financing or investment recovery period.
- Grid interconnection plans need to be firm, based on solid engineering plans and estimates. The allocation of costs with the interconnecting entity must be clearly established.
- Site control must be assured. Surveys, independent title searches and on-the-ground confirmation should be undertaken to assure that the necessary property has been defined, appropriate site control can be effected with the appropriate parties and that access to all land required for construction mobilization and support is secured.
- An independent analysis must be made of the energy regulatory setting and probable changes going forward.
- Conflicts of interest need to be identified and disclosed as early as practical. Sponsor contracts to provide goods or services may present problems to later partners or funders.
- An analysis of the legal and regulatory issues affecting the project must be made.

Financial/Operational

- Sale of energy needs to be assured through customer contracts, distribution company purchases or regulatory regime. In each case the ability to pay of the purchasing entity needs to be assured, a back-up plan needs to exist and the long-term viability of the purchasing entity needs to be examined.
- A tax analysis must be prepared, covering income tax, value-added taxes, employee tax obligations, depreciation schedules and any other tax, tariff, royalty or dividend regulations.
- Road construction issues and related costs must be defined. This pertains to both the construction and operation periods of the facility.
- Time and financial estimates must take into account the requirements of construction materials and manpower mobilization.
- An analysis of construction and operation risks must be prepared and assignment of risk – through contracts or insurance – defined.
- An objective and transparent analysis of sponsor capability, financial resources and track record must be made and independently verified.
- An engineering, procurement and construction plan must be prepared and time allowances made for seeking competitive offers.
- A completed feasibility analysis should be part of the record, leading to a separate business-investment plan to present to third parties.
- For rural energy projects, revenue collection plans and devices must be put in place to assure repossession of non-performing energy assets sold on credit, leased or provided in fee-for-service arrangements. Re-marketing plans must also exist.
- Working capital must be included in project estimates reflecting reasonable collection periods on revenues.
- Revenue losses from theft or non-payment must be estimated.
- Component and operating cost escalations must be estimated and back-up supplies identified.
- A program to identify local entrepreneurs and technical staff must be developed and tested.
- Realistic estimates of the costs of general management, administration and fund-raising must be made.
- Marketing materials and contracts, in local dialect and customs are crucial to household energy system marketing.
- Independent and credible data is needed on currency exchange and depreciation issues.
- Salary and benefits, as well as employee longevity obligations must be clearly understood.
- Capitalization and tax filing requirements must be documented.
- Best practices regarding security, guarantees and other financial back-up must be verified as practical in the case of the project at hand.
- Exit mechanisms need to be realistic and alternatives identified.

Due Diligence and Risk Analysis Checklist for Entrepreneurs

In preparing an investment proposal for funding consideration, an entrepreneur needs to address numerous project issues to demonstrate the sustainability of the project and ways to mitigate any risks. The following checklist outlines the required information.

When a financial institution reviews a renewable energy investment package, the following project components need to be answered to gain a full understanding of the viability of the project and assess the risks.

I. Market

- Would this technology be cost-competitive with existing sources of electricity (kerosene, candles, diesel generators, etc.)?
- How would the product or services be marketed?
- What is the market potential?
- Do customers have the ability and willingness to pay for the products or services?
- What is the country's energy regulatory policy?

II. Technical

- Fuel Resources:
  - What fuel resource (eg: water, sun, bagasse) is being used?
  - What fuel supply contracts are needed and which have been secured? Even waste to energy projects need to enter into fuel supply contracts. "Waste" can become an economic value in the future; assumptions that today's waste will be tomorrow's free fuel are not viable.
  - What fuel resource data is available? How long has it been analyzed?
  - Is historic data available? Site specific and long term data is needed especially for wind and water projects.
- Licensing/permits:
- What licenses or permits are required to complete this project?
- What is the status and schedule for each of these?
- What contracts are needed?
- Energy Purchase Agreements:
- Who will buy the energy produced? Creditworthiness of buyer needs to be verified. Sale of energy needs to be assured through customer contracts, distribution company purchases or regulatory regime. In each case the ability to pay of the purchasing entity needs to be assured, a back-up plan needs to exist and the long-term viability of the purchasing entity needs to be examined.
- What is the status of energy purchase agreements? Is there a PPA or, is this a wholesale market? If so, what is the structure of the market and what are the tariffs? Is it a newly established market or is it already operational? Are there any special considerations for Renewable Energy?
- What risks are there?
- Is there a back-up purchaser for the energy?
- When selling renewable energy equipment directly to customers, revenue collection plans and devices must be in place to assure repossession of non-performing energy assets sold on credit, leased or provided in fee-for-service arrangements. Re-marketing plans must also exist.
- Wheeling:
- If the energy is being sold to other than the local utility, are there expenses to "wheel" the energy to the purchaser? Are they included in the economics?
- Interconnection issues:
- Have the interconnection costs been considered in the investment costs? If not, will the purchaser of the energy pay for this?
- Land ownership issues.
- What is the risk that a developer may lose access to the site in which the project would be implemented? Costs of the land? Relocation of human population? Concessions?
- EPC contracting.
- Will an EPC contractor be retained?
- What is the status of identifying and securing a commitment from an EPC contractor?
- What are the EPC contractors qualifications?
- Is financing available through the EPC contractor?

- Quality of equipment/guarantees.
- What type of equipment is being used (new vs refurbished)? Who is the manufacturer?
- Who will supply the equipment?
- What guarantees will be provided?
- Is financing available through the supplier?
- Is there a local representative for the supplier? If so, what is his experience?
- Concessions/Permits:
- What permits, licenses or concessions are needed?
- What is the schedule for obtaining the necessary items?
- Technical Capability:
- Who will provide technical capability?
- If outside technical assistance is needed, how will this be funded?
- Time Schedule:
- How realistic is the workplan and schedule?
- What financial resources are available if there is slippage in the schedule?
- Operations and Maintenance:
- How will O&M be handled and by whom?
- What is their experience and level of commitment?

III. Sponsors

- Sponsor Credentials:
- What is the overall structure of the company?
- Who are the owners?
- Are there any conflicts of interest?
- Legal Standing:
- Has the Project Company been incorporated?
- Experience of the Company:
- How many years have the entrepreneurs been in business?
- Have they been successful?
- Managerial Strengthen/Depth of company:
- Describe the technical and managerial experience of the team and what is required to ensure that the venture is profitable and sustainable?
- Has the project/energy enterprise secured collaboration with applicable third parties such as equipment suppliers, engineers, site owners, etc.?
- Development of Operations:
- How will the project operate on a day-to-day basis?
- Does the project developer live near the project site? If not, how will the project steadily advance?

IV. Financial

- Financial viability:
- What financial information is available: audited company financial statements, project cashflows?
- What is the company's current financial situation?
- What is the total project cost? A working capital plan must be defined.
- Structure:
- What is the financial structure of the project?
- Have revenues losses from theft or non-payment been estimated?
- Component and operating cost escalations must be estiamted and back-up supplies identified.
- What are the financing and refinancing plans?
- How much has the developer invested to bring the project to this point?
- What percentage of equity will the developer's investment equal?
- How has this been valued?
- Are other organizations investing? Debt or equity? Under what terms?
- Does the developer have financial resources to handle unexpected delays?
- Terms:
- What are the proposed terms?
- Is this a loan, equity, or quasi-equity?
- What type of guarantees can be provided?
- Will this be a dollar denominated investment?
- Can funds be repatriated?
- What is the exit mechanism?

V. Risks

- What risks are associated with this project?
  - Country, Political
  - Currency, Inflation and Interest Rate
  - Managerial Capacity
  - Access to balance of project funding/other investors (bankability of project)
  - Ability of customers to pay
  - Construction Risk
  - Environmental Risk
  - Contractual Liability Risk (energy purchase/sale agreements, fuel supply contracts), Contract Enforceability
  - Competition
- What is the level of risk-sharing with the developer and other partners?

VI. Impact

- Social:
  - How does the energy enterprise or project improve the quality of life through the provision of energy services (lighting, cooking, water)?
  - Are there productive uses involved with this project? If so, what are they?
  - How many people will benefit from this project?
  - If the project is grid-connected, who will benefit from increased supply to the grid? Will there be long-term benefits (permanent jobs, access to water, grid extension) or will there be short-term (temporary jobs during construction)?

- Environment:

A thorough analysis of environmental assessment and permitting requirements needs to be undertaken independently and linked back to fuel, energy generation, site access, construction mobilization and other issues in the public domain.

  - What are guidelines and record-keeping requirements for:
    - ❑ Effluent Discharges
    - ❑ Air
    - ❑ Hazardous materials
    - ❑ Solid waste
    - ❑ Noise
    - ❑ Relocation
    - ❑ End-use Efficiency
    - ❑ Greenhouse gases
    - ❑ Other _____
    - ❑ Resource studies (wind, hydrology, etc.).
  - Will the project improve or protect the local, national, and global environment?
  - What other energy sources such as diesel, kerosene, candles or firewood will be displaced?
  - If displacing carbon, can this be quantified now?
  - Does the project have any negative environmental effects?
  - Has an environmental impact assessment been done?
  - Does one need to be done?

Sample Business Plan

River Number One
2.6 MW Hydroelectric Project

Date: June 2000

Project Sponsor Contact Information:
Joe Smith, River One Development Group
383 Franklin Street, Cordoba City, Cordoba 07003
Email: joe@riverone.com
TEL:

Table of Contents:

Confidentiality and Disclaimer Statement: The information contained in this business plan is confidential and the property of the sponsors. This business plan is not an offering of securities. This business plan contains statements and assumptions about the future that may or may not come true and cannot be relied upon. This document should not be given to others or copied without the project sponsor's permission

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Executive Summary

The Project is a proposed 2.65 MW run-of-river hydroelectric project in the _____ Province of the Republic of _____. The Project will provide 1.55 kW of guaranteed capacity and 18.1 million kWh per year for sale to the national utility under a 15 year power purchase agreement.

The Project will be constructed in an area that has ample, documented hydrological resources. The Project will provide peaking capacity and energy through an efficient high-head hydroelectric installation comprised of a reservoir, an open canal and a tunnel connected to a penstock and a powerhouse. The Project will connect to the tail of the national interconnected system through a 3-km transmission line. The project would use three Pelton style hydroelectric units.

The River One Project involves four parcels of land, which are owned or under the control of the project sponsor. The project will be built under an EPC contract. The EPC contract and bid documents have been completed. Two qualified companies have expressed interest and are in the process of bidding. Construction will be supervised by Smith and Jones, Consulting Engineers, on behalf of the Project Company. Operations and maintenance will be provided by a subsidiary of the successful EPC contractor or by a subsidiary of the national utility, which is operating a similar project for a private sector generator.

Three national permits are required to build and operate the Project: Water Use Permit, Energy Generation Permit and Environmental Permit. All three permits have been obtained. One local permit, to improve a public road used in site access, is pending.

The Project Company, Rio One Hydroelectric Project is owned by River One Development Group comprised of S&C Consultants, a fifteen year old civil engineering firm, Thomas Higgins, Esq., and E+Co (USA).

The implementation plan for the Project contains the following key milestones and dates:

§ Complete the negotiation and enter a final contract with the EPC contractor (4 months).
§ Complete term sheet, due diligence and document preparation for construction and permanent debt (7 months).
§ Complete equity agreement and closing with shareholders (7 months)
§ Execute power purchase agreement with the national utility (3 months).
§ Final land payment on Parcel #3 of the project site.(1 month).
PAGE 3

Construction can commence immediately after the completion of these events; operations can commence 12 months later.

The following data summarize the financial aspects of this business plan:

Capital Cost - $3,450,000
Indicative Financial Plan – 50% Debt at 12% interest, 1 year capitalized interest and seven year repayment with equal principal payments yearly.
Sponsor's equity - $415,000
Equity to be obtained - $1,310,000
10 Year Equity IRR – 19.16%
Lowest Year Debt Service Coverage Ratio – 1.7 times
Seven year Average DSCR - 2.1 times

At the present time the sponsors are seeking $1,310,000 in equity financing for the project and $ 1,725,000 in debt.

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RIVER ONE 2.65 MW HYDROELECTRIC PROJECT
Business Plan

Section 1 - LOCATION AND TECHNOLOGY

The project's 2.65 MW of capacity would be located in the _____ Province of the Republic of _____, 190 km from the capital, at the confluence of River One and River Two (see map). Water data for the province and the River One and River Two have been accurately collected for more than twenty years. These data were reviewed and tested by an independent hydrology engineer as part of the feasibility study of this project.

The Project is located in a forested and largely uninhabited area, near a protected area. Access to the area is presently on an unpaved road that contributes to local erosion. The Project's construction will improve the road quality and access in the area.

Independent engineering, environmental and social analyses have verified site and surrounding conditions as acceptable and estimated the costs, benefits and consequences of the project. These results are recorded in the document "Feasibility Analysis-River One Hydroelectric Project" prepared by Smith and Jones, consulting engineers.

The Project will provide peaking capacity and energy through an efficient high-head hydroelectric installation comprised of a reservoir, an open canal and a tunnel connected to a penstock and a powerhouse. The design of the installation is consistent with a similar installation in a nearby valley with similar geo-technical conditions.

A powerhouse would be built near the town of _____ with an intake in the River One. Firm capacity of 1.55kW and 18.1 million kWh of energy will be sold to the national utility through a fifteen-year power purchase agreement. The project would connect to the tail of the national interconnected system through a 3-km transmission line. The project would utilize three Pelton turbines manufactured by _____.

Section 2 – AGREEMENTS

§ Site Control
Four parcels of land are required for the project, as well as a site access through a poorly maintained public road. Three of the required parcels of land are owned by the Project Company. A final installment payment of $100,000 is to be made on these parcels. The fourth parcel of land has granted an irrevocable use permit for 40 years, which can be renewed for an additional twenty years. The fee for this permit has been included in the project's annual operating expenses.

§ Pre-construction
Pre-construction work has been undertaken by the project sponsors and a team of technical, legal and financial advisors. With one exception all of these contracts have been completed. The exception is an engineering services contract with Smith and Jones, Consulting Engineers. Under this contract S&J is supervising the preparation and negotiation of the EPC contracts. It is anticipated that Smith and Jones will serve as the owner's engineer during the construction process. Funds for this contract are included in the project's capital cost estimate.

§ Construction (EPC)
The project will be constructed under a lump-sum, turnkey engineering, procurement and construction contract. Preliminary estimates have been received from two credit-worthy and experienced firms, who have each agreed to provide appropriate performance bond and insurance policy coverage.

§ Operations and Maintenance
The project will enter a 10-year operating contract with either the successful EPC or with the national utility. All are experienced operators of hydroelectric projects of the size of this project. The initial construction (EPC) contract will provide for equipment spare parts and the financial plan provides ample funds for major maintenance.

§ Sale of Output
Capacity and energy will be sold to the national utility, which provides a general letter of credit guaranteeing its financial obligations under the power purchase agreement. The national utility has six similar power purchase arrangements, all indexed to foreign currency, and the utility has met all of its obligations under these agreements. Although the utility is yet to achieve sustainable financial performance it is able to regularly borrow at commercial rates, both domestically and internationally, and has steadily improved its operating performance during the last three years. The utility is being prepared for partial or total privatization; thus the pressure to improve operating performance and the need for guarantees, first, that the contract will be honored by any successor company and, second, letter of credit support for payments. All of the essential terms and conditions of the power purchase agreement are completed.

§ Permits
Required permits and government approvals have been obtained; only the approval of the detailed design of a road access cutting across public property remains in process. Following is a list of the pertinent permits and approvals:

§ Final permit to draw and use water from River One – Approved December 7, 1999 by The Ministry of Natural Resources and Environment. Approved by Congress under the Small Energy Projects Regulation, which also provided approval for the generation and environmental permits.
§ Permit to produce, transmit and sell electricity. – Approved May 15, 2000.
§ Environmental approval and national permit to construct project –Environmental Impact Assessment on May 1, 2000 and contruction permit approved May 10, 2000.
§ Temporary road access permit and permission to improve a public road– Submitted May 15, 2000; approval pending.

The Project has obtained an opinion from its legal advisor that these constitute all of the permits required to commence construction.

Section 3 – SPONSORS AND ADVISORS

The sponsors of the project are an experienced civil engineering firm, an experienced business manager and two investors with prior experience in similar projects.

The Project Company, Rio One Hydroelectric Project is owned by River One Development Group comprised of S&C Consultants, a fifteen year old civil engineering firm, Thomas Higgins, Esq., and E+Co (USA).

§ S&C Consultants is a fifteen year old civil engineering firm with 16 full-time employees. It has been involved in more than ten projects of a similar nature. The firm presently owns 51% of the Project Company.
§ Thomas Higgins, Esq. has been managing businesses for twenty years directly and through a management company (TH Investments, Inc.). Mr. Higgins and THI own 20% of the project company and provide legal and general management expertise.
§ E+Co (USA) is an investor in the Project Company. E+Co. brings substantial experience in hydro investing, forestry, biomass and greenhouse gas related issues. E+Co owns 29% of the project company.

Clark and Hjerthen are the project's legal advisors. Energy House Capital Corporation is the project's financial advisor. Merill, Coopers, Waterhouse, PC are the sponsor's public accountants and auditors.

Section 4 – MARKET

§ Country
The Republic of _____ is a stable democracy. Orderly transitions in government have taken place for more than thirty years. One party dominates national politics in the executive branch but three major parties shared power successfully in the legislative branch of government. The currency of _____ is the _____, which has traded in the 10:1 to 11.5: 1 range with the US$ for the last five years. The population of _____ is 11.2 million, growing at a rate of 2.3% per year. GDP per capita is $1175 nominal and $4800 in comparative purchasing power. The EIU Country Risk Service gives _____ an overall B- rating (A being the highest and D the lowest). This service rated political risk an A, economic policy and economic structure risk at B- and C- respectively (the latter being the result of substantial restructuring underway in the transport and telecommunications area) and Liquidity risk as a C (an improvement from the previous rating). Real GDP has grown by 3.5%-4.3% these last three years and inflation (consumer prices) has averaged 3.5%. The electricity system has 534 MW of installed capacity and last year generated 2,921 GWh of energy. Those figures are projected to be 1,400 MW and 7,700 GWh in 10-12 years.

§ Legal and Regulatory Framework
The Energy Law of 1997 which mandated the creation of a private sector generation of electricity for sale to the national utility under long term power purchase contracts, governs the energy sector. The key features of this law and its implementing regulations and bylaws are the following:

§ Separation of energy generation, energy transmission and energy distribution within the national utility. Eventual sale of distribution assets is forecasted in the law. More than one distribution company will be formed from the assets spun off in this manner.
§ Transmission will be governed by a state-owned company, which will have no other function. Transmission costs will be recovered through a surcharge to energy purchases and sales.
§ Distribution companies must contract for firm capacity from the national utility generation company, which in turn will contract with independent power producers (IPPs) such as the Project. These contracts (both between IPPs and the national generation company and between the generation company and the national distribution company) must be entered in a transparent manner and cover at least five years of the projected capacity needs of the distribution company. There will be penalties for capacity not delivered by generators or not covered by the Distribution Company.
§ A National Energy Commission will oversee the operation of the Market.
§ Generators using renewable sources of energy --- wind, hydro, biomass, solar --- will receive up to a 10% price premium on top of the standard offer included in the power purchase agreements available to all generators of electricity.
§ Renewable energy projects will receive a 5-year income tax holiday and will be exempt from import duties on equipment.
§ Rural electrification will be supported through a per household investment by the government, regardless of the mode of electricity service. In other words, the government will support an investment of $200 per household (subject to adjustment by the National Energy Commission) to promote rural electrification. On-grid extensions will be the responsibility of the nation distribution company serving a particular area. Off-grid hook-ups will be on the basis of applications by energy service companies to provide services to a defined area (between 1000-5000 households). Upon approval of a 5-year off-grid service territory concession companies are responsible for direct marketing to households within the area. Companies are required to provide performance bonds or other security and will be paid the $200 hook-up fee upon installation and verification of the provision of service.

§ Customer
Firm capacity is being sold to the national utility, which provides a general letter of credit guaranteeing its financial obligations to purchase firm capacity and energy from generators such as the Project. Payments are guaranteed within 15 days of a month-end statement being delivered to the national utility.

Section 5 – IMPLEMENTATION

The project will require 12 months to complete from the issuance of a Notice to Proceed to the designated EPC (engineering, procurement and construction) contractor by the Sponsors. The following events, estimated to require seven months from the date of this business plan, must be completed in order to issue such a Notice to Proceed.

§ Complete the negotiation and enter a final contract with the EPC contractor (4 months).
§ Complete term sheet, due diligence and document preparation for construction and permanent debt (7 months).
§ Completion of equity agreement and closing (7 months)
§ Execution of final power purchase contract (3 months).
§ Final land payment on Parcel #3 of the project site.(1 month).

Section 6 – FINANCE

§ Basic Assumptions
Required Investment
The total capital cost of the Project is expected to be under $3.45 million, which is $1,337 per kW. This estimate includes all costs up to the date project operations commence, including interest capitalized during the construction period. This estimate is the result of an independent assessment prepared for the feasibility analysis, confirmed by preliminary quotes from two qualified turnkey contractors.

The estimated capital cost is comprised of the following:

	US $	
Land	275,000	8.0%
EPC	2,125,000	61.6%
Taxes (VAT)	71,600	3.5%
Legal and Financing	85,000	2.5%
Pre-construction	215,000	6.2%
Sponsor's fee	200,000	7.2%
Working capital	65,000	1.9%
Insurance	77,800	2.3%
IDC (interest during construction)	207,000	6.0%
Contingency	128,600	3.7%
Total	$3,450,000	100.0%

Capacity and Energy Output

The Project will provide 2,580 kW of "nameplate" capacity. At an 80% plant factor this equates to 2,064 kW of firm capacity. Because of significant penalties for failure to deliver firm capacity the project sponsors have chosen to only contract for 75% of this amount in the early years of the project. Thus, all the financial projections are based on selling only 1,548 kW of firm capacity to the nation utility's distribution company. Based on twenty years of water data the project will comfortably produce 18.1 million units of energy (kWh) per year.

Revenue

The Project has negotiated a 15-year contract to sell its 1,548 MW of capacity at $10.76 per kW per month. This contract can be extended for an additional five years. Energy sales are based on the newly established national utility rate of $37.70 per MWh.

Forecasts by the National Energy Commission for the next five years all show average rates of $40 per MWh or more. In combination these energy and capacity revenues are estimated to produce first full year operating revenues of $881,000, after the deduction of appropriate value-added taxes and transmission taxes. This equates to total revenue (capacity and energy) of $.049 per kilowatt-hour. Revenues are denominated in US dollars although paid in equivalent local currency, which can be freely exchanged.
Operating Costs

Operating and maintenance costs, including the provision of a fund for major replacements and the payments to transmit energy to the national grid will cost $130,000 per year, which equates to $.007 per kilowatt-hour. Operating costs include:

O&M Costs, including land rent	60,000
Maintenance	5,000
Transmission Costs	11,000
Insurance	12,000
Administration	36,000
Other Costs	6,000
Total Costs	130,000

Useful Life and Depreciation

With scheduled maintenance and replacements, the Project will have a useful life in excess of thirty years. For tax purposes the asset will be depreciated over 20 years, reflecting a combination of the rates for civil works, equipment and infrastructure such as the powerhouse building. Under Government of _____ regulations governing projects such as River One, 80% of the full cost of the project, including interest during construction, can be depreciated.

Taxes

Separate from Income Taxes and Import Duties, Value-added taxes (VAT) will be paid on construction materials and equipment. These payments will be offset against net VAT collected (and passed through to the Government of _____) on the sale on energy in the early years. VAT and transmission taxes combine to total 16% of revenues. Because of the offset and pass-through nature of these costs, these amounts are not shown on the pro forma financial statements.

Income taxes will be paid on Net Income After Depreciation and Interest. A five-year tax holiday is provided under the energy law for renewable energy projects such as River One. The marginal tax rate is 25%.

§ Indicative Financing Plan
This business plan has been organized on a 50%-50% split between debt and equity. Debt is assumed to be at 12% annual interest over a period of 7 years, with interest accrued for the construction year. Equal principal payments will be made each year. Debt service coverage ratios will not be less than 1.7 times in any given year and will average 2.1 times over the seven years. Equity is assumed to be all common shares, with annual distributions made to shareholders once all debt service requirements have been met.
§ Pro Forma Financial Projections (first 4 operating years)

Project Year	0	1	2	3	4		
Fiscal Year	2001	2002	2003	2004	2005		
Capital Expenditure		(3,450,000)	0	0	0	0	
Revenues	0	881,446	891,669	902,046	912,578		
Operating and Maintenance			0	130,000	136,500	143,325	150,491
Net from operations	0		751,446	755,169	758,721	762,087	
Overhead	0	0	0	0	0		
Net before Interest, Depreciation and Taxes	0		751,446	755,169	758,721	762,087	

Interest	0	192,214	162,643	133,071	103,500
Net before Depreciation and Taxes	0	559,231	592,526	625,650	658,587
Depreciation	0	138,000	138,000	138,000	138,000
Net before Taxes	0	421,231	454,526	487,650	520,587
Taxes	0	0	0	0	0
Net Income	0	421,231	454,526	487,650	520,587
Add back: Depreciation	0	138,000	138,000	138,000	138,000
Less: Principal	0	246,429	246,429	246,429	246,429
Net Cash Flow	(3,450,000)	312,803	346,098	379,221	412,159

§ Financial Indicators
10 Year Internal Rate of Return on Equity = 19.16%
Debt Service Coverage Ratio – lowest year (Year 1) = 1.7 times
Debt Service Coverage Ratio – average for seven years = 2.1 times

§ Sensitivity Analysis

If no debt available (all equity deal) 15.90% IRR

If 60% debt is available 20.42% IRR
1.7 DSCR average

If no tax holiday 14.00% IRR
1.8 DSCR average

If 10% higher capital cost 15.02% IRR
1.9 DSCR average

If 10% lower capital cost 24.15% IRR
2.3 DSCR average

§ Pro Forma Financial Projections and Basic Assumptions – Detailed – are presented on ATTACHMENT A.

Section 7 – IMPACTS

The social and environmental benefits of this project include the following:

§ The project replaces the need for additional fossil fuel capacity additions to the national electric grid.
§ The siting and dam construction for the project meets national and international standards.
§ No displacement of people would occur as a result of the project.
§ While trees would be cut during the construction phase of the project a reforestation program would replace these by a factor of ten.
§ The project will employ no fewer than 45 local workers during the construction period.
§ The project will permanently improve access to the area and reduce erosion through the upgrade of presently unpaved roads.
§ Through the use of water as fuel, combined with tree planting the project will avoid over 6250 tons of carbon dioxide emissions per year. This number will be slightly offset during the construction period because of the concrete and transportation impacts of construction.

Section 8 – RISKS

This business plan poses the following risks to lenders and investors:

§ Hydrology and weather
Based on 20 years of data this risk is mitigated by conservative estimates of water flow but weather patterns, especially increases in violent storms and hurricanes, are noteworthy.
§ Construction
Utilizing a turn-key EPC approach with a qualified and insured contractor mitigates the risk that construction will not be completed or that substantial cost over-runs will occur.
§ Operation
Utilizing a local, experienced and well-established contractor mitigates the risk that operating interruptions will occur.
§ Technology failure
Strong manufacturer warranties, substantial experience with this proven technology and excellent operator credentials mitigates the risk that the turbines or generators, controls or interconnection equipment will fail.
§ Accidents and business interruption
The project's insurance program covers loss of revenue during interruptions and replacement due to major accidents.
§ Failure to achieve capacity and energy output
Careful and conservative estimates have mitigated the risk that basic capacity and energy forecasts will not be met.
§ Creditworthiness of capacity and energy buyers
Capacity payments will be guaranteed by a letter of credit from a reputable bank..
§ Changes in law, policy, regulation (including taxes)
The present energy law was in design for four years, debated and approved by three different sessions of the Congress, is endorsed by all major political parties and represents a pattern in the region. The prior energy law was in force for 15 years with all of the obligations under that law met, including tax and import duty incentives.
§ Sponsor or management change
The present implementation plan for the project is self-managing once the conditions set forth in Section 7 are met. The sponsors will maintain an equity position in the project and will enter agreements with shareholders and lenders to provide for replacement management under appropriate circumstances.
§ Foreign exchange conversion of dollar-denominated contract
The Republic of _____ has had the free conversion of currency at transparent rates, without limitation, and the transfer of amounts off-shore for more than 10 years.

§ Expropriation of assets
Though considered unnecessary by the sponsors, risk insurance is available to cover this eventuality.

CLOSING

The sponsors of the Project are proposing a 50-50 debt-equity capitalization of this project, which is supported by the projections included in this business plan. At the present time the sponsors are seeking expressions of interest and direct negotiations with lenders and investors for:
§ $1,310,000 in equity, which will secure a significant majority ownership in the project and its resulting cash flow, with exit mechanisms to be discussed.
§ $1,725,000 in loans for a seven-year period, dollar denominated at an effective interest rate of 12%, with a one-year capitalized interest period and equal principal payments.

ATTACHMENTS

Pro forma financial projections.

Sponsor information and financial reports.
Executive summary of the Smith and Jones Feasibility Study and other technical studies.
EIU Report (1st Q 2000) on the Republic of _____.
Summaries and approval letters on all permits.
Term sheet of the proposed power purchase contract.

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Business Plan

SunSpot Inc
Household, Business and Productive Use Solar (PV) Project

Date: April 2000

Project Sponsor Contact Information:
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Confidentiality and Disclaimer Statement: The information contained in this business plan is confidential and the property of the sponsors. This business plan is not an offering of securities. This business plan contains statements and assumptions about the future that may or may not come true and cannot be relied upon. This document should not be given to others or copied without the project sponsor's permission

Executive Summary

Sunspot proposes a 5000 household and business solar electrification project in the five northern provinces of the Republic of _____. The Project will provide household and business electricity through the installation of 10-60 watt systems and the collection of monthly fees for the service provided. The Project will also provide a line of income generation equipment tied to solar energy sources through a joint venture with an established small enterprise creation organization.

The Project will be implemented in areas that have ample, documented solar insolation and will build on demonstration and pilot projects that have established consumer acceptance, willingness and ability to pay. The Project will provide households and businesses with a cost-effective substitute for current energy sources (batteries, candles, paraffin). The Project will be implemented through a network of sales and service points (affiliated with and located at existing businesses) combined with a network of technicians for installation and routine maintenance. The Project will be managed from _____, which is located in Province #1 and central to all the provinces being serviced.

The Project Company, Sunspot, is owned by three local entrepreneurs (each with 18.3% for a total of 55%) and E+Co (USA).

The implementation plan for the Project contains the following key milestones and dates:
§ Complete the identification and contracting with the last 2 of the seven local entrepreneurs (2 months).
§ Complete documentation on a $1.592 million debt package to be drawn down in $315,000 to $332,000 increments to support the purchase an installation of systems over the next five years (3 months).
§ Identify and close on $200,000 worth of equity (5 months).

Implementation can commence immediately after the completion of these events.

The following data summarize the financial aspects of this business plan:
§ Capital Cost - $2,600,00 over 5 years.
§ Indicative Financial Plan – Five yearly debt tranches of between $315,000 and $332,000, which will finance 70% of the installed cost per customer. An eight year debt schedule is proposed with a one year moratorium on principal and interest and a 13.44% interest rate for seven equal annual payments.
§ Sponsor's equity - $150,000
§ Equity to be obtained - $200,000
§ 10 Year IRR on net cash flow after debt service 27%

§ Lowest Year Debt Service Coverage Ratio – 1.46 times. 12-year average DSCR – 2.0 times
§ At the present time the sponsors are seeking $200,000 in equity financing for the project and offering either a 35% common share interest in the project company or a 15% common share ownership combined with a preferred dividend of 15% for year 4-12.
§ At the present time the sponsors are seeking a $1,592,000 debt arrangement with drawdowns as follows:
§ Year 1 = $332,000
§ Years 2-5 = $315,000
§ Secured by the household installation and pledges of the shares of the present owners and agreements to debt service covenants before cash distributions.

Sun Spot
Business Plan

Section 1 - LOCATION AND TECHNOLOGY

The project will be located in three of _____ 21 provinces. The sponsors have been operating in all three of these provinces for more than 5 years. Headquarters is located in Province #1. Sales and Distribution Centers are located in Provinces #2 and #3. These are located within 60 km of headquarters on year-round traveled roads. Each province contains more than 15,000 unelectrified homes in areas not expected to be grid electrified in the next 20 years. Headquarters and each provincial sales and distribution point can each service 2000-4000 customers (this business plan is built of 5000 in total). Through a network of nine local entrepreneurs, seven of whom are trained and operating (contracts with the final two are being completed now and training will commence shortly).

The project will use polycrystalline photovoltaic panels and balance of system components (battery, inverter, controller, wiring, brackets and power points) field tested by Sunspot through its previous activities: the sale and installation of 325 systems for cash and the installation of 75 pilot fee-for-service households. Sunspot will offer three major products of 30, 40 and 50 watts but will also offer smaller packages and a deluxe 60-watt package. Each is profiled in an attachment to this business plan.

The Republic of _____ enjoys year-round solar insolation levels more than adequate to guarantee peak performance of the PV systems purchased by Sunspot for the world's leading manufacturers, including _____ and _____, with whom Sunspot has been dealing for more than 3 years.

Section 2 – AGREEMENTS and KEY BUSINESS ARRANGEMENTS

§ Site Control – headquarters, sales and service locations are controlled through ownership or lease arrangements. The major space requirement for the project is a location to assemble components (in headquarters). Individual local entrepreneurs (at the village level) house their Sunspot operation within existing stores or locations under their control and agree not to house competing products.
§ Pre-implementation – these activities have been undertaken by the sponsors under a shareholders agreement prescribing contribution of cash and time by Sunspot's owners. These activities, which have cost in excess of $75,000 include the development of standard customer contracts and marketing materials; the identification and training of local (multi-village level) entrepreneurs; and, the configuration and pilot installing of 75 fee-for-service systems and associated installation, maintenance and collection systems. Under the existing shareholder agreement the sponsors have committed to an additional $75,000 of time and cash.
§ Marketing -- The sponsors with the support of the NGO _____ have undertaken marketing. Sunspot has sold, for cash 375 systems over the last five years, which led to the development and testing of the fee for service approach (See Customers). The primary marketing and sales tools consist of village presentations, household demonstrations of various products and follow-up visits on market day to secure customer sign-up.

In a related activity – and potential growth sector – Sunspot has entered a three-year agreement with _____, an NGO specializing in small enterprise development through the provision of training, equipment and financing. Under this agreement Sunspot will modify certain equipment to be solar powered. These will include equipment presently powered with small gasoline-petrol engines, with batteries charged at remote locations and manually powered devices. Equipment for shelling, de-husking and sewing are the first line of products being modified and tested. Under this agreement Sunspot will provide the energy component and limit its price to a 20% mark-up.
§ Customers enter a three-year standard contract and pay the initial installation fee.
§ Installation – is undertaken by Sunspot technicians who are paid on the basis of installations made. The full cost of installation is paid by the new customers up front ($20 to $30) as a statement of their commitment to the product and service.
§ Operations and Maintenance – is performed by Sunspot technicians in concert with training of customers on appropriate use of the product installed. Battery replacements are the responsibility of customers, thus assuring a motivation to protect their invest-

ment well.
§ Collection – takes place at the seven (soon to be nine) central points and at key locations in the province. Household collections are not part of the collection process or agreement.
§ Permits -- Required permits and government approvals have been obtained. These include: (1) general license to do business; (2) permit to enter financial agreements extending more than one year; (3) registration as a company including or contemplating foreign ownership; and, (4) permit to import goods and services in excess of AMOUNT per year. The Project has obtained an opinion from its legal advisor that these constitute all of the permits required to commence construction.

Section 3 – SPONSORS AND ADVISORS

The sponsors of the project are three sole proprietors who have joined together to form Sunspot:
_____, an electrical contractor with 20 years experience.
_____, a distributor of hardware and appliances in the countryside.
_____, a consultant and professor of business management.
A fourth shareholder is E+Co (USA) an early stage investor in such companies. Sunspot is presently constituted as a stock corporation. Each of the individuals holds 18.3% of the shares and E+Co holds 45% of the shares. Each of the four has a seat on the board of directors. _____ is the general manager and expects to be involved in the company full-time for at least the next five years. The articles of incorporation, bylaws and shareholder agreement are summarized in attachments to this business plan.

Section 4 – MARKET

§ Country
The Republic of _____ is stable. Orderly transitions in government have taken place for more than ten years. One party dominates national politics in the executive branch but three major parties share power successfully in the legislative branch of government. The currency of _____ is the _____, which has traded in the 10:1 to 11.5: 1 range with the US$ for the last five years. The population of _____ is 11.2 million, growing at a rate of 2.3% per year. GDP per capita is $675 nominal and $1900 in comparative purchasing power. The EIU Country Risk Service gives _____ an overall C rating (A being the highest and D the lowest). This service rated political risk an A, economic policy and economic structure risk at B- and C- respectively (the latter being the result of a need for substantial restructuring underway in the transport and telecommunications area) and Liquidity risk as a C-. Real GDP has grown by 2.5%-3% these last three years and inflation (consumer prices) has averaged 8.5%. The electricity system has 534 MW of installed capacity and last year generated 2,921 GWh of energy. Those figures are projected to be 1,400 MW and 7,700 GWh in 10-12 years but there is significant uncertainty about the government and the national utility to finance such an expansion and very significant skepticism about the national utility's ability to undertaker any griid expansions whatsoever. There are estimated to be 350,000 unelectrified homes in the country.

§ Legal and Regulatory Framework
The Energy Law of 1997 which mandated the creation of a private sector generation of electricity for sale to the national utility under long term power purchase contracts, governs the energy sector. The key features of this law have NOT been implemented. They are:

§ Separation of energy generation, energy transmission and energy distribution within the national utility. Eventual sale of distribution assets is forecasted in the law. More than one distribution company will be formed from the assets spun off in this manner.
§ Transmission will be governed by a state-owned company, which will have no other function. Transmission costs will be recovered through a surcharge to energy purchases and sales.
§ Distribution companies must contract for firm capacity from the national utility generation company. which in turn will contract with independent power producers (IPPs)
§ A National Energy Commission would oversee the operation of the Market.
§ Generators using renewable sources of energy --- wind, hydro, biomass, solar --- will receive up to a 10% price premium on top of the standard offer included in the power purchase agreements available to all generators of electricity.

§ Renewable energy projects would receive a 5-year income tax holiday and will be exempt from import duties on equipment. Significant for the proposed project this has not been enacted and would substantially improve financial results.
§ Rural electrification will be supported through a per-household investment by the government, regardless of the mode of electricity service. In other words, the government will support an investment of $200 per household (subject to adjustment by the National Energy Commission) to promote rural electrification. On-grid extensions will be the responsibility of the nation distribution company serving a particular area. Off-grid hook-ups will be on the basis of applications by energy service companies to provide services to a defined area (between 1000-5000 households). Upon approval of a 5-year off-grid service territory concession companies are responsible for direct marketing to households within the area. Companies are required to provide performance bonds or other security and will be paid the $200 hook-up fee upon installation and verification of the provision of service. Significant for the proposed project this has not been enacted and would substantially improve financial results.

§ Customers
Five years experience by Sunspot as well as market research demonstrates that between 7.5% and 10% of households can afford to by Sunspot products for cash and another 10% to 12.5% can afford to by Sunspot products if 18 to 36 month financing is offered. Thus, no more than 20% of the market (350,000 homes nationwide, 50,000 in the three large provinces that are Sunspot's target market) could afford a cash or credit scheme. By offering monthly service at various prices (from as low as $5 per month to $20 per month) Sunspot can reach 55% of the market, a figure that would grow to 75% if and when the government household entitlement plus concession program is implemented.

Section 5 – IMPLEMENTATION

Seven of the needed nine sales and service centers are implemented; two are nearing completion of contracts and the commencement of training. The purpose of this document is to secure the financing needed to implement Sunspot's plan. If financing (debt and equity) existed today Sunspot could be operational in all seven sales and service points within weeks and fully operational in nine locations within 2-4 months.
Section 6 – FINANCE

§ Basic Assumptions
§ Sunspot will install 5000 systems over five years. Sunspot has the capacity to contract for and install 1000 systems in the first year as a result of its previous pilot program.
§ Systems will range from 10-60 watts but the dominant share of product offerings will average 40 watts.
§ Average cost for fully installed systems, excluding installation cost paid directly by customers, is $450 for the first year and $425 thereafter.
§ Average revenue will be $14 per month ($168 per year).
§ Operating costs, comprised of both fixed and variable costs, will begin at $150,000 per year and grow to $300,000 per year, including contingency allowances.
§ Sunspot's agreement with _____ to provide solar energy sources for productive use equipment has been estimated conservatively for this business plan, at 600 watts per year growing to 4000 watts per year, with a 20% mark-up.

Required Investment

The estimated capital cost is comprised of the following:
§ PV systems to be installed: $1,592,500 as follows
§ Year 1 = 1000 systems at $475 or $475,000, financed 70% with debt ($332,500).
§ Year 2-5 = 1000 systems per year at $450 or $450,000 per year or $1.8 million over 4 years (70% debt).
§ $150,000 sponsors start-up equity contribution
§ $200,000 in additional start-up equity
§ Total project = $2.6 million

Useful Life and Depreciation

Sunspot's installations, excluding batteries, have a useful life of 15-20 years, backed by component warranties. For tax purposes installations wqill be depreciated at 10% per year. Customers will replace batteries.

Taxes

Separate from Income Taxes and Import Duties, Value-added taxes (VAT) will be paid on construction materials and equipment. These payments will be offset against net VAT collected (and passed through to the Government of _____) on the sale on energy in the early years. VAT and transmission taxes combine to total 16% of revenues. Because of the offset and pass-through nature of these costs, these amounts are not shown on the pro forma financial statements.

Income taxes will be paid on Net Income After Depreciation and Interest. A five-year tax holiday is provided under the energy law for renewable energy projects but has yet to be implemented. The marginal tax rate is 20%.

§ Indicative Financing Plan

Debt—Sunspot's business plan is built on the financing of 70% of the cost of customer installations through debt. This indicative financing plan is supported by debt service coverage projections. The terms proposed for each of five tranches of loans are the following

§ 8 year term
§ Amounts per tranche $315,000 to $332,500
§ No principal or interest in Year 1 after borrowing
§ Equal annual payment in Years 2-8 after borrowing
§ Interest at 13.44% based on a 12% nominal rate, adjusted upward to account for interest and principal grace period.

Equity – Sunspot requires a minimum of $200,000 in start-up equity to implement this business plan in addition to the sponsor's commitment. Sunspot is offering two options for investors:
(1) a 35% common shareholding
(2) a 15% common shareholding combined with a fixed 15% preferred dividend
for years 4-12.

Pro Forma Financial Results –

Year	0	1	2	3	4	5	6	
Income Statement								
Revenue		175,560	353,600	531,000	708,000	882,000	882,000	
Operating Cost			150,000	200,000	250,000	300,000	300,000	300,000
Net from Operations				25,560	153,600	281,000	408,000	582,000	582,000
Interest		0	44,688	82,787	116,302	144,618	167,035	
Depreciation			47,500	92,500	137,500	182,500	227,500	227,500
Taxable Income			-21,940	16,412	60,713	109,198	209,882	187,465
Taxes (at 20%)			0	3,282	12,143	21,840	41,976	37,493
Net Income			-21,940	13,130	48,571	87,358	167,906	149,972
Cash Flow								
Add back depreciation				47,500	92,500	137,500	182,500	227,500	227,500
Less principal payments				0	31,526	65,630	104,318	148,206	197,991
Capital Investment			150,000	475,000	450,000	425,000	425,000	425,000	0
Amounts Borrowed			0	332,500	315,000	315,000	315,000	315,000	0
Net Cash Flow		-150,000	-116,940	-60,897	10,440	55,540	137,200	179,481	
IRR on net cash flow			26.7%						

Debt Service	-	76,214	148,417	220,620	292,823	365,026
Available to Pay Debt Service	25,560	150,318	268,857	386,160	540,024	

544,507

Coverage		NA	1.97	1.81	1.75	1.84	1.49						
Debt Service-12 years		2,555,184											
Available		5,063,477											
DSCR, # Times		1.98											
Equity Investor Options													
35%	19.0%	(150,000)		(50,000)		3,654		19,439		48,020		62,818	
15%	15.0%	(150,000)		(50,000)		1,566		8,331		50,580		56,922	
# units	1000	1000	1000	1000	1000	1000	0						
Cumulative		1000	2000	3000	4000	5000	5000						
Average cost per unit		100%	475	450	450	450	450	0					
Amount Borrowed (%)		70%	70%	70%	70%	70%	70%	70%					
Average revenue per unit/month			$14.50	$14.50	$14.50	$14.50	$14.50	$14.50	$14.50				
Loan Term/years/equal annual			7										
Loan Interest Rate(12% + 1 year grace)			13.44%										
Operating Cost		150000	200000	250000	300000	300000	300000						
Other Revenue/ watts			600	2000	3000	4000	4000	4000					
Average Sales Price/watt			13	14	15	15	15	15					
Margin	20%	20%	20%	20%	20%	20%							
Revenue:			175,560		353,600		531,000		708,000		882,000		
882,000													
Fee for Service			174,000		348,000		522,000		696,000		870,000		
870,000													
Other		1,560		5,600		9,000		12,000		12,000		12,000	
Amounts Borrowed				332,500		315,000		315,000		315,000		315,000	
Cumulative Borrowings				332,500		647,500		962,500		1,277,500		1,592,500	
1,592,500													
Outstanding Debt			332,500		615,974		865,343		1,076,025		1,242,820		1,044,828

§ Financial Indicators
12 Year Internal Rate of Return on net cash flow = 26.7%
Debt Service Coverage Ratio – lowest year = 1.46 times
Debt Service Coverage Ratio – average for twelve years = 1.98

§ Sensitivity Analysis
Revenue decrease of 10% = IRR to 16.5%
Revenue increase of 10% = IRR to 36.8%
60% of investment financed = 24.4%

§ Pro Forma Financial Projections and Basic Assumptions – Detailed – are presented on ATTACHMENT A.

Section 7 – IMPACTS

The social and environmental benefits of this project include the following.
§ The project replaces the need for additional fossil fuel capacity additions to the national electric grid and the extension of the grid.
§ The project will employ no fewer than 30 local workers.
§ The project will avoid carbon dioxide emissions (to be measured, verified and perhaps converted to revenue).
§ The project will replace kerosene, dry cell and remotely charged batteries.
§ The project will improve quality of life in 5000 households and afford income and education opportunities while avoiding the health consequences of kerosene.

Section 8 – RISKS

This business plan poses the following risks to lenders and investors:
§ Customer Non-payment – will be addressed through a proven collection notice (2 times), re-possession and re-marketing program.
§ Technology failure – will be addressed through regular O&M and customer training.
§ Grid Extensions – are highly unlikely during the project period if at all, although procedures exist to remove and re-market systems in the event a grid extension occurs.
§ Competition – is unlikely in the immediate market area on a direct basis, as there are 300,000 unelectrified households outside out three-province territory and no Sunspot-like firms operating. Other competition from petrol sets and mini-grids, as well as wind-PV hybrids are uneconomic (in the case of petrol and mini-grids) and unlikely in the case of hybrids (as Sunspot may consider such a combination also). The major competitive risk would be give-away programs direct to our customer base, which is extremely unlikely.

CLOSING

The sponsors are seeking to identify interested banks and investors for a multi-year, multi-tranche loan program. Cash flow and existing owner shares as well as covenants to prohibit cash flow distributions until coverage requirements are met would secure bank loans. The sponsors are seeking what would evolve to be a long-term and highly profitable relationship.

The sponsors are also seeking an early stage equity investors and offering a significant position in a growing company.

ATTACHMENTS

Pro forma financial projections.
Sponsor information and financial reports.
Executive summary of pilot program results.
EIU Report (1st Q 2000) on the Country.
Summaries of bylaws, articles of incorporation and shareholder agreements.

ANNEX G - Glossary, Abbreviations and Conversions

This Attachment contains the following:

- ❑ Renewable Energy Technical Terms
- ❑ General Financial Terms
- ❑ Abbreviations
- ❑ Conversions

RENEWABLE ENERGY TECHNICAL TERMS

Absorber: The part of the solar collector that receives radiant energy and transforms it into heat energy.

Absorptive Coating: Covers the absorber plate and improves its ability to absorb energy without reflecting it away.

Active Solar System: A system that traps the sun's energy and utilizes a mechanical subsystem to move that energy to its point of intended use for water heating, space heating and possibly space cooling.

Alternating Current (AC): An electric current that reverses direction in a circuit at regular intervals. Electrical energy usually obtained from utility grids or generators.

Ampere (Amp): Measure of electric current.

Amp-Hours: Battery storage capacity. A 100 amp-hour battery will supply a 10-amp load for 10 hrs.

Array: A group of photovoltaic modules wired together to produce a specific amount of power. Array size can range from one to hundreds of modules, depending on how much power will be needed.

Bagasse: The fibrous material remaining after the extraction of juice from sugarcane; often burned by sugar mills as a source of energy.

Balance of System (BOS): Parts of a photovoltaic system other than the photovoltaic array, such as: connectors, sockets, wires, cables, power outlets and mounting hardware.

Batch: Black tank that serves as both collector and storage tank. Can be enclosed, with one side glazed.

Battery: An energy storage device.

Bioenergy: Energy derived from plant matter, or biomass. Green plants capture solar energy and store it as chemical energy in the form of cell walls in the plants' stalks, stems and leaves and as oils or starch in the seed, fruits or roots. Both plants and the waste materials derived from them (such as sawdust, wood wastes, and agricultural wastes) are referred to as biomass. Biomass can be used directly as a solid fuel to produce heat, or it can be converted to other bioenergy carriers such as liquid and gaseous fuels.

Borehole: Synonym for water well.

Btu (British thermal unit): A unit of heat. The quantity of heat required to raise the temperature of one pound of water by one degree Fahrenheit.

Carbon Dioxide (CO_2): The gas formed in the ordinary combustion of carbon, given out in the breathing of animals.

Casing: Plastic or steel tube that is permanently inserted in the well after drilling. Its size is specified according to its inside diameter.

Cell (photovoltaic): A semi-conductor device that converts light directly into DC electricity.
Centrifugal Pump: A pumping mechanism that spins water by means of an "impeller". Water is pushed out by centrifugal force. See also multi-stage. Centrifugal pumps have high flow rates with low suction.

Check Valve: A valve that allows water to flow one way but not the other. A foot valve is one example.

Chlorofluorocarbons: Compounds containing chlorine, fluorine, and carbon - they generally are used as propellants, refrigerants, blowing agents (for producing foam), and solvents. They are identified with numbered suffixes (e.g., CFC-11, CFC-12) which identify the ratio of these elements in each compound. They are known to deplete stratospheric ozone and also are “greenhouse” gases in that they effectively absorb certain types of radiation in the atmosphere.

Closed Loop System: System of which no part is vented to the atmosphere or fed with fresh liquid. The system liquid is re-circulated.

Cogeneration: The simultaneous generation of both electric power and heat. The heat, instead of being discharged without further use, is used in some fashion (e.g., in district heating system, steam, etc).

Collector Loop: The part of the solar system that has solar collectors. The collector loop may be piped and include other components.

Collector Tilt: The angle between the horizontal plane and the solar collector plane.

Concentrator: A photovoltaic module, which includes optical components, such as lenses, to direct and concentrate sunlight onto a solar cell of smaller areas. Most concentrator arrays must directly face or track the sun.

Controller/Regulator: A device to protect the batteries from being overcharged.

Dam: A structure for impeding and controlling the flow of water, which increases the water elevation to create the hydraulic head. The reservoir creates, in effect, stored energy.

Deforestation: The permanent clearing of forest land and its conversion to non-forest uses such as clearing land for agriculture, cutting down trees for lumber and gathering fuelwood. These activities are having devastating effects of acid rain, nuclear radiation and other pollutants.

Demand-side management: The planning, implementation and monitoring of utility activities designed to encourage customers to modify their pattern of electricity usage.

Diaphragm Pump: A type of pump in which water is drawn in and forced out of one or more chambers, by a flexible diaphragm. Check valves let water into and out of each chamber.

Differential Controller: Control, which measures the difference between the collector and the tank temperatures.

Diffuse Radiation: Solar radiation received after its direction has been changed by reflection and scattering in the atmosphere.

Diode: An electronic semiconductor device that allows current flow in only one direction. Also called a rectifier. The electrical equivalent of a check valve in water.

Direct Current (DC): A type of electricity transmission and distribution by which electricity flows in one direction through the conductor; usually relatively low voltage and high current.

Efficiency (of a solar cell or module): The ratio of electric energy produced to the amount of solar energy incident on the cell or module. Typical crystalline solar modules are about 10% efficient -- they convert about 10% of the light energy they receive into electricity.

Emissions: Flows of gases, liquid droplets, or solid particles into the atmosphere. Gross emissions from a specific source are the total quantity released. Net emissions are gross emissions *minus* flows back to the original source. Plants, for example, take carbon from the atmosphere and store it as biomass during photosynthesis, and they release it during respiration, when they decompose, or when they are burned.

Energy: The capacity for doing work.

Energy audit: A survey that shows how much energy is being used and shows ways to reduce energy usage.

Energy intensity: The amount of energy required per unit of a particular product or activity. Often used interchangeably with “energy per dollar of GNP.”

Flat-plat module or array: A photovoltaic module or array in which the incident solar radiation strikes a flat surface and no concentration of sunlight is involved.

Flat Plate Collector: Converts the sun's radiation into heat on a flat surface within a simple box. Does not use reflecting surfaces, lens arrangements to concentrate the sun's energy.

Foot Valve: A check valve placed in the water source below a surface pump. It prevents water from flowing back down the pipe and "losing prime". See check valve and priming.

Fossil fuel: Coal, petroleum or natural gas. Any fuel derived from them.

Friction Loss: The loss of pressure due to flow of water in pipe. This is determined by 3 factors: pipe size (inside diameter), flow rate, and length of pipe. It is determined by consulting a friction loss chart available in an engineering reference book or from a pipe supplier. It is expressed in PSI or Feet (equivalent additional feet of pumping).

Gasifiers: Tank for anaerobic fermentation of biomass residues from sugar cane, pulp and paper, etc., to produce biogas.

Generating capacity: The capacity of a power plant to generate electricity - typically expressed in watts-electric (e.g., kWe or Mwe).

Geothermal: Natural heat extracted from the earth's crust using its vertical thermal gradient, most readily available where there is a discontinuity in the earth's crust (e.g. where there is separation or erosion of tectonic plates).

Greenhouse effect: A popular term used to describe the heating effect due to the trapping of long wave radiation by greenhouse gases produced from natural and human sources.

Greenhouse gases: The gases such as water, vapor, carbon dioxide, methane and low level ozone that are transparent to solar radiation, but opaque to long wave radiation, and which contribute to the greenhouse effect.

Grid-connected: A photovoltaic system that is connected to a centralized electrical power network.

Gross domestic product (GDP): total value of goods and services produced by a country (residents and non-residents) per annum.

Gross national product (GNP): GDP + income residents receive from abroad for labor and investments, less similar payments made to non-residents who contributed to the domestic economy.

Head: A unit of pressure for a fluid, commonly used in water pumping and hydro power to express the height a pump must lift water or the distance water falls. Head losses are important for determining flow rates and pump sizes.

Headers: Main passages through which the heat transfer medium enters into or exits from the collector. Also called manifolds.

Heat Exchanger: A device that is used to transfer heat between fluids and gasses through an intervening metal surface.

Heat Transfer Medium: Air or liquid that is heated and used to transmit energy to its point of use.

Hybrid system: A power system consisting of two or more power generating subsystems (e.g., the combination of a wind turbine or diesel generator and a photovoltaic system).

Indirect System: A solar heating or cooling system in which the solar heat is collected outside the building and transferred inside using ducts or piping, and usually, fans or pumps.

Insolation: The amount of energy in sunlight reaching an area. Usually expressed in watts per square meter (W/m2), but also expressed on a daily basis as watts per square meter per day (W/m2/day).

Inverter: An appliance used to convert DC (battery) power into standard household (utility) AC electricity.

Jet Pump: A surface-mounted centrifugal pump that uses an “ejector” (venturi) device to augment its suction capacity. In a “deep well jet pump”, the ejector is down in the well, to assist the pump in overcoming the limitations of suction. (Some water is diverted back down the well, causing an increase in energy use.)

Kilowatt (kW): 1000 watts

Kilowatt-hour (kWh): 1000 watt-hours. A typical residence in the United States consumes about 1000 kilowatt-hours each month at a price in the range of $.06 to .15 per kilowatt-hour.

Least-cost planning: In energy planning, the practice of basing investment decisions on the least costly option for providing *energy services.* It is distinguished from the more traditional approach which focuses on the least costly way to provide specific types of energy, with little or no consideration of less costly alternatives that provide the same energy service at lower costs.

Life cycle cost (LCC) analysis: A form of economic analysis to calculate the total expected costs of ownership over the life span of the system. LCC analysis allows a direct comparison of the costs of alternative energy systems, such as photovoltaics, fossil fuel generators, or extending utility power lines.

Load: The demand on an energy producing system. The energy consumption or requirement of a piece or group of equipment.

Maintenance costs: Any costs incurred in the upkeep of a system. These costs may include replacement and repair of components.

Maximum power point tracker: An electronic device that acts as a “transmission” between the PV panels and the pump. Provides the maximum power possible out of the solar array. While an **array** tracker that follows the sun provides higher efficiency and power in the summer, a MPPT provides the highest gains in winter and/or cold weather, due to the higher PV outputs at colder cell temperatures. Where maximum efficiency is needed, both may be used.

Megawatt: One thousand kilowatts, or 1 million watts. Standard measure of electric power plant generating capacity.

Megawatt hours: One thousand-kilowatt hours or 1 million-watt hours.

Methane: A compound consisting of one carbon atom and four hydrogen atoms; it occurs naturally, often in association with coal and petroleum (see Natural gas below) and as a byproduct of the metabolic activities of some microorganisms; it also can be synthesized artificially.

Module: A number of solar electric cells wired together to form a unit, usually in a sealed frame of convenient size for handling and assembling into arrays. Also called a “panel.”

Montreal Protocol: The principal international agreement under which ozone-depleting compounds are regulated. Its formal name is the “Montreal Protocol on Substances that Deplete the Ozone Layer” and was adopted in September 1987.

Multi-Stage Centrifugal: A centrifugal pump with more than one impeller and chamber stacked in a sequence to produce higher pressure. Conventional AC deep well submersible pumps and higher power solar submersibles work this way.

Natural gas: A naturally occurring mixture of hydrocarbons (principally methane) and small quantities of other gases found in porous geological formations, often in association with petroleum.

OECD: Organization for Economic Cooperation and Development, an organization that includes most of the world’s industrialized, market economies. Members include: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, and United States.

Off-peak: The period of low energy demand, as opposed to peak demand.

Open Loop System: Some part of the system is vented to the atmosphere, or the system contains fresh or changeable water.

Operating costs: The costs of using a system. For fuel-based systems these costs include all fuel costs over the system's lifetime.

Ozone: A molecule consisting of three oxygen atoms in the atmosphere, it is found in both the stratosphere and troposphere. Ozone effectively absorbs certain forms of solar ultraviolet radiation known to damage living organisms. It also absorbs certain wavelengths of infrared radiation and therefore is a "greenhouse" gas.

Panel: A device containing solar cells encapsulated under glass and installed in an aluminum frame. Typically rated at approximately 50 watts for 12-volt DC applications.

Passive Solar Heating: Solar heating of a building accomplished by architectural design without the aid of mechanical equipment.

Peak sun hours: The equivalent number of hours per day when solar insolation averages 1000 watts per square meter. For example, six peak sun hours means that the energy received during total daylight hours equals the energy that would have been received had the insolation for six hours been 1000 watts per square meter.

Peak Watts (Wp): The maximum power (in watts) a solar array will produce on a clear, sunny day while the array is in full sunlight and operating at 25 C. Actual wattage at higher temperatures is usually somewhat lower.

Photovoltaics (PV): The direct conversion of light into electricity. "Photo" means light and "voltaic" means electric. More commonly referred to as solar electricity.

Polycrystal Silicon Cells: Pure silicon is melted and cast into bricks, then sliced into thin wafers and coated with electrical contacts. Typically 36 cells are soldered together to produce a 12 volt DC solar module.

Positive Displacement Pump: Any mechanism that seals water in a chamber then forces it out by reducing the volume of the chamber. Examples: piston (including jack), diaphragm, rotary vane. Used for low volume and high lift. Contrast with "centrifugal". Synonyms: volumetric pump, force pump.

Power: The rate at which energy is consumed or generated. Power is measured in watts or horsepower.

Pressure: The amount of force applied by water that is either forced by a pump, or by the gravity. Measured in pounds per square inch (PSI). PSI = vertical lift (or drop) in Feet / 2.31, or .43 PSI per foot.

Pressure Switch: An electrical switch actuated by the pressure in a pressure tank. When the pressure drops to a low set point (cut-in) it turns a pump on. At a high point (cutout) it turns the pump off.

Pump Controller: An electronic device, which varies the voltage and current of a PV array to match the needs of an array-direct pump. It allows the pump to start and to run under low sun conditions without stalling. Electrical analogy: variable transformer. Mechanical analogy: automatic transmission. See Linear Current Booster and Maximum Power Point Tracker.

Pump Jack: A deep well piston pump. The piston and cylinder is submerged in the well water and actuated by a rod inside the drop pipe, powered by a motor at the surface. This is an old-fashioned system still used for extremely deep wells, including solar pumps as deep as 1000 feet. In solar powered systems, a DC motor replaces the windmill.

Pump Staging: A method of placing two or more pumps together to increase flow or overcome head losses. Series-staged pumps are placed in the same line and increase the head. Parallel-staged pumps are placed in two separate lines, feeding a common line and increase the flow rate.

Renewable energy: Flows of energy that are regenerative or virtually inexhaustible. Most commonly includes solar (electricity and thermal), biomass, geothermal, wind, tidal, wave, and hydropower sources.

Retrofit: To update an existing structure or technology by modifying it, as opposed to creating something entirely new from scratch. For example, an old house can be retrofitted with advanced windows to slow the flow of energy into or from the house.

Risers: Flow passages (pipes or channels) that distribute heat transfer fluid across the absorber panel in a collector.

Sealed Piston Pump: A type of pump in which water is drawn in and forced out of a chamber by a piston mechanism. The pistons have a very short stroke, allowing the use of flexible gaskets to seal water out of the piston mechanism. Check valves let water into and out of the chamber.

Sensor: Sensing device that changes its electrical resistance according to temperature. Used in the control system to generate input data on collector and storage tank temperatures.

Silicon: A non-metallic element that, when specially treated, is sensitive to light and capable of transforming light into electricity. Silicon is the basic material of beach sand, and is the raw material used to manufacture most photovoltaic cells.

Solar Collectors: A solar collector is a device designed to absorb incident solar radiation and to transfer the energy to a fluid passing through it.

Solar Radiation: The sun's energy that comes to earth in the form of direct, diffuse and reflected rays.

Solar Storage: A water tank or rock bed that absorbs collected solar energy and holds it until needed.

Solar Thermal: Solar thermal energy systems capture the sun's free energy and convert it into heat. The most common applications in developing countries are heating water, food processing, crop drying and space heating in colder climates.

Stand-alone Photovoltaic System: A solar electric system commonly used in remote locations that are not connected to the main electric grid. Most stand-alone systems include some type of energy storage, such as batteries or pumped water.

Static Water Level: Depth to the water surface in a well under static conditions (not being pumped). May be subject to seasonal changes or lowering due to depletion.

Submergence: Applied to submersible pumps: Distance beneath the static water level, at which a pump is set. Synonym: immersion level. Total Dynamic Head - vertical lift + friction loss in piping (see friction loss).

Submersible Pump: A motor/pump combination designed to be placed entirely below the water surface.

Suction Lift: Applied to surface pumps: Vertical distance from the surface of the water in the source, to a pump located above surface pump located above. This distance is limited by physics to around 20 feet at sea level (subtract 1 ft. per 1000 ft. altitude) and should be minimized for best results.

Surface Pump: A pump that is not submersible. It must be placed no more than about 20-ft. above the surface of the water in the well.

Sustainable: A term used to characterize activities that can be undertaken in such a manner as to not adversely affect the environmental conditions (e.g., soil, water quality, climate) necessary to support those same activities in the future.

Thermostat: Temperature sensing device which is used to switch mechanical equipment on and off.

Thermosyphon: Passive solar systems that rely on the natural convection of liquids to collect energy. Designed with the tank above the collection surface.

Transfer Fluid, Heat: The heat transfer fluid is the medium, such as air, water or other fluid, which passes through the solar collector and carries the absorbed thermal energy away from the collector.

Unglazed Collector: A collector with no transparent cover plate.

Vane Pump: (Rotary Vane) A positive displacement mechanism used in low volume high lift surface pumps and booster pumps. Durable and efficient, but requires cleanly filtered water due to its mechanical precision.

Vertical Lift: The vertical distance that water is pumped. This determines the pressure that the pump pushes against. Total vertical lift = vertical lift from surface of water source up to the discharge in the tank + (in a pressure system)

discharge pressure. Synonym: static head. Note: Horizontal distance does NOT add to the vertical lift, except in terms of pipe friction loss. NOR does the volume (weight) of water contained in pipe or tank. Submergence of the pump does NOT add to the vertical lift in the case of a centrifugal type pump. In the case of a positive displacement pump, it may add to the lift somewhat.

Voltage/Volts: The amount of electricity pressure, which causes the flow of electricity through the circuit. Typically 12 volt DC for panels/batteries or 120/220 volts AC for appliances.

Watts: The measure of electrical power. Volts x amps = watts.

Watt-Hour: The quantity of electrical energy used or produced when one watt is used for one hour.

GENERAL FINANCIAL TERMS

Accounting: Is the process of recording, classifying, summarizing, communicating and interpreting the economic events of a business or organization to interested users.

Accounts payable: Amounts of money owed to others. These are current liabilities incurred by a company during the normal course of business.

Accounts receivable: Amounts of money owed to a business by customers who purchase goods or services on credit. On the balance sheet, these are current assets.

Accrual basis accounting: An accounting method that recognizes expenses when incurred and revenue when earned rather than when payment is made or received.

Asset: Something of monetary value owned by a business or individual.

Balance sheet: An accounting report that summarizes a firm's financial position at a specific date by listing assets, liabilities and owner's equity.

Bonds: Long-term promissory note or debt instrument issued by public and private institutions.

Break-even: The point where the level-of-sales is such that, total revenues equal total costs. Break-even analysis serves as a guideline to determine how changes in the volume of sales affect earnings.

Budget: An estimated amount of expected income and expense for a specified future period of time. It is a formal financial summary of management plans that allows the communication of previously agreed upon objectives and once approved it is used for evaluating performance.

Budget-forecast-actual: A comparison between actual results with planned objectives.

Business cycle: The regular but recurring periods of change in economic activity over time. It is characterized by periods of expansion, abundance, contraction and recessions.

Business plan: A formal written strategy that specifies the steps to be undertaken in order to carry out a specific activity and reach the planned objectives of the organization. It is a document that details the past, present and future of a company usually designed to attract capital investment.

Cash basis accounting: An accounting method that records revenue when is received and expenses when they are paid.

Cash flow: The amount of net cash available in a firm as a result of its operations. It is calculated by adding non-cash expenses such as depreciation to net income after taxes and it helps determine a firm's level of liquidity.

Contribution (margin, percentage): The contribution margin is the amount of revenue remaining after deducting variable costs from total sales. This margin is the amount available to cover fixed costs and to contribute to income. If you divide the contribution margin by total sales you can obtain the contribution margin ratio. This ratio helps you determine the effect of changes in sales on income.

Controller, Comptroller: An organizations chief accounting officer responsible for the establishment and maintenance of the firm's accounting system.

Corporation: A business organized as a legal entity separate from its owners, distinguished by having limited liability, easy transfer of ownership and unlimited life.

Cost of goods sold: The total cost of products sold during a specific period. It is equal to beginning inventory plus cost of goods purchased minus ending inventory.

Credit: An accounting entry that records a decrease to assets and an increase to liabilities and owner's equity. It is also the ability to borrow or purchase goods and services without having to pay on delivery.

Current ratio: A liquidity measure that helps determine a company's short-term debt paying ability. It is obtained by dividing current assets by current liabilities.

DBA, doing business as: Used to signify that a company is operating using a name other than its legally incorporated name.

Debentures: A long-term unsecured debt instrument. It usually applies to unsecured bonds of a corporation.

Debt (senior, junior): Words used to prioritize the order in which debt is going to be repaid or claimed in the event of liquidation.

Debt to equity ratio: It is computed by dividing owner's equity into long term debt and it shows the relationship between long term funds provided by creditors and funds provided by owners.

Due diligence: Pertains to the process leading up to an investment. Including among other things a review of financial statements, market assessment, economic conditions and management background.

Equity: In accounting terms is the funds contributed to the firm by stockholders through direct payment or retained earnings. Also known as owner's equity.

Exit strategy: Is a component of an investment plan that sets forth one or more mechanisms for an investor to liquidate their original investment plus earn a return. Examples of exit strategies include among others, initial public offerings and buyback agreements from other shareholders.

Financial plan: The process of determining the financing needs of a firm including a strategy for obtaining those funds.

Financial Reporting: Reports that provide financial statistics relative to an organization's operations and financial condition.

Grants: An amount of money that doesn't need to be repaid.

Gross domestic product (GDP): Total value of goods and services produced by a country (residents and non-residents) per annum.

Gross national product (GNP): GDP + income residents receive from abroad for labor and investments, less similar payments made to non-residents who contributed to the domestic economy.

Gross profit: Total sales revenue minus cost of goods sold. Gross profit does not take into account selling and administrative expenses.

Income statement: A financial statement that reports revenue and expenses and resulting net income or net loss for a specified period of time.

Insolvency: The inability to meet debt obligations.

Inventory: The amount of raw materials, work in process and finished goods owned by a company and ready for sale during the course of business.

ANNEX G

Investor: An institution or individual who provides funds to others through risk capital (equity) by purchasing income-producing assets. (eg. shares). Someone that puts money into a project or other assets in exchange for income returns or interest.

Lenders: Institutions or individuals that provide funds (eg. Loans) with a specified interest rate and repayment period.

Limited liability companies: A business form that makes its owners responsible for no more capital than they have personally invested in the business. Thus, stockholders only lose the amount paid for the shares of ownership regardless of the firm's financial obligations.

Limited partner: A member of a limited partnership that enjoys limited liability. He or she is not liable for the debts of the partnership.

Management: The individuals directing, handling and controlling the affairs of a business.

Market analysis: A study of the economic environment including among others market structure, size, competition, barriers and, growth potential.

Market penetration: The portion of a particular market that a company has been able to acquire.

Mezzanine debt: After initial capital is raised for a company there exists a period of time when combinations of debt convertible to equity is a viable tool to finance a company. These debt instruments, which sometimes are accompanied with warrants (an option to purchase stock) and are often convertible to equity, are grouped together under the heading of mezzanine debt, meaning it is between start-up capital and conventional debt. It is also sometimes referred to as quasi equity.

Net income: The income that remains after all expenses including taxes have been deducted from revenues. Also called net profit.

Non-compete agreement: An agreement between parties under which one party promises not to engage in certain business activities in a particular region.

Non-disclosure agreement: A confidentiality agreement.

Operating costs: Expenses incurred during the normal course of business with the exception of interest expense, taxes and cost of goods sold.

Partnership: A business form owned by two or more people who agree to share both, profits and losses.

Payback strategy: The mechanism to be followed in order to fulfill a firm's corresponding debt obligations.

Per capita GNP: GNP divided by the country's population total.

Personal guarantee: A personal pledge, tangible object or formal assurance given as security for a debt obligation.

Preferred shares: A type of security that shows ownership of a company and has preference over common shares in the payment of dividends and claims of assets.

Projections: The calculation of future costs, revenues, rates of growth and the like.

Prospectus: A formal document that discloses information relating to a new securities offering including, information about the issuing company, financial data, proposed business plan, list of its officers, description of its operations and, any pending litigation.

Quick ratio: A liquidity measure computed by dividing current liabilities into all current assets with the exception of inventory. It helps determine a company's ability to meet its immediate short -term debt obligations.

Ratios (financial): A relationship between two or more sets of financial data points with the purpose of tracking the performance of a company.

Return on equity: It is calculated by dividing owner's equity into net income after taxes and it's a measure of the net

income that a firm is able to earn as a percent of the stockholder's investment.

Return on investment: It is calculated by dividing total assets into net income after taxes and it measures the firm's effectiveness to generate income from available assets.

Sales: It represents revenue exclusively from the sale of goods and services.

Soft loans: A loan with below market rate and terms and even possible forgiveness.

Sole proprietor: The one and only owner of a business who is, personally liable for all the financial obligations incurred by his or her company.

Stock offering: A new issue of securities.

Stock, shares (common, preferred): Securities that show ownership in a corporation and if preferred give the holder a claim prior to the claim of common stockholders on earnings and in the event of liquidation also on assets.

Strategy, tactics: A plan, method or procedures used to obtain a specific goal or result.

Vision and mission: The goals and objectives of an organization.

Working capital: Is computed by subtracting current liabilities from current assets and it represents the amount of funds a firm needs to cover its current obligations. Thus, it also serves as a measure of liquidity.

ABBREVIATIONS

Bbl:	Barrel (of oil), 159 litres
Bcm:	Billion cubic meters (10^9 m^3)
Btu:	British thermal unit (1 Btu = 1055.06 J)
CNG:	Compressed Natural Gas
GJ:	Gigajoule
GtC:	Gigatonnes (elemented) carbon (10^9 tonnes C)
Gtoe:	Gigatonnes oil equivalent (10^9 tonnes oil equivalent)
GW:	Gigawatt (10^9 watts)
KW:	kilowatt
LPG:	Liquefied Petroleum Gas
Mtoe:	Million tonnes oil equivalent
MWh:	Megawatt hour
toe:	Tonnes oil equivalent
TWh:	Tera watt hours (10^{12} watt hours)

ENERGY EQUIVALENTS

1 million metric tonnes of oil is equivalent (toe) to:

- 1.5 million tons of coal
- 1.2 billion cubic meters of natural gas
- 2.5 million tons of fuelwood
- 4 terawatt hours of electricity
- 2 metric tons of uranium (fast reactors)

1 barrel of oil = 159 liters
= 42 gallons (US)
= 35 gallons (UK)

CONVERSIONS

Electrical power is measured in watts

ANNEX G

1,000 watts (W) = 1 kilowatt (kW)
1,000 kilowatts = 1 megawatt (MW)
1,000 megawatts = 1 gigawatt (GW)
1,000 gigawatts = 1 terawatt (TW)

The kilowatt-hour (kWh) measures the amount of electrical energy supplied or consumed.

1,000 kWh = 1 megawatt hour (mWh)
1,000 mWh = 1 gigawatt hour (GWh)
1,000 GWh = 1 terawatt hour (TWh)

1 calorie (cal) =
4.196 Joule (J)

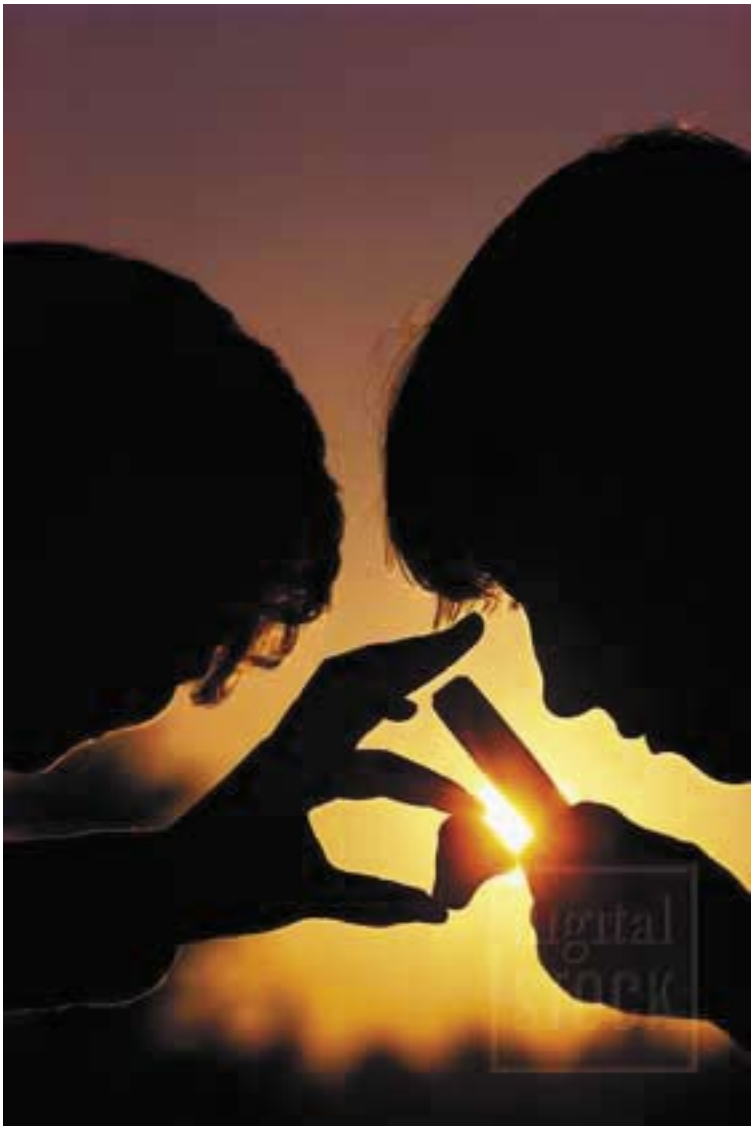
1 quad (quadrillion Btu) =
$1.05x10^{18}$ Joules (J)
1.05 exajoules (EJ)
$3.60x10^{5}$ metric tons, coal
$1.72x10^{6}$ barrels, oil
$2.36x10^{5}$ metric tons, oil
$2.83x10^{10}$ cubic meters, gas
$1.07x10^{12}$ cubic feet, gas
$2.93x10^{2}$ terawatthours

1 kilowatt-hour =
$3.41x10^{3}$ British thermal units (Btu)
$3.6x10^{6}$ Joules (J)

Joule =
$9.48x10^{-4}$ British thermal units (Btu)
$2.78x10^{-7}$ kilowatt-hours (kWh)
0.239 Calorie (cal)
(generally thought of as the energy content of a match tip)

1 British thermal unit (Btu) =
$2.93x10^{-4}$ kilowatt-hours (kWh)
$1.05x10^{3}$ Joules (J)

1 barrel of oil =
Approx. 0.136 tones



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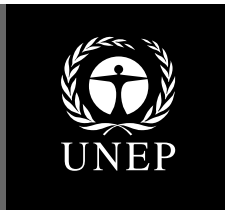

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