USAID
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AILEG Analysis and Investment for Low-Emission Growth

Clean Energy Lending Toolkit

THE AILEG PROJECT

Contract No. EEM-I-00-07-00004-00
Task Order No. AID-OAA-TO-11-00041

FEBRUARY 2014

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For

U.S. Agency for International Development

Office of Economic Policy
Global Climate Change Office
Office of Microenterprise and Private Enterprise Promotion
Bureau of Economic Growth, Education, and Environment

By

Enclude (formerly ShoreBank International Ltd. and Triodos Facet)
Abt Associates

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DISCLAIMER

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ACKNOWLEDGMENTS

The Clean Energy Lending Toolkit was written by Lauren Moser Counts (Enclude/ShoreBank International, Project Team Manager), Nienke Stam (Enclude/Triodos Facet), Katherine Vilnrotter (Enclude/ShoreBank International), Manuel Alegre (Enclude/ShoreBank International), Arjan Visser (Enclude/Triodos Facet), Alex Blake (Enclude/ShoreBank International), Marcia Gowen Trump (Abt Associates), and Eric Hyman (USAID/Economic Growth, Education, and Environment Bureau, Office of Economic Policy, Capacity Building Division). Marcia Gowen Trump provided technical and managerial input as Chief of Party for the prime contractor, Abt Associates. Before the document was finalized, ShoreBank International merged with Triodos Facet (its sister organization in the Netherlands) and the joint organization is now operating under the name Enclude.

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ACRONYMS

AC	Air Conditioning
AEFS	Associated Energy Financial Savings
AILEG	Analysis and Investment for Low Emission Growth
BOD	Biological Oxygen Demand
BOOT	Build-Own-Operate-Transfer
CO_2	Carbon Dioxide
CE	Clean Energy
CDM	Clean Development Mechanism
COD	Chemical Oxygen Demand
DCA	Development Credit Authority
DFI	Development Finance Institution
E3	Bureau of Economic Growth, Education and Environment
EBRD	European Bank for Reconstruction and Development
EEIC	Energy Efficiency Investment Cost
EE	Energy Efficiency
EP	Economic Policy
EPC	Energy Performance Contracting or Engineering, Procurement, and Commission
ESCO	Energy Services Company
FI	Financial Institution
GABV	Global Alliance for Banking on Values
GHG	Greenhouse Gas
HVAC	Heating, Ventilation, and Air-conditioning
ICO	Improved Cooking Oven
IDC	Industrial Development Corporation
IFC	International Finance Corporation
IRR	Internal Rate of Return
IT	Information Technology
JI	Joint Implementation
LIBOR	London Interbank Offered Rate
MFI	Microfinance Institution
MPEP	Micro-Enterprise and Private Enterprise Promotion
NPL	Non-Performing Loan

O&M	Operations and Maintenance
OMR	Operating, Maintenance and Replacement
PFI	Partner Financial Institution
PPA	Power Purchase Agreement
PV	Photovoltaic
RAROC	Risk-Adjusted Income/Return on Capital
RE	Renewable Energy
RES	Renewable Energy System
RoSEFF	Romania SME Sustainable Energy Finance Facility
SABS	South African Bureau of Standards
SANEDI	South African National Energy Development Institute
SBI	ShoreBank International Ltd.
SPBP	Simple Payback Period
SPC	Special Purpose Company
SME	Small and Medium Size Enterprise
SWH	Solar Water Heater
SWOT	Strengths, Weaknesses, Opportunities, and Threats
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development
USG	United States Government

CLEAN ENERGY LENDING TOOLKIT

MODULE 1: IMPLEMENTER'S GUIDE

PURPOSE

This module presents an overview of the purpose and content of the Toolkit.

HOW TO USE THIS MODULE

A read-me-first reference.

Solar panel installation in Brazil. *Photo Credit: USAID*

CLEAN ENERGY LENDING TOOLKIT

MODULE 1: IMPLEMENTER'S GUIDE

1.1 WHAT IS CLEAN ENERGY AND WHY IS IT IMPORTANT?

Despite huge investments in the energy sector, as of 2012 there were nearly 1.3 billion people without access to electricity and nearly 2.6 billion people lacked access to clean cooking equipment and fuels.[1] Sustainable development challenges will increase with population and income growth. Energy demand increases in emerging markets are likely to drive the global market. Large increases in conventional energy (fossil fuels and nuclear power) consumption could increase prices and emissions of air and water pollutants that jeopardize human health and the natural environment as well as greenhouse gases (GHGs) associated with global climate change.

Clean energy (CE), also known as sustainable energy, has been defined as any energy source that meets the needs of the present without compromising the ability of future generations to meet their needs.[2] CE encompasses both energy efficiency and renewable energy as both can reduce use of non-renewable energy and minimize environmental pollution and GHG emissions.

Energy efficiency (EE) investments reduce the amount of energy required to produce products and services through technological improvements in equipment for energy generation, storage, transmission and distribution, or use.

This Toolkit focuses primarily on energy efficiency measures in buildings and industry

- **Buildings:** Lighting, air-conditioning, heating, office equipment, insulation and double glazing. Energy-saving techniques in commercial and residential buildings are attractive to building owners or tenants who pay utility bills.
- **Industry:** Production processes (such as water heating and air compression), motors, and steam systems require significant amounts of energy.

Renewable energy (RE) is produced by naturally occurring, self-replenishing sources or processes. Types of RE discussed in this Toolkit include

- **Hydropower:** Transformation of the force of moving water into mechanical energy and then into electrical power
- **Biomass:** Biological material from agricultural and forestry activities that can be converted into useful forms of energy
- **Biogas:** Combustible gas produced by a process called anaerobic digestion, wherein bacteria break down liquid organic matter in the absence of oxygen

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[1] International Energy Agency, Organization for Economic Co-operation and Development, "World Energy Outlook 2012 Factsheet: How Will Global Energy Markets Evolve to 2035?" accessed July 23, 2013, http://www.worldenergyoutlook.org/media/weowebsite/2012/factsheets.pdf.

[2] Florida Renewable Energy Association, "Clean Energy Defined," accessed July 23, 2013, http://cleanenergyflorida.org/clean-energy-defined/.

- **Solar Energy:** Sunlight can be used to heat water or buildings and can be converted into electrical energy via photovoltaic (PV) panels
- **Wind Power:** Conversion of wind energy into electricity or mechanical energy via technologies such as wind turbines, windmills, or wind pumps.

These types of renewable energy can be implemented in stand-alone systems or grid-connected systems. **Stand-alone systems** are not connected to a public (national) grid. The energy is consumed locally, either immediately or after storage in a battery. **Grid-connected systems** allow electricity produced by renewable sources to be distributed to more distant users in one or more countries or a sub-national region. Mini-grid projects serve a local distribution system that is not connected to the national grid. An example of a mini-grid system would be solar PV for all or part of a village.

CE financing has not been a priority of the financial institutions (FIs) or the capital markets in most developing countries. Perceptions of CE investments have lagged behind their actual viability, because of past issues of cost competitiveness, the ease of financing conventional fuels and large-scale power systems, energy pricing disincentives, difficulties in contract enforcement, a weak policy and regulatory environment and high transaction costs in reaching small or remote borrowers. FIs in developing countries often lack the loan products, systems and market knowledge to serve the CE lending market effectively and efficiently. There are distinct differences between EE and RE markets that are critical for designing appropriate credit products and systems.

CE investments require sufficient capital on terms that help ensure their sustainability and profitability. In many countries, FIs have lacked an understanding of the requirements for lending to CE projects or have only achieved a limited market penetration rate. Financing constraints for CE has resulted from a lack of specialized lending programs or unsuitable loan terms. These loans are sometimes too short term and not matched to cash flows or savings from energy use and large collateral requirements are needed due to perceived high risks. If FIs can improve their skills and systems for CE lending, this market segment can be profitable and expand. These investments can help diversify energy sources and build new, high-growth domestic industries that can reduce pollution and GHG emissions while increasing economic growth and energy security. FIs need rigorous lending capabilities to ensure the sustainability and profitability of CE financing products. FIs may face supply-side constraints such as the lack of specialized funding processes and procedures for decentralized SMEs. Demand-side constraints of potential CE borrowers include limited access to medium and long-term financing, inappropriate lending terms and conditions, and perceived high risks that lead to high collateral requirements.

CE lending is part of a larger global movement in the industry toward sustainable banking, in which the markets and products support investments in long-term environmental, social, and economic viability. Changes in the capital markets have helped

> The charter of the Global Alliance for Banking on Values:
>
> "Social and ecological criteria must play a critical role in the creation and use of financial products. All banks must use indicators to report social and ecological impact which should also be used within the regulatory framework."
>
> BERLIN DECLARATION PRESS RELEASE, MARCH 13, 2013
>
> http://www.triodos.com/en/about-triodos-bank/news/press-releases/gabv-berlin-

drive expansion of CE investments because these projects can present good business opportunities for growth in lending. New energy loan products can help FIs reach new customers and deepen relationships with existing customers.

CE investments can help FIs market new and existing products, support the growing EE and RE industries, and leverage the increasing consumer interest in buying sustainable products. CE lending is an important component of the fast-growing sustainable banking industry that is being capitalized with significant private investment flows from diverse sources. Many major FIs have been trying to position themselves in this expanding market segment. By successfully navigating CE lending, an FI will be well-placed to leverage access to the broader sustainable banking market.

Multinational, national, and local banks have increasingly focused on financing sustainable "green" economies. The Global Alliance for Banking on Values (GABV) is an independent network of 22 member banks on six continents that was founded in 2009 (www.GABV.org). The GABV demonstrates the power of finance to deliver sustainable development for underserved people, communities, and the environment (see box).

Worldwide, developed and developing countries are now mobilizing more CE financing with donor and private sector participation. Examples of some international lending programs that have been created over the past decade include the Clean Investment Fund, Clean Technology Fund, and the Green Fund, all spearheaded by the UNFCCC and its multilateral development bank partners.[3]

1.2 PURPOSE AND COMPONENTS OF THE CLEAN ENERGY LENDING TOOLKIT

This toolkit was developed to help FIs gain a greater understanding of CE market opportunities, systems and products needed for effective lending in this sector to consumers, small and medium-sized enterprises (SMEs), energy service companies (ESCOs)[4], and project implementers. The United States Agency for International Development (USAID) supported this Toolkit to increase investments in market-ready, renewable energy and energy efficiency systems through The Analysis and Investment for Low-Emission Growth (AILEG) Project.[5] USAID's prior financial sector support through projects like the Microenterprise Access to Banking Services (MABS) program in the Philippines have provided tools and technical assistance to banks interested in developing microfinance products targeting underserved rural populations.[6] The MABS program produced two toolkits ("A Toolkit for Banks" and "Project Management Toolkit") as well as instructional videos and documentaries to support the program's initiative to expand access to financial services within the microenterprise sector. While MABS was

[3] Heinrich Böll Stiftung and Overseas Development Institute, "Climate Funds Update: The Latest Information on Climate Funds," accessed November 19, 2013, http://www.climatefundsupdate.org/resources/finance-fundamentals.

[4] The definition of ESCO used in this toolkit is limited to entities that contract projects that generate loan repayment through realized energy cost savings. They usually specialize in a specific energy saving technology or building system (such as HVAC or combined heat and power).

[5] Additional resource - USAID: Coping with the Energy Challenge, EnergyToolbox,.org, Training and Field Support Toolkit, and the Diagnostic Tool: http://www.energytoolbox.org/cec/1.shtml

[6] USAID, Microenterprise Access to Banking Services (MABS):

MABS Official Website: http://www.rbapmabs.org/home/index.html,

MABS Final Report: http://mabs4finalreport.wordpress.com/

intended to guide banks seamlessly through the development and implementation of a microfinance unit, several of the tools produced by MABS are also useful when entering the CE finance market and have therefore been incorporated into this document.

This toolkit takes banks through the process of developing a sector specific strategy (internal and external), product development and implementation. It also provides a background on relevant technologies in the CE sector and resources for more information. This Toolkit describes processes, procedures, formats and case studies to help the financial industry

- Determine the profitability and viability of CE lending to consumers, SMEs, ESCOs, and project implementers;
- Conduct an audit of internal capabilities and needs to successfully serve this market;
- Create credit products and processes for lending to CE companies; and
- Understand how others have started or expanded CE lending.

The Toolkit explains the steps involved in deciding whether and how to finance CE technologies. It contains six modules to guide users through decisions on whether to lend to the CE market and how to structure products and systems for lower risk and greater profitability. The first four modules are intended to be used sequentially by a financial institution that is beginning to consider CE lending. Financial institution staff can understand most CE technologies by reading Module 5 first.

Module 1. IMPLEMENTER'S GUIDE: Toolkit overview and content summary

Module 2. MARKET DIAGNOSTIC: What are profitable CE lending markets?

Module 3. INSTITUTIONAL READINESS: Internal assessment of an FI's lending ability, needs and development of a strategic plan

Module 4. CREDIT PRODUCT DEVELOPMENT: What loan products should be developed and what is the business plan or implementation plan for them? What changes in processes and staffing are needed? Do CE lending templates need to be developed?

Module 5. TECHNOLOGY OPTIONS: A short primer on potential CE systems

Module 6. CASE STUDIES: Successful CE lending by selected banks

The Implementer's Guide (Module 1), lists the elements of the Toolkit and the purpose and goals for CE lending. The Market Diagnostic (Module 2) can help FIs conduct an external market mapping or assessment to identify profitable CE lending market segments and opportunities for growth. After an FI has concluded that the CE market in its service territory looks promising, the next step is to determine its institutional readiness for lending. The Institutional Readiness chapter (Module 3) will help FIs to assess their internal capacity and needs and develop a strategic and operational plan for entering or expanding CE lending. The use of this module may result in the realization that the institution is not ready to expand into the CE market and move onto the next module. In these cases, the institution may refer to a set of institution building resources produced by USAID's MABS program. This extensive set of tools can assist interested financial institutions in building up internal capacity to the point where

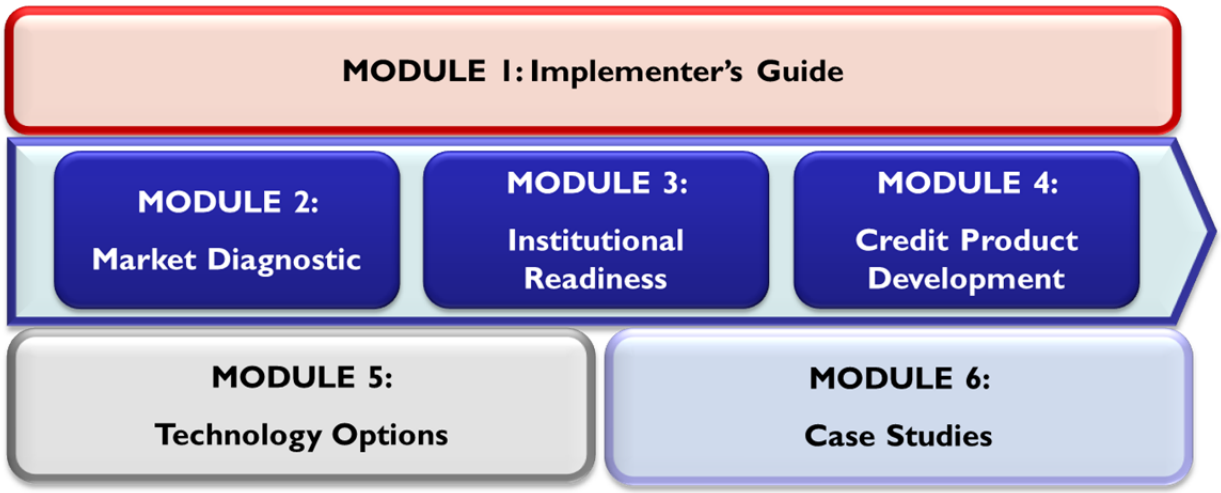
they can then progress to the sector specific capacity development tools in this toolkit (discussed in Module 4 Credit Product Development).

After potential opportunities for CE lending have been identified in a strategic plan, the Credit Product Development section (Module 4) helps FIs design appropriate loan products and internal processes (management, operations, and reporting) for CE financing. The Technology Options section (Module 5) provides background information on EE and RE systems to acquaint lenders with the risks and advantages of CE lending to consumers, SMEs, ESCOs, and project implementers. It is important to distinguish among the various categories of CE because the appropriate lending products, processes, and needs may vary due to differences in the capital intensity, payback period, timing of cash-flows, or supply terms with the grid operator. An FI will need to conduct separate RE and EE market diagnostics and develop a suite of appropriate lending products for the various EE/RE market segments.

Module 6 contains some case studies of successful CE lending programs in Honduras, the Peru, Romania and South Africa.

Figure 1.1 shows the relationships among the six modules. These modules offer FIs a comprehensive suite of resources to develop the capacity, systems, and information needed to prudently enter or ramp up CE financing.

Figure 1.1: Components of the Clean Energy Lending Toolkit



The Toolkit is generic in that it addresses broad but critical lending needs, options, products, and processes for various types of CE system. The modular structure allows FIs to select some or all the tools as needed. FIs are also encouraged to customize the tools to their internal processes and systems.

Because of differences in markets and the capabilities and size and types of FIs, lending products may need to be structured to fit different circumstances. The Toolkit also addresses the implications of the different type of CE technologies and users for loan criteria, bundling, and marketing.

1.3 RELATIONSHIP BETWEEN CE FINANCING AND CARBON CREDITS

The first carbon markets emerged from the 1997 Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC). The Kyoto Protocol sought to curtail excess greenhouse gas emissions by creating a ceiling on GHG emissions and allocating emission rights (sometimes called

credits) to participating countries, which then allocate them to sub-regions or GHG emitters. Under a "cap and trade" system, owners of emission rights can either use them or reduce their emissions and sell surplus rights. The rationale for this system is that the total emissions can be reduced in the least costly way, instead of mandating reductions in more expensive ways. Conversely, companies that surpass their allotted emissions must buy more credits. Administrators of the trading scheme can adjust the ceiling over time to bring down total emissions as technologies and costs change. Emission rights for the various greenhouse gases are measured in terms of the equivalent amount of carbon dioxide (CO_2) based on their relative effects on global warming.

This approach provides a financial incentive for GHG mitigation investments as an alternative to a pure regulatory approach. The main challenges faced in carbon emission trading are in setting the emission ceilings, distributing the credits, ensuring mandatory participation, and maintaining strict enforcement to ensure a sufficiently large impact.

The European Union established the first regional GHG emission trading system within its borders in 2005.[7] It also participated in the market for carbon credits from developing countries under the Clean Development Mechanism (CDM) and from Eastern and Central European countries under the Joint Implementation (JI) mechanism. Greenhouse gas emission trading systems have also been implemented in some states in the United States of America and some regions in China.

In mid-2013, the carbon market in Europe and the CDM and JI markets suffered from very low carbon prices caused by emissions ceilings that were too high to create an incentive to investing in reducing GHG emissions. Although the EU has discussed reducing the emission ceilings to boost carbon prices, member countries were unable to reach a political agreement to improve incentives for mitigation investments. However, many CE solutions have become cheaper over time and prices of GHG-intensive sources of electricity and conventional fuels have risen, making more CE investments financially viable now without the additional incentives from carbon credits.

1.3.1 Resources

For more information on carbon credits and greenhouse "cap-and-trade" programs, please see:

- Kossoy, Alexandre, et. al. *Mapping carbon pricing initiatives: developments and prospects*. Washington, DC: World Bank, 2013, http://documents.worldbank.org/curated/en/2013/05/17751166/mapping-carbon-pricing-initiatives-developments-prospects
- Carbonfund.org: Supporting third-party validated renewable energy, energy efficiency, and reforestation projects globally to reduce carbon dioxide emissions and the threat of climate change, accessed on November 19, 2013, http://www.carbonfund.org/
- MicroEnergy Credits: A partner for microfinance institutions that are starting a Clean Energy Portfolio, accessed on November 19, 2013, http://microenergycredits.com/
- Myclimate: A leading provider of voluntary carbon offsetting measures, accessed on November 19, 2013, http://www.myclimate.org/

[7] European Commission, Climate Action, Policies, Emission Trading System. http://ec.europa.eu/clima/policies/ets/ . For additional information, see: Ellerman, A., Denny; Buchner, Barbara K.. "The European Union Emissions Trading Scheme: Origins, Allocation, and Early Results," *Review of Environmental Economics and Policy*, January 2007, pg. 66–87.

MODULE 2: MARKET DIAGNOSTIC

PURPOSE

This module helps in identifying CE lending opportunities.

HOW TO USE THIS MODULE

Assess CE lending options and markets.

Photo Credit: Abt Associates

CLEAN ENERGY LENDING TOOLKIT

MODULE 2: MARKET DIAGNOSTIC

2.1 OVERVIEW

The ***Market Diagnostic*** is designed to help an FI gauge the potential profitability of EE and RE markets. This module provides the information necessary for conducting a market assessment of CE lending opportunities. It includes a set of key market mapping questions and flow diagrams to guide decisions on whether to enter specific market segments with new or existing products and services.

The first step in building any lending business is to understand the target markets and their segmentation. Market research, mapping, and planning can address the following key questions:

- Is the local CE sector large enough to be profitable for the bank?
- What are the recent trends and projections for prices of electricity and other fuels? Who are the main market players?
- Are there any operational or financial bottlenecks in the sector?
- What are the legal and regulatory considerations, such as compulsory energy efficiency measures, and the availability and level of feed-in tariffs or power purchase agreements?
- What are the best points of entry to gain market share?
- What other factors need to be considered?

This module will help guide FIs through these and other related questions.

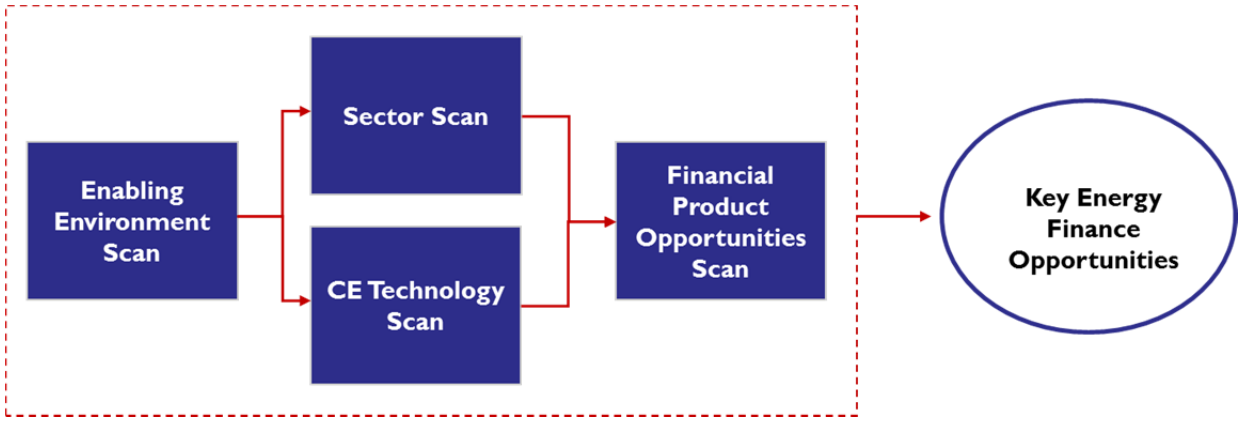
An FI needs to understand these fundamentals of its CE market (local, regional, and/or international) to develop an effective business model for achieving scale and profitability. A CE market assessment identifies the key sectors and technologies that should be targeted. It will help define the FI's CE finance strategy, map actors and their inter-relationships in the CE sector, and design the business model and loan products.

2.1.1 Elements of the CE Market Diagnostic Tool

The various EE and RE market segments need to have separate market diagnostics since each offers different levels and patterns of returns and requires different lending instruments and processes. The market diagnostic tool focuses on four focus areas (figure 2.1):

1. **Enabling Environment Scan:** Assess the enabling environment (regulatory framework, incentives, and constraints) that affect CE project development and implementation
2. **Sector (EE vs. RE) Scan:** Identify the economic sectors and sub-sectors to target for CE financing
3. **Technology Scan**: Assess the specific technologies or system optimizations suitable for CE financing and the availability of knowledge and inputs for them
4. **Financial Product Opportunities Scan**: Determine the types of financial products suitable to meet CE financing demand (section 2.3)

Figure 2.1: Elements of the Market Diagnostic Tool



Source: Chemonics, "Deepening the Microfinance Sector in Malawi," Prepared for USAID, September 2009, accessed November 19, 2013, http://pdf.usaid.gov/pdf_docs/PDACP483.pdf.

Analysis of existing and potential competition is an integral part of the sector, technology, and financial product scans. This analysis will outline the energy offerings already provided by the market and provide insight into the market segments that are still underserved. Specific flow diagrams and decision trees for each of these scan are available (figures 2.3 and 2.4).

2.2 GUIDELINES FOR MARKET MAPPING

2.2.1 Primary Implementation Steps

A full market diagnostic can take a considerable amount of time. FIs can either designate their own staff members to conduct or coordinate the market assessment or hire an outside party. If an FI decides to hire an external expert, the active participation of its senior staff is very important in defining the objectives, research questions, and methods. Some additional recommendations on working with an external market research consultant follow:

- Ensure that the terms of reference have been developed in detail and are geared to the information the FI needs to make strategic decisions. Delegating responsibility for defining the terms of reference is a too common mistake. Although market researchers know their profession, they might not have sufficient expertise in the banking industry or the CE sector or understanding of the organizational culture of their clients. FIs should develop the scoring criteria for proposals, create a shortlist of vendors, interview those within the competitive range, and obtain additional information where necessary.
- Although price is always a consideration, it is inadvisable to automatically select the lowest bidder. The FI should consider the vendors':
    - Understanding of the FI's overall needs,
    - Understanding of the local market,
    - Experience in CE,
    - Expertise of the proposed project manager and team,
    - References and work samples, and
    - Working relationship and professionalism during the procurement process

- Actively participate in development of research tools, questionnaires, sampling methods, and objectives. This is often the most important stage of ensuring that the research results in a strong outcome. The FI should assign an internal project manager to guide the market research and help ensure that each step of the process is in line with the desired deliverables. Although market researchers know how to conduct field surveys and focus groups, they are generally not financial industry or energy experts.
- Draft reports should be carefully reviewed before acceptance and full payment.
- The FI should prepare its own report that summarizes the market research data, analysis, findings, and recommendations for senior management and the board of directors.

2.3 APPROACH TO THE CE MARKET OPPORTUNITY DIAGNOSTIC

2.3.1 Enabling Environment Scan

The first step in any diagnostic is to fully understand the financial, political, regulatory, and policy environment. Many emerging and developing countries have chronic supply shortfalls of electricity and conventional fuels that hinder economic growth. This can result in high or rising real energy prices and creating a favorable climate for energy efficiency measures. At the same time, many of these countries have substantial renewable energy potential. Figure 2.2 shows the major elements of a supportive enabling environment for CE.

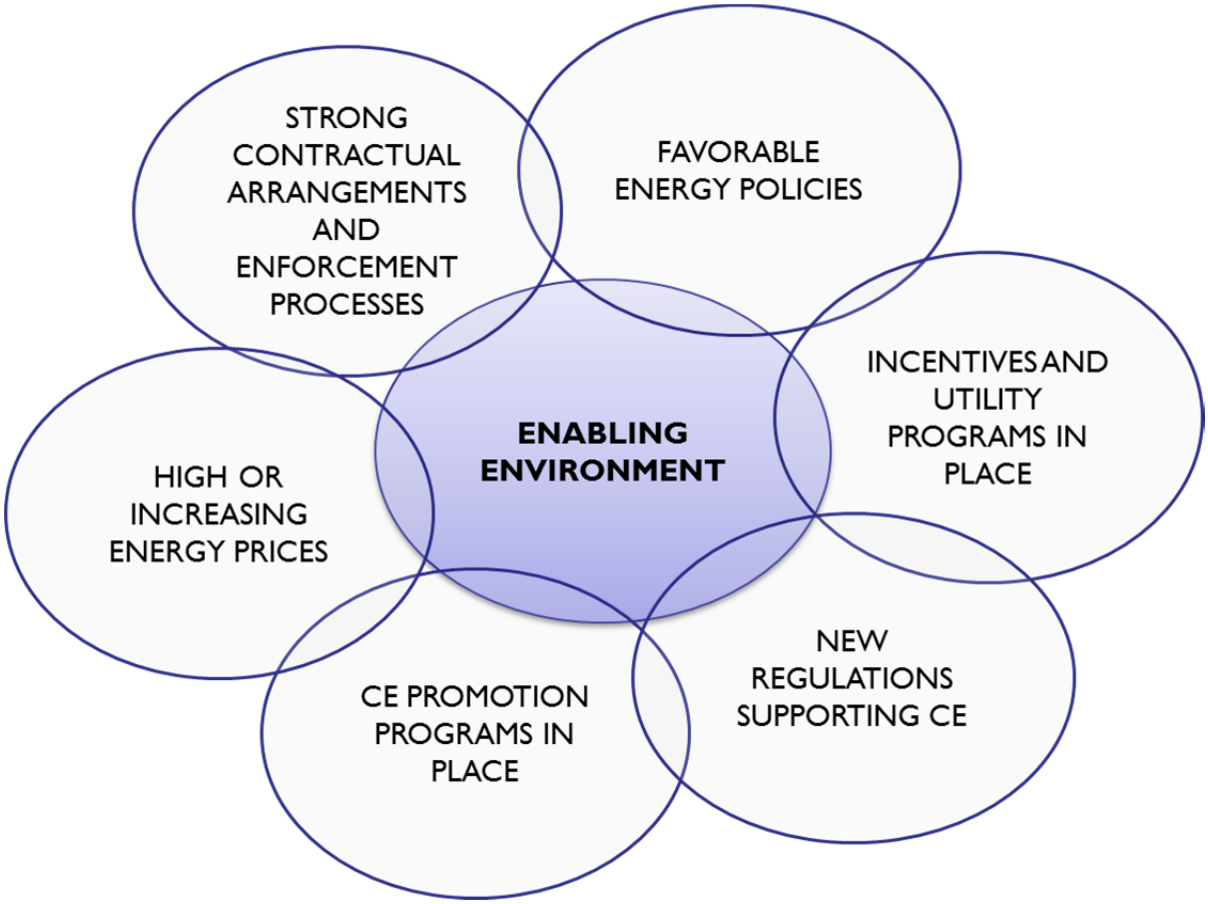
1. Energy prices trending up
2. Favorable energy policies from local and national governments
3. Utility programs and incentives looking to expand the renewable energy generation capacity
4. Tax incentives, financing programs, and disincentives
5. Regulations that support energy efficiency
6. Strong contractual arrangements and enforcement processes to support bankable contracts

Some key questions for an enabling environment scan are listed below.

Key Questions for an Enabling Environment Scan

1. What are the projected real energy prices for the next 5, 10 and 20 years?
2. What government policies (national, regional, and local) are in place to promote CE projects (e.g., feed-in tariffs and renewable energy mandates)? How do they promote uptake of specific sectors/technologies?
3. What CE incentive programs are available from utilities or energy buyers?
4. Are industry charters in place for voluntary or mandatory reductions in energy use in particular industries?
5. What other financing programs or incentives are available to decrease the cost of CE (tax deductions, credits or donor funds)?

Figure 2.2: Major Elements of Supportive Enabling Environments



2.3.2 Sector Scans

Sector scans can help tailor lending products, loan requirements and processes to the particular types of energy systems and services that the FI is considering financing. A sector scan focuses on three market segments:

1. **Energy-intensive industries:** Sectors with high energy consumption conducive to energy efficiency measures.
2. **Renewable energy producers:** Generators of renewable energy through solar, wind, biomass or geothermal.
3. **CE market players:** ESCOs, equipment manufacturers, suppliers, and installers of CE technologies.

CE financing can deepen relationships between an FI and its existing clients, who are generally less risky than new clients without a track record with the institution. A portfolio screening enables an FI to identify potential CE lending clients out of its existing customer base in other sectors and market segments.

Energy-Intensive Users with Potential Efficiency Gains

FIs may find good opportunities by focusing on the most promising market segments for EE financing. Energy efficiency lending often targets manufacturing and building construction because they often have a large potential for energy conservation through efficiency improvements. Wholesale and retail trade is another important market segment for EE lending because of the large number of firms with warehouses and logistical facilities that use substantial amounts of electricity for lighting, refrigeration, heating, and cooking. Some key questions for a portfolio screening are listed below.

Key Questions for a Sector Scan of Energy-Intensive Users

1. What are the most energy-intensive sub-sectors using electricity or fossil fuels?
2. Do the identified incentive programs promote specific sectors or sub-sectors?
3. What kind of EE measures are usually taken for each of these sub-sectors? What is the average size of EE projects?
4. What is the potential demand for external finance in each sub-sector?
5. To what extent is energy financing demand already met by other market players?

Renewable Energy Producers

Many developing countries have under-served lending and equity investment opportunities for financial institutions in the renewable energy sector. In assessing the market, grid-connected and off-grid opportunities should be distinguished:

- **Grid-connected:** Systems that produce electricity for the national or sub-national distribution system ("mains"). Examples include large- or medium- small scale solar photovoltaic, hydropower, wind farms, and biomass
- **Off-grid:** Small systems that produce energy for local use at the production site. Examples include small-scale photovoltaic, biogas digesters, and solar water heaters.

Development of large, grid-connected projects is often linked to a national incentive program that provides higher prices for electricity from renewable sources, either through a feed-in tariff or power purchase agreement (PPA).[8] The off-grid market is mainly driven by the private sector. Some key questions for a renewable energy market sector scan are listed below:

Key Questions for a Sector Scan of Renewable Energy Producers

1. What are the most viable RE generation options for medium- and large-scale, grid-connected projects? What is the average size of these investments and the range?
2. Are equity investors interested in financing energy investments?
3. Do the incentive programs promote specific RE technologies or certain sizes of projects?
4. Are existing clients in the FI's lending portfolio interested in investing in RE?
5. What are the key characteristics of the RE market? What is the estimated demand for financing?
6. Which off-grid RE investments are commercially and financially viable?

[8] Feed-in tariff programs are economic policies that use long term contracts with the goal of promoting active investment and production in renewable energy sources, while power purchase agreements are contracts between energy producers and purchasers.

CE Market Players

In many countries, manufacturers and suppliers of CE technologies, energy service companies, and technical installation companies are a growing market for commercial financing. Below are some key questions for FIs interested in targeting these providers of CE products and services.

Key Questions for a Sector Scan of CE Market Players

1. What are the key characteristics of ESCOs? How many ESCOs are active and what is their average size and range?
2. What types and amounts of finance are required for the projects implemented by ESCOs?
3. What are the capital needs of the ESCOs themselves?
4. What is the estimated demand for financing by manufacturers and suppliers of CE technologies, energy service companies, and technical installation companies?
5. To what extent are other market players already meeting this finance demand?
6. How many CE companies are manufacturing, selling, or installing solar water heaters, distributing solar PV panels and end-use products, biogas digesters, and improved cook-stoves? What are the sizes and locations of these businesses? Are they domestically or locally owned?

2.3.3 CE Technology Scan

Many energy efficiency projects consist of a series of process improvements that, when combined, can lead to substantial energy savings. Financing these projects can be complicated because the expected cost savings must be carefully analyzed. The risks to be analyzed include the likelihood that the projected savings will be realized, energy prices will be as high as expected, costs will be no higher than the estimates, and implementation will be on schedule? What are the critical assumptions and how will they be monitored during implementation?

There are also risks in renewable energy investments. For example, the amount of power that a wind farm generates depends on the amount of time that the turbines are operating, which is affected by weather, maintenance, and availability of spare parts for repairs. Solar photovoltaics are very sensitive to the amount of solar insolation and damage from bad weather or vandalism.

FIs can hire external experts to assess whether the underlying assumptions for an investment project are realistic. Large energy lenders may benefit from in-house expertise on technology risks and quality standards, which is a strong advantage for FIs with large CE programs, but this may not be feasible for smaller CE lending.

It may be desirable for FIs to connect industrial and commercial customers with suppliers of proven energy-saving technologies that are industry-specific and have attractive paybacks. FIs can also refer potential clients to energy efficiency specialists willing to share risks with the clients and the bank. Other aspects to take into consideration are 1) the spread of a technology or system optimization across sectors to reach scale and 2) the capital requirements for implementing these technologies or system optimizations. Loan sizes and repayment periods should match the current loan sizes on offer. A CE technology scan can assess which CE technologies and process optimizations are most suitable for CE lending products.

Key Questions for a CE Technology Scan

1. Which CE technologies are promoted under existing incentive programs and are budgeted resource sufficient to meet the demand?
2. Are there incentive programs for analysis of energy efficiency or substitution potential? Which types of process improvements are predominantly financed?
3. What is the average project size and payback time for these projects?
4. In which sub-sectors are process optimization projects mainly carried out?
5. What are the main CE technologies and process optimization projects offered by ESCOs?
6. Which technologies and system optimizations have been introduced most widely (number of sectors and project sizes)?
7. What are the returns and payback periods for these technologies or system optimizations?
8. Who are the main providers of renewable energy technologies? Which ones have agents in the country or local Area? What brands are most commonly used?
9. What quality standards have been set by government or multilateral donor (such as The World Bank) renewable energy projects?
10. What warranty or service contracts are provided by the manufacturer?

2.3.4 Key Financial Product Opportunities

After selecting key sectors and CE technologies to target for CE lending, FIs should determine the types of finance products best suited to meet the customer demand. A key challenge for energy efficiency finance is that average loan sizes are relatively small in many sectors. Therefore, it is important to structure financing and delivery mechanisms to aggregate small loans and keep transaction costs down. For instance, FIs can use ESCOs or franchisors as agents or provide wholesale loans to retail financial institutions. This could also apply to small-scale, off-grid renewable energy projects.

Medium and large-scale, grid-connected, RE projects are often characterized by greenfield conditions, the lack the example of similar projects in comparable areas of the country. Project developers often need to acquire environmental permits and connection licenses, which can take quite a long time. Furthermore, these projects often require project financing tied to government feed-in tariffs or the power purchase agreements with utilities.

Financing of CE market players often entail the use of equipment inventories as partial collateral. Some key questions for identifying key financial product opportunities follow.

Key Questions for a Financial Product Opportunities Scan

1. What is the demand for energy financing in the identified sectors by average loan size, duration, and type of finance (e.g., equipment finance, bridge finance[9])?
2. What is the demand for financing for specific CE technologies by average loan size, duration, and type of finance?
3. What kind of non-collateral guarantees can an FI obtain from borrowers?
4. What CE products are already available in the market?
5. What organizations or companies could serve as loan aggregators?

[9] A bridge loan is a type of short-term loan pending the arrangement of larger or longer-term financing.

2.4 MARKET OPPORTUNITY DIAGNOSTIC SUMMARY

Figure 2.3 shows the types of outcomes that may result from the four types of market diagnostic scans discussed above. The various market scans will provide insights on the following issues:

- Whether the enabling environment is favorable for CE lending to the targeted clients,
- Priority sub-sectors and their estimated potential financing demand,
- Proven technologies with wide applicability in the selected sub-sectors, and
- Financial products and delivery mechanisms suitable to meet the identified financing demand in the selected sectors.

Figure 2.4 summarizes how the outcomes of the various scans link together and result in the identification of financial products and delivery mechanisms suitable to meet the projected demand in these sectors.

Figure 2.3: Potential Outcomes of the Market Diagnostic

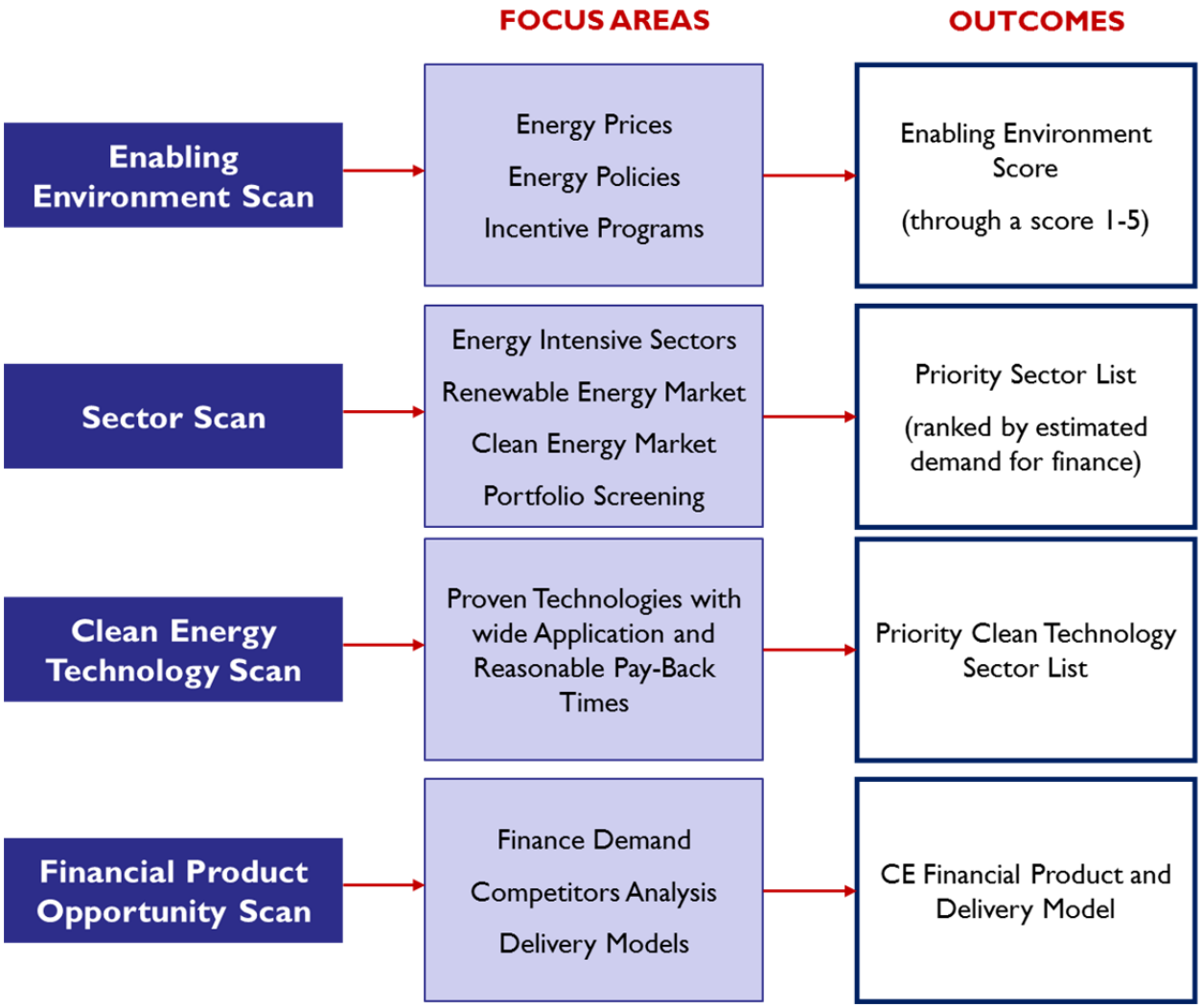
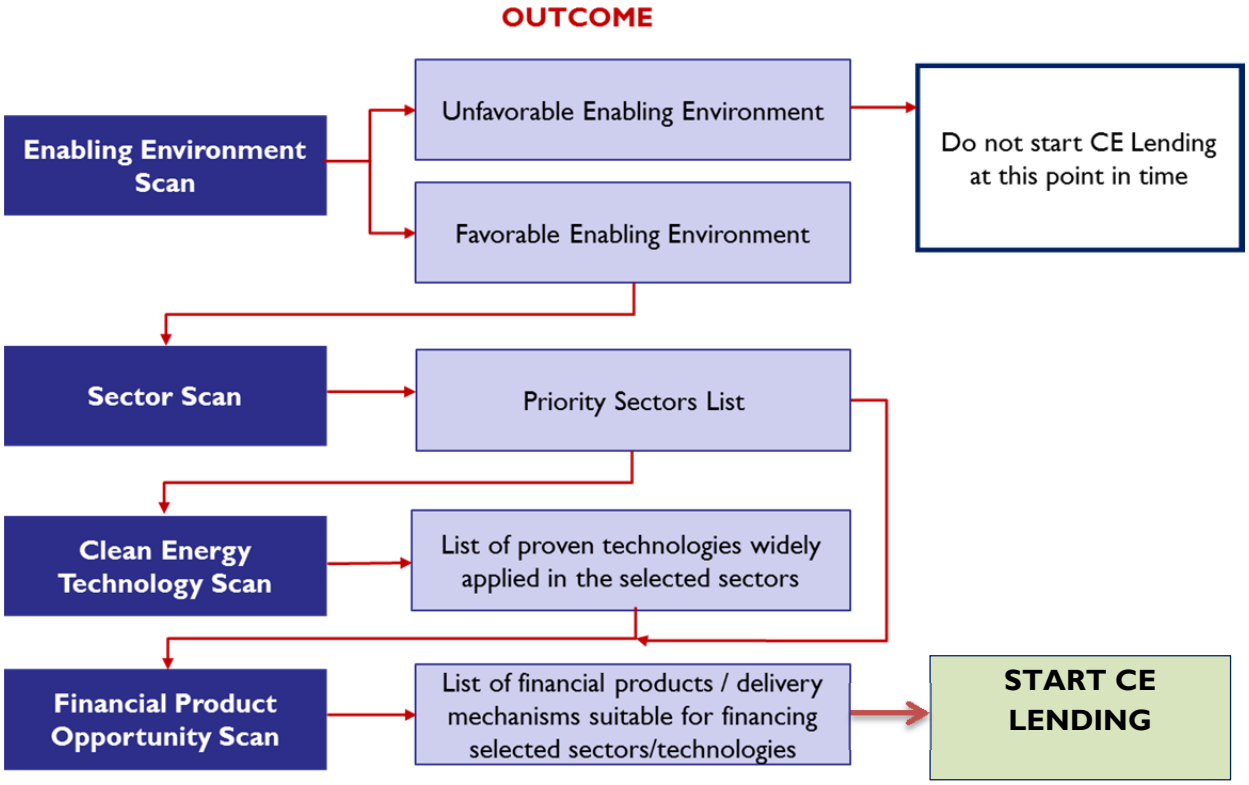


Figure 2.4: Summary of Market Diagnostic Outcomes



2.5 TOOLS

This section contains market diagnostic questionnaires that can be used to conduct the various market scans described in this module. To conduct each market diagnostic scan, an FI should always consider and seek answers to these major questions that affect the ability for profitable lending to the CE market in the FI's locale. After the questions are posed, the FI should score the responses to determine potential ranking about whether the answers do or do not favor lending to the CE market in their region.

2.5.1 Enabling Environment Scan

A. Energy Pricing

1. What are the expected national energy price increases for the next 5-10 years? How do these price increases vary for different users (industry/commercial sector/residential)? What are the sources of information on prices and are they sufficiently reliable for planning purposes?

SCORING
To what extent do the future energy price trends support the adoption of CE among target client base?

1. Does not promote adoption
2. Promotes adoption to a limited extent
3. Promotes adoption to a considerable extent
4. Promotes adoption substantially
5. Fully promotes adoption

Score:……

B. Energy Policies

1. Are government policies (national, regional, and local) in place to promote the adoption of CE? If so, identify the most important laws and regulations.
2. How do government policies promote this adoption of specific sectors/technologies?
3. Are current policies effective in promoting the adoption of CE projects? Are these policies fully implemented? What shortcomings can be identified?
4. Are there any plans for the government to put new policies in place to overcome current shortcomings?
5. Are there feed-in tariffs set for renewable energy? How do they compare to wholesale prices of electricity from non-renewable sources?
6. Are the tariffs high enough to encourage growth in renewable energy use?

SCORING
To what extent do the current energy policies of national, regional, and local governments support the adoption of CE among target client base?

1. Does not promote adoption
2. Promotes adoption to a limited extent
3. Promotes adoption to a considerable extent
4. Promotes adoption substantially
5. Fully promotes adoption

Score:……

C. Incentive Programs

1. Describe any tax or subsidy incentive programs offered by utilities, government, donors, or others to promote renewable energy or energy efficiency?
2. Who is eligible for these incentives and what are the conditions?
   - Corporations/SMEs
   - Energy-intensive industries
   - Commercial sector
   - Public sector (hospitals, schools)
   - Individual households
3. Are industry players or consumers aware of these incentives?
   - Not known
   - Known to a limited extent
   - Known to an average extent
   - Widely known
   - Fully known
4. Are these incentive programs easily accessible? Is the application process clear, comprehensive, and not too costly or time consuming? If not, describe the barriers.

5. Has the uptake of each of these incentive programs been at, above, or below expectations and why?
6. If the uptake of these programs has been below expectations, are there any plans to change the structure of the existing programs to increase the uptake? What are these suggested changes?
7. Are industry charters in place for voluntary or mandatory reductions in energy use of specific industries?
8. Have these charters been successfully implemented? Are there any barriers affecting implementation?
9. Are the incentive programs equally accessible to women and men? To what extent are women entrepreneurs and consumers benefitting?

SCORING

To what extent do the current incentive programs in place support the adoption of CE among client base?

1. Do not promote adoption
2. Promote adoption to a limited extent
3. Promote adoption to a considerable extent
4. Promote adoption substantially
5. Fully promote adoption

Score:……

OUTCOME OF THE ENABLING ENVIRONMENT SCAN

Total scores for 2.51 A, B, and C: ……

1 - 3 : Unfavorable enabling environment for the adoption of CE projects
4 - 6 : Limited enabling environment for CE projects
7 - 9 : Considerable enabling environment for CE projects
10 - 12 : Substantial enabling environment for CE projects
13 : Complete enabling environment for CE projects

2.5.2 Sector Scan

Energy-Intensive Sectors

1. What are the most fossil fuel-intensive sectors in the local market?
2. Which of these sectors contain a substantial number of small and medium-sized enterprises (SMEs)? What definition of SMEs was used? Provide key characteristics of each sector in terms of:
    - Total number of active businesses
    - Total number of larger market players
    - Sales of large market players
3. What is the average size of CE projects implemented in these sectors or sub-sectors? What kinds of EE measures are usually taken for each of these sectors?
4. What is the potential demand for CE financing of each of these sectors (total number of larger market players multiplied by the average size of CE projects implemented)?
5. How much of this finance demand is already being met by other market players? List key competitors. What are the gaps in underserved sectors or sizes and types of clients? (see section 2.5.6)
6. Do the identified incentive programs promote specific sectors or sub-sectors? Provide key characteristics of each sector in terms of
    - Total number of active businesses,

- Total number of larger market players, and
- Sales of larger market players

List energy-intensive sectors that could be targeted for a CE offering of the institution in decreasing order of importance. Sectors that meet the following criteria are suitable target sectors for an energy offering:

a. Sectors or sub-sectors that are targeted by incentive programs; these sectors are more likely to be interested in carrying out CE projects.
b. Sectors or sub-sectors that have a finance need that corresponds with current offerings or target client profile.
c. Sectors or sub-sectors that are underserved by the market.
d. Sectors or sub-sectors that have a substantial finance demand.

1. Sector……
2. Sector:……
3. Sector:……
4. Sector:……
5. Sector:……
6. Sector:……
7. Sector:……
8. Sector:……

Renewable Energy Market

1. What are the most interesting large-scale, grid-connected RE generation options to operate? For instance:
    - Wind
    - Biomass
    - Geothermal
    - Solar
2. What is the average size of these investment projects? For grid-connected renewable energy, contact the government agency that regulates power purchase agreements. Off-grid renewable energy companies may have a trade association that may be able to provide information.
3. Are equity investors interested in financing these investment projects? If so, are they mainly local or international investors?
4. Do the identified incentive programs offered by the government or utilities promote specific RE technologies or certain sizes of projects?
5. What are the key characteristics of the RE market:
    - Total number of active businesses
    - Total number of large developers
    - Total number of projects under development
6. What are the financing needs of this market (type and average amount of finance required)?
7. To what extent does the FI currently meet this financing demand? Does it already offer the type of finance required, and does the amount of finance needed correspond with the loan sizes provided?
8. What is the potential finance demand in this sector? Is this finance demand already met by other market players? List key competitors.

List renewable energy sub-sectors that could be targeted for a CE offering by the institution. Sub-sectors that meet the following criteria are most suitable:

a. Grid-connected renewable energy with a large energy production potential (in Mega-Watts) and reasonable cost compared to non-renewable energy sources.
b. Sub-sectors that are targeted by incentive programs.
c. Sub-sectors that have a finance need that corresponds with current offerings / target client profile.
d. Sub-sectors that are underserved by the market.
e. Sectors that have a substantial finance demand.

1. Sub-sector:……
2. Sub-sector:……
3. Sub-sector:……
4. Sub-sector:……
5. Sub-sector:……
6. Sub-sector:……
7. Sub-sector:……
8. Sub-sector:……

CE Market Players

1. What are the key characteristics of the energy service company (ESCO) market:
   - Total number of active businesses
   - Total number of large market players
   - Average turnover of larger market players
   - Average project size of projects conducted by larger market players and number of projects carried out per year
2. What type and amount of finance is generally required for projects carried out by ESCOs?
3. What are the operating capital needs of ESCOs?
4. What is the estimated finance demand of this sector (average finance need per project x number of projects carried out on an annual basis x number of market players + average capital need per ESCO x number of market players)?
5. To what extent are other FIs already meeting the financing demands of ESCOs? Who are the other providers of ESCO financing?
6. To what extent does the FI already finance ESCOs? If not, have they received any finance requests from an ESCO in the past and why weren't they funded?
7. What other important sub-sectors that can be identified in the CE marketplace (e.g., manufacturers, sellers, or installers of solar water heaters, energy efficiency devices, solar PV panels and products, biogas digesters, and improved cook stoves)?
8. Key characteristics of each sub-sector:
   - Total number of active businesses
   - Total number of large market players
   - Average sales of the sub-sector
   - Types and amounts of finance generally required by these sub-sectors
   - Potential loan demand in each of these sub-sectors (total number of market players x average amount of finance required)
   - To what extent are other market players already meeting this financing demand? List competitors.

CE market sub-sectors that could be targeted for CE lending by the financial institution. Sectors that meet the following criteria are most suitable:

a. Competing entities already adopting CE technologies
b. Size and duration of financing corresponding to the FI's current offerings or target client profile
c. Sectors underserved by the market
d. Sectors with a sufficient demand for financing

1. Sector:……
2. Sector:……
3. Sector:……
4. Sector:……
5. Sector:……
6. Sector:……
7. Sector:……
8. Sector:……

Portfolio Screening

1. What are the dominant sectors in the FI's lending portfolio (e.g., real estate, industry, agriculture)?
2. What is the potential for CE projects in these sectors?
3. What CE projects does the FI already finance (e.g., finance of assets such as CE technology equipment, financing of CE projects, energy management technology)? What is the average loan size and repayment period for these projects?
4. What is the FI's experience in approving these deals? What have been the stumbling blocks or sources of delay in approved projects?
5. Has the FI rejected any CE finance requests? If so, why?
6. What is the estimated potential CE lending client base within the FI's existing portfolio (number of clients and turnover)?

List sectors within the FI's SME portfolio that could be targeted for a CE offering in decreasing order of importance. Sectors that meet the following criteria are most suitable:

a. Have availability of incentives for CE (rebates and other subsidies, tax preferences, or price or purchase guarantees)
b. Have a high potential for adoption or process optimization and fall within the FI's range of loan sizes
c. Prior successful experience with CE borrowing.

1. Sector:……
2. Sector:……
3. Sector:……
4. Sector:……
5. Sector:……
6. Sector:……
7. Sector:……
8. Sector: ……

OUTCOME OF THE SECTOR SCAN

This scan identifies priority sectors for a CE offering:

- Energy-intensive sectors
- Renewable energy market
- CE market
- Existing SME portfolio

List the priority sub-sectors for CE financing in decreasing order of the potential demand for finance:

1. Sector:……
   Finance demand
2. Sector:……
   Finance demand
3. Sector:……
   Finance demand
4. Sector:……..
   Finance demand
5. Sector:……..
   Finance demand (local currency)…….
6. Sector: ……..
   Finance demand
7. Sector:……..
   Finance demand
8. Sector:……..
   Finance demand

2.5.1 CE Technology Scan

1. Which CE technologies qualify for existing incentives?
2. Which CE technologies are considered proven in the country? Which technologies are still at the pilot or demonstration scale in country? Which have not been piloted or demonstrated in country?
3. What has been the uptake rate for the existing CE incentives? Are the incentives high enough to stimulate substantial interest? Which technologies have the highest adoption rate?
4. Are incentives available for turn-key[10] process optimization projects? Which process improvements have been financed by FIs in country?
5. What is the average project size (local currency) of energy process optimization projects?
6. In which sub-sectors have energy process optimization projects been carried out most often?
7. What are the main CE technologies installed by ESCOs?
8. Which CE technologies have been adopted most widely (in terms of number of applications and project size)?
9. What is the payback period for these technologies?
10. Who are the major renewable CE technology providers? Are they international or domestic firms? What brands are commonly used?
11. Have quality standards for energy projects been set by the government or the World Bank?
12. What warranty or service contracts are typically provided for energy technologies?

[10] Turn-Key: Supplied, installed, or purchased in a condition ready for immediate use, occupation, or operation

OUTCOME OF THE CE TECHNOLOGY SCAN

List the CE technologies/system optimizations that the institution should target for an energy offering. Sectors that meet the following criteria are most suitable:

- Technologies/system optimizations that are considered proven by energy sector players
- Technologies/system optimizations requiring a capital input that is in line with the finance amounts the institution provides
- Technologies/system optimizations that are applied across a wide variety of sectors
- Technologies/system optimization projects with reasonable payback periods (preferably > 7 years)

1. Technology/system optimization……
2. Technology/system optimization……
3. Technology/system optimization……
4. Technology/system optimization……
5. Technology/system optimization……
6. Technology/system optimization……
7. Technology/system optimization……
8. Technology/system optimization……

COMBINED OUTCOMES OF SECTOR AND CE TECHNOLOGY SCAN

List the CE technologies or system optimizations in decreasing order of priority:

1. Sector: ……CE technology/system optimizations:……..
2. Sector: ……CE technology/system optimizations:……..
3. Sector: ……CE technology/system optimizations:……..
4. Sector: ……CE technology/system optimizations:……..
5. Sector: ……CE technology/system optimizations:……..
6. Sector: ……CE technology/system optimizations:……..
7. Sector: ……CE technology/system optimizations:……..
8. Sector: ……CE technology/system optimizations:……..

2.5.2 Key Financial Product Opportunities

1. What is the CE financing demand in the identified sectors in terms of average loan size, duration, and type of finance (consumer finance, equipment finance, bridge finance, leasing, ESCO finance, project finance)?
2. To what extent does the CE market already supply these products? What CE supply delivery models are being used? Who are the existing providers?
3. What non-collateral guarantees can the FI obtain from clients?
4. What types of organizations could be used as an aggregator to obtain and disseminate information and reduce transaction costs? To what extent has the FI already built relationships with these players?
5. What marketing channels could be used to effectively market a CE offering (e.g., technology suppliers, utilities, ESCOs, municipalities, within the FI)?

OUTCOME OF THE FINANCIAL PRODUCT OPPORTUNITIES SCAN

List the **financial products** that can be offered to the selected target sectors in decreasing order of importance based on the following criteria:

- Financial products that can be offered to large scale clients or a large number of SMEs and in multiple sectors
- Financial products that are similar to products that the FI is already offering

List which of the following financial products are suitable for roll out?

- CE consumer/retail loan finance
- SME finance, including inventory finance
- Project finance
- ESCO in-lending model

1. Financial product ……..… Delivery model……
2. Financial product ……..… Delivery model……
3. Financial product …….. Delivery model……
4. Financial product ……..… Delivery model……
5. Financial product……..… Delivery model……
6. Financial product……..…. Delivery model……
7. Financial product……..… Delivery model……
8. Financial product…… Delivery model……

2.5.3 Indicative Scope of Work for the Market Assessment

The core components of a market assessment are the following:

I. Market Overview

A. Overall Assessment of the CE Market

- Macroeconomic situation
- Description of major economic drivers and how they affect energy markets
- Local CE market environment and specific indicators for CE (price and availability, consumption)
- Government and donor funded CE facilities

B. Overall Assessment of Firms in the CE Sector by Market Segments

- Internal review of the FI's customer segments in the energy sector
- Description of any operational or financial bottlenecks
- Historical performance of the market segments; analysis of strengths, weaknesses,

opportunities, and threats (SWOT); and sensitivity analysis of each segment)

- The most profitable and scalable market segments for the FI

II. Characteristics and Size of Market Demand for Financial Services

This comprehensive external assessment of SMEs in the CE sector (e.g., companies listed by official government data) should include:

A. Background Information on the Firms:

1. Size:
   a. Revenues
   b. Total assets
2. Type of business
3. Location
4. Industry
5. Number of employees

B. Characteristics of Current Financial Products

1. Loans
   a. Types of loan (working capital or investments)
   b. Terms (interest rate, fixed or variable fees, collateral, grace period, repayment period, and installment frequency)
   c. Loan size
   d. Marketing channels for CE financing
2. Deposits
   a. Types
   b. Average balance
   c. Average transaction size
   d. Interest rates
   e. Marketing channels
   f. Secondary services used (e.g., ATM, debit card, mobile banking, Internet banking)
3. Other services
   a. Cash management
   b. Wealth management
   c. Credit cards
   d. Payment insurance
   e. Life insurance
   f. Informal sector financing
   g. Marketing channels

III. Characteristics of Proposed Financial Products

1. Loans
   a. Types of loan (working capital or fixed capital)
   e. Terms (interest rate, fixed or variable fees, collateral, grace period, repayment period, and installment frequency)
   b. Marketing channels
   c. Loan size
   d. Other desired features (depending on sector and technological focus of product)
2. Deposits
   a. Types of deposit
   b. Approximate balance
   c. Average transactions
   d. Interest rates

3. Other services
   a. Cash management
   b. Wealth management
   c. Credit cards
   d. Payment insurance
   e. Life insurance
   f. Informal sources

IV. Description of existing financial products of the FI

A. Loans

1. Types of loan (working capital or fixed capital
   f. Terms interest rate, fixed or variable fees, collateral, grace period, repayment period, and installment frequency)
2. Loan size
3. Target clientele and the marketing channels

B. Deposits

1. Types of deposit
2. Average balance
3. Average transactions
4. Interest rates
5. Secondary services used (e.g. ATM, debit card, mobile banking, Internet banking)
6. Target clientele and the marketing channels

C. Other services (including target clientele and the marketing channels)

1. Cash management
2. Wealth management
3. Credit cards
4. Payment insurance
5. Life insurance
6. Product bundling
7. Others

V. Summary of gaps between demand and supply, explanation of findings, and recommendations

A. Overall assessment of the existing gap between supply and demand
B. Natural areas of congruence between bank's financial product offerings and existing targeted customer segments
C. Necessary product packages and marketing channels
D. Necessary partnerships

2.5.4 Market Research Requirements and Sources

Table 2.1: Types of Market Research Analysis

Type of Analysis	Key Questions	Detailed Information
1. Market Analysis	• What is the size of the market? • What are the main market segments throughout different levels of the supply chain, their characteristics and growth potential? • What are the risks associated with each segment? • What are the FI's strengths serving key segments? • What is the existing competition in targeting each segment? • What are the cost implications in serving each segment? • What are the best channels for the FI to reach each segment?	• Overall sector analysis for CE supply chains • Detailed supply chain map • Prices of technology options • Energy savings or generation potential for technology options • Regional energy use profile • Weather and other environmental conditions requirements for production and use of CE technologies (both) • Energy production activity profile (technology and sector)
2. Competitor Analysis	• What are the FI's market share analysis and market share trends? • Which institutions are the FI's main competitors in the CE finance market? • "8 Ps" analysis for primary competitors: – Product – Price – Positioning (market perception, branding) – Place – Promotion – People – Physical evidence – Process	• Competitors' SWOT • Recent and projected Trends in competition • Market share analysis
3. Customer Analysis	• What are the target market client profiles and how do they compare to the FI's existing clients? • What do clients want to finance? • How sensitive are the clients to loan interest rates and fees? • What are the target client perceptions of the satisfaction with existing financial services?	• Borrower demographic or business profiles • Current use of financial services use vs. unmet demand • Perceptions of loan product benefits • Recommendations for loan product development • Recommendations on the FI's current position and perceived performance

Type of Analysis	Key Questions	Detailed Information
4. Pre- and Post-Product Testing	• What are target clients' understanding of – Brands – Taglines – Corporate identity/position – What is target clients' perception of the product concepts? • What feedback has been obtained from target clients on product relevance and correctness?	• Satisfaction with financial services • Recommendations for changes in financial services

Data Collection Options

1. Internally conducted market research
   - Secondary research
   - Bank expert knowledge
   - Quantitative analysis of existing clients
   - Focus groups or individual or large groups meetings with existing or target clients
   - Mail, phone, email or in-person surveys
2. Externally conducted market research (firm or individual consultants)
3. Combination of internally and externally conducted market research

Market Research Action Plan[11]

The Action Plan will be used to map out the implementation of the Market Research activities and responsibilities.

For the period _____

Scan Type	Focus Area	Outcome	Timeline		Point Person
			Start	End	
1. Enabling Environment Scan	a. Energy Prices b. Energy Policies c. Incentive Programs	Enabling Environment Score (1 – 5)			
2. Sector Scan	a. Energy Intensive Sectors b. Renewable Energy Market c. CE Market d. Portfolio Screening	Priority Sector List (Ranked by estimated demand for finance)			
3. CE Technology Scan	a. Proven Technologies with wide Application and Reasonable Pay-Back Times	Priority CE Technology Sector List			
4. Financial Product Opportunity Scan	a. Finance Demand b. Competitors Analysis c. Delivery Models	CE Financial Product and Delivery Model			

[11] Tool adapted from USAID's MABS "A Toolkit for Banks:" Strategic Planning, Market Research Action Plan.

2.5.5 Competitive Position Analysis

Rate the product's strengths and weaknesses relative to the FI's main competitors' products. (Data can be gathered through various techniques such as focus groups, interviews, or mystery shopping.)

Characteristic	Product 1	Product 2	Product 3	Product 4	Product 5
Product (Design)					
Minimum loan size					
Maximum loan size					
Repayment period					
Repayment flexibility					
Collateral requirements					
Grace period					
Specific qualification criteria					
Other requirements					
Product Price					
Interest rate					
Loan application and processing fees					
Penalty charges					
Other fees					
Other costs incurred by the borrower (not paid to the FI)					
Promotion					
Marketing/information dissemination					
Advertising					
Positioning					
Branding					
Corporate image					
Product image					
Place					
Convenience of branch locations					
Staff efficiency and courtesy					
Process					
Loan application documentation and requirements					
Loan processing time					

2.5.6 Competitor Analysis Template[12]

List all the financial institutions offering CE finance in your market following the format below. Using the data below, identify your 3 top competitors that cater to more or less the same market. Transfer the data to worksheet 2.

Worksheet 1:

	Commercial Banks	Rural Banks	Lending Investors
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			
	NGO's / MFIs	Cooperatives	Other Institutions Active in CE Lending (such as Technology Suppliers)
1			
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			
12			
13			
14			
15			

[12] Tool adapted from USAID's MABS "A Toolkit for Banks:" Strategic Planning, Competitor's Analysis Template, Pre-Planning Template 8

Instructions:

1. Identify the top 3 competitors operating in the FI's trade area (financial institutions which cater more or less to same target market/customers).
2. Rate using a scale of 1 to 5, with 5 as the highest and 1 as the lowest.
3. Justify the ratings for each element.

Worksheet 2:

Total Number of Financial Institutions in the CE finance area
(refer to Worksheet 1 template):_____

	ELEMENTS	Own Bank	Competitor 1	Competitor 2	Competitor 3
	Indicate Names of Competitors in this line				
1	**Variety of Loan Products & Deposit Services Offered**				
2	**Pricing of Loan Product (Interest & Service Fee on Loans)**				
	Consumer Loans for Consumers and SMEs				
	ESCO Loans				
	Project Finance Products				
	Technology Based Loans				
	Others_____				
3	**Other Clean Energy Related Services**				
	Installation				
	Maintenance				
	Others_____				
4	**Accessibility of Branch Office/Field Office/ATMs**				
	Branch				
	Field Office				
	ATM Outlets				
5	**Promo Offers/Value Added Service**				
6	**Service Quality (Attentiveness/Friendliness of Bank Staff)**				
7	**Competence of Bank Employees**				
8	**Bank Perception to the Community/ Customers**				
	Total Rating				
	No. of Elements where Bank is more competitive				

2.5.7 Competitors SWOT Analysis[13]

Competitor	Strength	Weaknesses	Opportunities	Threats
	Describe the strengths of the competitor. Consider these factors: • Unique CE capabilities • Reputation • Market share • Superior resources ***Ask the following questions:*** • ***What are their advantages?*** • ***What do they do well?***	Describe the weaknesses of the competitor. Consider these factors: • Reputation • Lack of CE capabilities • Resource and capability shortfall ***Ask the following questions:*** • ***What don't they do well?*** • ***What markets don't they serve?***	Describe what opportunities exist that the competitor could implement to capitalize on situations such as these: • Changes in the social, economic and political environment • New CE technology and processes • Unmet customer needs • Size, location and strategic positioning • Organization flexibility and focus ***Ask the following questions:*** • ***Where offerings are they likely to expand?*** • ***What are the trends they are likely to take advantage of?***	Describe what threats will prevent the competitor from being successful. Consider these factors: • Resistance to change • Lack of interest, motivation or commitment to CE lending • Lack of flexibility or focus • Mismatch of positioning with the market trends ***Ask the following questions:*** • ***What obstacles do they face?*** • ***Is changing technology threatening their position?***
Competitor 1				
Competitor 2				

[13] Tool adapted from USAID's MABS "A Toolkit for Banks:" Strategic Planning, Competitor's Analysis Template, Workshop Tool, SWOT Analysis.

MODULE 3: INSTITUTIONAL READINESS

PURPOSE

This module helps determine the institutional readiness of the organization to lend to the CE market.

HOW TO USE THIS MODULE

Guide internal assessment and strategic planning.

MODULE 3: INSTITUTIONAL READINESS

3.1 ABOUT INSTITUTIONAL READINESS

After determining that sufficient profitable opportunities for CE lending products exist, an FI will need to decide if this market is a good fit for its business strategy and whether its internal structure, staffing, and processes are adequate to meet the estimated demand. FIs should then prepare or revise a strategic plan before moving forward.[14]

3.1.1 Purpose: Determine FI Capacity and Needs

A CE lending strategy should address these basic questions:

- What is the FI's current role and positioning in the target CE markets?
- What are the short-term and long-term objectives of the FI?
- What business model is needed to achieve the institution's stated goals and objectives?

If a sizeable CE lending program is anticipated, an FI should designate a product manager to help ensure that the CE lending plan and strategy are reflected in the bank's overall business plan and organizational structure. Specific staff members should be assigned accountability for moving the business plan forward.

3.1.2 Expected Result: The Strategic Plan for CE Lending

An internal plan for CE lending should address the following questions and issues:

- *Current Condition and Desired Direction*
  - Mission statement: Defines the purpose and approaches of the FI (see section 3.2.2)
  - Vision: Where does the FI hope to be in the short-term, medium-term, and long-term? What are the FI's core values?
  - Core competencies: Activities that the organization carries out best, overall and with respect to the targeted markets
  - Strengths, weaknesses, opportunities and threats (SWOT) analysis. This may be done for the organization as a whole or just the CE finance unit. Customers: Summary of the characteristics of the target market from the assessment.

[14] If financial institution concludes as a result of using the tool in this module that it does not have the internal capacity to continue on with the development of a CE finance product, additional USAID resources are available to assist further institutional development. As mentioned in Module 1, USAID's MABS program produced a Toolkit for Banks, Project Management Toolkit, and Instructional Videos and Documentaries.

- *Implementation planning*
  - The FI should develop detailed action steps and timetable for development or expansion of CE products by location. It may be useful to test new products for a pilot period or at a limited number of locations to identify whether changes are needed before a broader rollout.
  - The implementation plan should address the organizational structure, staffing, and processes for servicing and monitoring the CE loan portfolio. The implementation plan includes training requirements for new and existing staff on the CE lending products. It should also address quantitative and qualitative performance indicators and targets and the process, responsibilities, and formats for monitoring and reporting.

3.2 GUIDELINES FOR DEVELOPMENT OF THE STRATEGIC PLAN FOR CE LENDING

3.2.1 Designing a Strategic Plan for CE Lending

The board of directors of an FI should be involved in early discussions on the CE lending strategy and should approve the final document. The preliminary discussions with the board should provide overall direction on the large issues, such as vision, capital availability, desired size of the portfolio and its roll-out over time, areas of specialization, risk tolerance, and potential partnerships. The subsequent strategic plan should address major issues in detail.

- Implications and recommendations of the market assessment
- Size and type of the CE lending portfolio and product line
- Competitive positioning in the marketplace
- Capital requirements for loan funds and potential sources and costs
- Does the organization have an adequate number of personnel with the skills and resources needed to carry out the business plan successfully? If not, what are the plans for human resource development and the expected costs?
- Setting of realistic targets
- Marketing strategies and partnerships for communicating and maintaining competitive advantages.
- Scenarios to be included in financial modeling and sensitivity analysis.
- How the CE product line may affect other areas of business. Will it support other areas and create opportunities for cross-selling or divert resources from them?
- How long it will take for the CE lending product line to reach profitability? Does the bank have access to sufficient capital to sustain the product line to that point?
- Does the bank's branch network reach down sufficiently into areas of market opportunity? Which branches should be given priority in the rollout strategy?

- Additional investments needed to reach the new market – marketing campaigns, bank infrastructure, and w technology purchases, such as hand-held devices that could help in reaching more remote borrowers.[15]
- Potential for short-term and long term partnerships with other financial institutions, government, donors, manufacturers or distributors of CE technologies or other players in specific value chains be involved? What is the outreach strategy for new partnerships?

3.3 TOOLS

Useful tools for developing a strategic plan for CE lending include:

- Internal Analysis – Financial Institution Market Readiness Tool
- Internal Vision-Mission Review
- Steps to Implement an Effective Strategy and Guidance on Formulating a Comprehensive Business Plan
- Marketing Strategies

3.3.1 The CE Finance Questionnaire for FIs

The CE Finance Questionnaire for FIs is used to gather the information needed for preparing a CE lending strategy. It also helps in identifying the aspects of the institution that need strengthening for CE lending readiness. It has four parts:

- Section I: CE Finance Market
- Section II: Current CE Loan Portfolio
- Section III: Current CE Finance Clients
- Section IV: FI Structure, Policies & Procedures in CE Lending

[15] For information regarding the use of technology by FIs to reach rural clients, see the following references:

Ivatury, Gautam, "Focus Note No. 22: Using Technology to Build Inclusive Financial Systems:" Washington, DC, CGAP, January 2006, http://www.cgap.org/sites/default/files/CGAP-Focus-Note-Using-Technology-to-Build-Inclusive-Financial-Systems-Jan-2006.pdf

Bridge, David and Mas, Ignacio. "Rural Connectivity Options for Microfinance Institutions: A Technical Note:" Washington, DC, CGAP, September 2008. http://www.cgap.org/sites/default/files/CGAP-Technical-Guide-Rural-Connectivity-Options-for-Microfinance-Institutions-Sep-2008.pdf

Banking Technology – Online publication focused on technology trends in banking. http://www.bankingtech.com/

Section I: CE Finance Market

Market Environment

	High	Medium-High	Medium	Medium-Low	Low
Importance of CE to the national and local economy					
Competition among financial institutions for CE loans					
Demand for CE finance					
Estimated number of new clients interested in CE financing					
Enabling environment for CE loans					
Ease of access to CE finance for potential clients and client organizations					
Ease of access to CE finance for local SMEs					

Challenges

	Rank Importance	**Strongly Applies**	**Mostly Applies**	**Somewhat Applies**	**Does Not Apply**
High loan origination costs					
High monitoring costs					
Easily recoverable collateral is unavailable or small					
Assessing client creditworthiness is complicated					
Lack of understanding of the sector and inadequate staff skills					
Weak management tools to manage CE lending risks					
Weak or costly legal enforcement					
Market price risks					
Energy production risks					
Insufficient capital for CE lending products					

Prospects for CE Lending

	High	Medium High	Medium	Medium Low	Low
CE lending priority in the FI (see 3.3.2)					
Expected growth in CE loan portfolio over the next 3-5 years					

Action Priorities for FIs CE

	High Priority	Medium High Priority	Medium Priority	Medium Low Priority	Low Priority
Policies and procedures for CE loans					
Risk management systems (risk limits, client assessment, loan approval)					
Understanding of the CE opportunities and markets					
Staff training					
Outreach to potential clients about CE loans					
Loan products tailored to the CE borrowers					
Investments in technologies and IT solutions to better reach CE clients at lower cost					

Section II: Current CE Loan Portfolio (from most recent financial statement)

a. Size of CE Portfolio		
CE loans as percent of total loan portfolio		
Number of CE loan clients		
Value of CE loans		
Growth of loan portfolio over last 3 years		
Percent growth of CE loans over last 3 years		
Percent growth of total loan portfolio over last 3 years		
b. Non-Performing Loan (NPL) Data		
Definition A:	Value NPL CE Loans	
NPL Ratio in CE Loan Portfolio = Non- Performing CE Loans / Total CE Loans	Value Total CE Loans	
	NPL Ratio Definition A	
Definition B:	Value NPL CE	

CE Share of NPLs Relative to Total NPLs	=	Non Performing CE Loans	/	Total Non-Performing Loans	Loans
					Value NPL Total Loans
					NPL Ratio Definition B
Definition C: NPL Ratio of Total Loan Portfolio	=	Non-Performing Loans	/	Total Loans	Value NPL Total Loans
					Value Total Loans
					NPL Ratio Definition C

Net Interest Margin		
CE loan portfolio		
Total loan portfolio		
Interest Rate Charged		
CE Loans	Min:	Max:
All loans	Min:	Max:
Loan Duration		
All loans		
Percentage of CE Loans for working capital (less than 1 year)		
Percentage of CE Loans for fixed capital (more than 1 year)		

Section III: Current CE Finance Clients

Current Financing Customers:					
Individuals/Households	Yes	No	Number of Individuals	Minimum Annual Revenue	Maximum Annual Revenue
SMEs providing CE services to others or investing in CE within their own business	Yes	No	Number of SMEs	Minimum Annual Revenue	Maximum Annual Revenue
SMEs involved in CE production (e.g., Independent Power Producers[16] (IPPs)	Yes	No	Number of SMEs	Minimum Annual Revenue	Maximum Annual Revenue
Large businesses providing CE services to others or investing in CE within their own business	Yes	No	Number of large Businesses	Minimum Annual Revenue	Maximum Annual Revenue
Large businesses involved in CE production	Yes	No	Number of large Businesses	Minimum Annual Revenue	Maximum Annual Revenue
Total CE Financing Customers	Yes	No	Total CE Customers	Minimum Annual Revenue	Maximum Annual Revenue

How does the FI obtain financial data and other information for CE clients?
From regulatory authorities? (Yes/No) From CE advisors? (Yes/No) From the clients? (Yes/No) From other sources? List others if applicable:

[16] An IPP is defined as an entity which owns facilities to generate electric power for sale to utilities and end users. Additional information can be found at GoPower Glossary, http://www.americasgenerators.com/glossary/term_view.php?TermID=76

How does the FI appraise client's creditworthiness?
Financial statement analysis? (Yes/No) Cash flow analysis? (Yes/No) Other techniques? List others, if applicable:

Ease of reaching clients: 1=most difficult; 5= easiest

	1	2	3	4	5
Individuals/households					
SMEs in CE (if applicable)					
ESCOs (if applicable)					
Project Developers (if applicable)					

Section IV: FI Structure, Policies, and Procedures in CE Lending

Is CE lending in a separate department? If it is part of another department, specify?
How many branches are there in rural vs. urban areas? What percent of the loan portfolio is in rural areas? Does the FI offer mobile banking services?
List the financial products the FI currently offers for CE lending (including working capital loans, purchasing equipment loans, leasing, factoring, and savings accounts)?
Describe the credit application process and the approval authority and limits.

Are there differences in credit policies for CE loans versus other types of loans *(e.g. inclusion of direct or indirect subsidies)*? If yes, describe.
Yes: _____ No Are there differences in credit policies between individuals, SMEs, ESCOs or project implementers (if applicable) for CE loans? If yes, describe. Yes: _____ No
What are the eligibility criteria for CE clients *(size of client operations, availability of collateral, historical information)*?
.
What is the FI's process for understanding its customers? (*Include sources and types of information obtained for the FI's clients)*
. Does the FI have access to a credit rating bureau for information about applicants CE? Yes: _____ No
Does the FI use a standard scorecard or rating system for determining the credit-worthiness of applicants? Is there a separate scorecard or rating system for CE applicants? If yes, how does it differ from the standard scorecard?
Yes: _____ No
Are there specific risk exposure guidelines or limits for CE loans or certain industries or commodities? If yes, describe.
Yes: _____ No

Are cash flow projections prepared for CE loans? If so, by whom *(bank staff, bank consultants, or applicants)*?
Yes: _____
No

Are there specific risk management tools and systems for non-CE loans? Are there different tools and systems for CE loans? If yes, describe their similarities and differences.
Yes: _____
No

What form of collateral does the FI require for CE loans?			
	Often Used	Sometimes Used	Rarely Used
Land			
Machines or Equipment			
Cash			
Commodity or Inventories			
Third-Party or Group Guarantees			
Guarantees from Government Other Programs			
Contracts from Commodity Buyers			
Alternative collateral (feed-in tariff or power purchase agreement)			
None			

How easy it is to foreclose on these types of loan collateral in the event of default: 1=very difficult; 5 =very easy					
	1	2	3	4	5
Land					
Machines or Equipment					
Cash					
Commodity or Inventories					
Third Party Guarantees					
Guarantees from Government or Other Programs					
Contracts from Commodity Buyers					
Alternative collateral (feed-in tariff or power purchase agreement)					

Do staff involved in CE lending have specific knowledge of the CE sector? If yes, specify.
Yes: _____
No
What is the typical background and experiences of loan officers for CE loans?
Have staff received any special training for CE lending?
Yes No
Who monitors CE loans?
How often are CE loans monitored?
Weekly Monthly Bi-Annually Annually
Are CE loans monitored separately from other loans? If yes, describe.
Yes: _____
No
Are there any specific systems or procedures for collection of non-performing CE loans? If yes, describe.
Yes: _____
No
Does it take more time or effort to collect on CE loans compared to other loans? If yes, describe the key differences.
Yes: _____
No

3.3.2 The Strategic Plan for CE Lending

CLEAN ENERGY LENDING TOOLKIT

The following tool will help the FI determine whether CE lending is in line with its overall institutional strategy. This section is adapted from the MABS project that assisted banks with microfinance lending in the Philippines. [17]

Strategy Alignment: Internal Vision-Mission Review

Instructions:

I. In the box below, write the current or existing vision-mission statement of your organization.

II. Based on the current or existing vision-mission of the organization, answer the following questions:

1. Is the current mission still valid (is the vision-mission consistent with the results of the financial and operations review)?

2. What is the basic purpose for the bank's existence?

3. What is unique and distinctive about the bank?

4. Who are the bank's principal customers, clients, and users?

[17] Tool adapted from USAID's MABS "A Toolkit for Banks:" Strategic Planning, Competitor's Analysis Template, Planning Template 9.

5. What are the principal products and services?

6. What is different now about the FI compared to 3-5 years ago?

7. What is likely to be different about the bank 3-5 years in the future?

8. What issues are important to the bank?

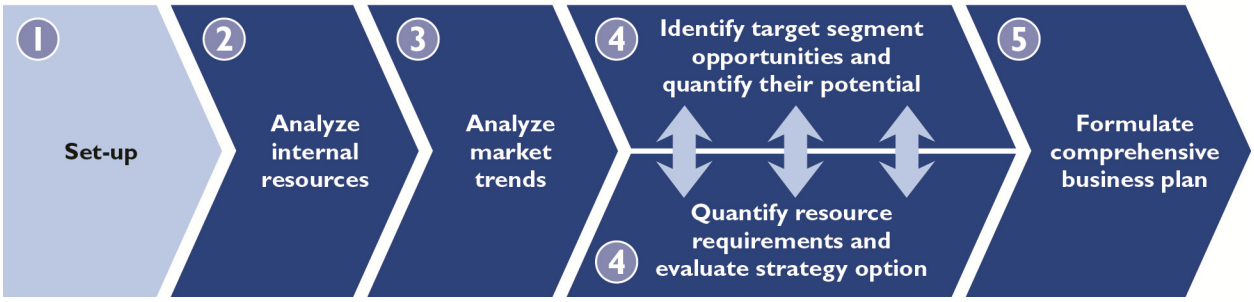
9. How does CE rate among those issues?

III. Based on the answers to the above questions, summarize the elements that will form your new vision-mission. After summarizing, formulate the bank's new vision-mission statement.

Vision-Mission Elements	Explanation
1. Who are we?	
2. Who are our principal clients?	
3. What are we committed to offer to: a) principal clients b) employees c) investors (stockholders, fund providers) d) community	
4. What will be the corporate values that will guide every facet of our organization and the way we do our business activities?	
5. Does CE fit into the overall strategy? If so, how?	

New Vision-Mission of the Organization

Figure 3.1: Strategic Plan Process



This section focuses on the formulation of a comprehensive business plan for CE lending encompassing

- Market development,
- Process improvement,
- Staff development, and
- Product development.

For each of these components, the business plan addresses

- Needs and challenges,
- Initiatives/actions,
- Timeline for, and
- Key performance indicators.

3.3.3 Marketing Strategy

Table 3.1 can help guide an FI in development of a marketing strategy.

Table 3.1: Types of Marketing Strategies

Strategy	Characteristics	Implications
Mass Marketing	• No differentiation in marketing approaches by customer; assumes client homogeneity • Only option for an FI that does not have information on market segmentation	**Advantages.** Mass marketing can reduce marketing costs because it relies on fewer approaches, often uses general media, and requires less information and differentiation of goods and services. **Disadvantages.** Mass marketing may be less effective than targeted approaches because promotional efforts may not be well targeted and clients may have diverse interests in goods and services (prices and other terms for placement and promotional approaches).
Segmented Marketing	• Implies ability to sub-divide a market and cater to the varying needs of different segments • Within each market segment, clients are assumed to have similar interest • The FI can concentrate efforts on selected segments that it wants to serve • Different goods and services and marketing approaches may be used for each market segment	**Advantages.** FIs can fine-tune goods and services and price and market them appropriately for the targeted market segments. The choice of distribution and communication channels may be easier. The FI may face fewer competitors in certain market segments. Risk can be reduced by avoiding the highest-risk clients and spreading risks across a subset of the market segments. May allow the FI to achieve economies of scale and scope,[18] thus giving the company a cost advantage in each segment in which it competes. **Disadvantages.** Development and implementation of a series of goods and services or marketing approaches may require more resources and effort. FIs may lack sufficient information on market segments and data collection and analysis on market segments may be expensive.

[18] Economies of scope are conceptually similar to economies of scale. Whereas economies of scale primarily refers to reductions in the average cost (cost per unit) associated with increasing the scale of production for a single product type, economies of scope refers to lowering the average cost for a firm in producing two or more products.

Strategy	Characteristics	Implications
Niche Marketing	• The FI aims to serve a limited client base with specific interests. • The FI concentrates its activities on its position within the niche market, rather than the broader market or large market segments. • Requires the ability to identify a specialized, niche market • FI will have one marketing mix. • Often the best strategy for a smaller FI	**Advantages.** Since niche markets can be small, harder to reach, or less profitable than the major market segments, they may be underserved or attract little competition. If an FI wants to focus on narrow market segments, it will to understand the needs of the niche better than anyone else and may need to carefully tailor its goods and services, processes, and locations. An FI can enjoy a good chance of becoming the supplier of choice to the segment and earn the largest market share and margin. **Disadvantages.** Transaction costs for reaching a niche market may be high relative to the volume of business that can be generated. Niche markets can be relatively risky because of lower margins or susceptibility to change if market conditions shift or new financial service providers enter these markets.

MODULE 4: CREDIT PRODUCT DEVELOPMENT

PURPOSE

This module helps FIs prepare credit products and processes for the CE lending market.

HOW TO USE THIS MODULE

A roadmap on how to develop credit products and processes for profitable CE lending.

Solar installation in the Philippines. *Photo Credit: Abt Associates*

MODULE 4: CREDIT PRODUCT DEVELOPMENT

4.1 CREDIT PRODUCT DEVELOPMENT FOR CE LENDING

The purpose of this module is to help FIs that have decided to proceed with CE lending to prepare viable goods, services, and processes. It is based on successful experiences from many developing countries. Such experience includes CE consumer product development for FIs in Bosnia and Herzegovina, Afghanistan, Mongolia and India; SME product development for an FI in Honduras; and ESCO product development in Romania.

Some well-established CE technologies are often financed through credit products that are not energy specific. For example, hybrid, electric, and natural gas vehicles are financed by the same loan and lease mechanisms as gasoline or diesel-powered vehicles, regardless of whether tax credits or government subsidies are available for the alternative fuel options. Similarly, commercial buildings designed to meet higher efficiency standards (such as ENERGY STAR or LEED) are usually financed with regular construction loans. However, more complex RE generation projects that are not financed as frequently, or are less standardized, may require specialized loan products due to their longer-term nature or difficulty of obtaining conventional collateral. The potential risks that expected energy savings will not materialize are typically small, but can be enough to inhibit interest in adoption or financing of energy efficiency improvements.

This section highlights some of the major market segments for specialized CE financing and the processes for developing appropriate financing products that can stimulate adoption and reduce risks for borrowers and financial institutions.

4.2 GUIDELINES FOR NEW PRODUCT DEVELOPMENT

Financial institutions should understand the types and extent of risks that new CE lending products present relative to their existing portfolios and ability to bear risks. In addition, regulators often require banks to report any new financial products so they can be aware of the risks taken by regulated financial institutions.[19]

FIs should have policies and procedures detailing the steps required for new product development. These steps should include making the business case for the new products, assessing the risks, developing

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[19] UNDP, "DERISKING RENEWABLE ENERGY INVESTMENT," UPDATED 15 APRIL 2013, HTTP://WWW.UNDP.ORG/CONTENT/UNDP/EN/HOME/LIBRARYPAGE/ENVIRONMENT-ENERGY/LOW_EMISSION_CLIMATERESILIENTDEVELOPMENT/DERISKING-RENEWABLE-ENERGY-INVESTMENT/

approval criteria and responsibilities, estimating costs and revenues, internal oversight and accountability, and management information systems and reporting.

The contents of a new financial product development proposal will vary with the type of products, the FI's product development capabilities, and risk criteria. In general, a proposal for the development of new financial services or product should include the following

- Brief summary of the new product(s)
- Reasons for development and implementation (such as energy cost savings, incentives, and regulations)
- Market analysis, including an internal SWOT analysis of the financial institution
- Target markets and segmentation, expected number of clients and volume of transactions
- Risks in piloting and rolling out the new products and risk mitigation strategies
- Proposed business conditions and fees
- Analysis of expected risks and rewards, including return on equity
- Accountability and standards for each new product
- Management support, oversight requirements and reporting authority
- Advance costs for developing the new products, including IT support solutions, staff training, and risk management
- Expected annual costs (including advertisement and training)
- Expected timetable for launching the products
- A policy explaining who has approval authority over new products and to whom new products are reported

4.2.1 Steps

The following steps are recommended for addressing the above issues in preparation of a new product development plan:

- Determine the CE Client Base and Demand for Financing
- Prepare the Business Case
- Assess Product Development Cost
-
- Assess Product Profitability
- Identify Risks and Set Approval Criteria
- Create or Revise Lending Policies
- Assign Management Responsibility and Accountability

Determine the CE Client Base and Demand for Financing

Many types of participants are involved in the CE supply chain (including CE technology manufacturing, sales, installation, post-sales servicing and end users). Any of these participants are potential clients for CE lending. ESCOs are another important specialized client for financial services.

The appropriate loan size can vary widely with the technology and scale of application. The loan tenure (repayment period), can also vary from three months to 30 years, depending on the anticipated cost savings or income generated from the investment, location (rural versus. urban), and utility distribution mechanism for electricity (grid-connected or off grid). Therefore, a broad range of loan products is needed to respond to the various market segments.

Prepare the Business Case

Describe the new products and the reasons for proposing them. It is important to analyze how the products will affect the FI and the borrowers. The business case should contain the following items:

- Briefly introduce the proposed CE technology products and the typical energy savings or income they can generate
- Describe the CE lending products
- Discuss the business impact of adding CE lending products (unit sales, margins, net revenue and profitability)
- Methods and assumptions
- Risks
- Conclusions and recommendations

Assess Product Development Cost

Project the costs of developing and implementing CE lending products, such as

- Infrastructure requirements and costs
- Information technology (IT)
- Human resource requirements
- External consultants
- Marketing requirements, such as building relationships with technology vendors and energy audit firms
- Partnerships with the vendors and service providers (relationship management)

Assess Product Profitability

Project the profitability impact of CE products in the portfolio as well as expenses, loss provisions, capital requirements, and other issues that will affect profitability and return.

- Volume of exposure
- Gross and net interest income
- Attributable direct costs (such as overhead and staff time)
- Expected default rates
- Loan loss provisioning
- Capital requirements
- Third-party contributions such as technical assistance subsidies, and supplementary credit lines with soft conditions

Identify Risks and Set Approval Criteria

Identify the risks associated with CE products and approval criteria for the targeted sectors. Obtain more information on sector-specific criteria for client selection and risks.

Create or Revise Lending Policies

Describe the financing policy requirements or changes needed for implementation of the new financing products and the processes used to measure, monitor, and control risks.

- Eligibility criteria for public or private sector incentives
- Minimum and maximum loan amounts and terms (including renewal options)
- Amount and type of collateral required
- Other supporting securities (promissory notes, guarantees, and insurance)
- Compliance with environmental laws and other regulatory requirements
- Maximum loan-to-value ratio for secured and unsecured loans
- Pricing (interest rate and calculation method, fees, and commissions)[20]
- Loan repayment methods
- Credit risk exceptions
- Product pricing exceptions
- Target market exceptions
- Loan application decline process
- Non-accrual and contractual write-off policy
- Asset recovery
- Fraud prevention and detection

Assign Management Responsibility and Accountability

Identify organizational structure and staffing requirements for introduction or expansion of the products, special procedures, work flow issues, and reporting, monitoring, and collection requirements.

- Procedures and process flows
- Approval requirements
- Piloting or demonstration
- Scaling up
- Monitoring
- Collection policy and strategy

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[20] Declining balance and flat interest rate are two common interest calculation methods. For more information on interest rate types and calculation methods, see: MF Transparency for additional resources, "MF Transparency Pricing Fundamental: Flat vs. Declining Balance Interest Rates:" accessed November 2013, http://www.mftransparency.org/wp-content/uploads/2012/05/MFT-BRF-205-EN-Flat-versus-Declining-Balance-Interest-Rates-What-is-the-Difference-2011-09.pdf
MF Transparency's "Calculating Transparent Pricing Tool – v2,2:" Published September 2012, http://www.mftransparency.org/resources/calculating-transparent-pricing-tool/

- Reporting requirements (non-renewable energy savings, renewable energy production, and greenhouse gas emission reduction) set by private investors, the government, donors, or internal corporate social responsibility requirements)

4.3 FINANCING PRODUCTS FOR CE

An FI should consider the following questions in new product development

- How does the new product compare to competitors' offerings?
- How does the product respond to the market demand in terms of pricing and loan tenure, size, and security?
- What are the anticipated energy savings from the various technologies that would be financed?
- What are the appropriate terms and conditions and guarantees for loans for grid-connected and stand-alone renewable energy projects?
- What are appropriate pricing alternatives? Are they suitable for the costs and cash flows associated with particular CE technologies and the targeted sectors (consistent with the clients' capacity to repay)?
- Since renewable energy projects may take some time to build and generate cost savings or revenues, a grace period may be appropriate to match repayments to cash flows. In some cases (such as seasonal hydropower), it might be desirable to vary the repayment plan to correspond to the seasonality.

4.3.1 Product Design[21]

This section address the main elements of CE loan product design, including loan purpose, target market segment, and terms (tenure, size, and security requirements). Table 4.1 presents the factors that FIs should consider in designing new CE financing products.

[21] World Council of Credit Unions (www.woccu.org <http://www.woccu.org>) has published the first known Islamic finance manual for credit unions in the developing world: World Council of Credit Unions Toolkit for Islamic Investment and Finance Cooperatives (IIFCs), "Islamic Finance Manual Operating Policies and Procedures For Credit Unions," July 2013, http://www.woccu.org/financialinclusion/bestpractices/operations

Table 4.1: CE Lending Product Design Features

Feature	Description
Loan Purpose	Products should be designed with a clear understanding of the uses of the funds. Some FIs may be interested in loans for energy-efficient consumer products (green home improvements). Others may want to finance broader SME energy efficiency. Decisions about the loan products to offer will vary with the risk tolerance of the FI and its comparative advantages in specific markets.
Eligible Borrowers	Factors to consider for consumer loans include income level and sources, employment status, credit history, and distance from the nearest branch office. Section 4.5 addresses special considerations for ESCO loans.
Loan Sizes	Minimum and maximum loan amounts should be set for each category of borrower. The demand for loans, regulatory limitations, and the FI's financial capacity to fund and monitor loans should be considered in setting the range of loan sizes.
Loan Duration	The repayment period for loan products will depend on the types of activity financed, available funding levels, and repayment capacity of customers. One of the greatest challenges for long-term loans is a mismatch between the terms of liabilities and assets. ESCO or project finance might require longer term loans than small FIs can safely finance (5 to 10 years or more).
Disbursement Method	• **In-kind Disbursements:** FIs pay the loan proceeds to the technology suppliers or installers who provide equipment and services to the users responsible for repayment of the loans. In-kind disbursements can reduce the risk of fraud or borrower use of loan proceeds for unauthorized purposes. • **Cash Disbursements:** FIs release the loan proceeds directly to the borrower in full (lump sum) or a series of partial payments (tranches). Tranche disbursement allows the FI to withhold a portion of the loan funds while it monitors use of the funds and the borrowers' implementation progress. The appropriateness of lump sum versus tranche disbursement depends on the type of activities funded. Tranche disbursement is particularly effective for large projects (such as ESCO financing or greenfield project finance that involves construction or phased purchases) because it provides the FI with additional assurances on use of the funds.

4.3.2 Pricing Strategy

This section provides more detail on considerations affecting loan pricing. Loan pricing is largely determined by market forces and national macroeconomic policies and regulations. FIs often start with international or national reference rates and then add margins to cover their administrative costs, desired profit, and risk. Common international reference rates used by banks include the 1) London Interbank Offered Rate (LIBOR) for US dollar loans, 2) Euro Interbank Offered Rate for Euro loans, and 3) the South African Benchmark Overnight Rate. The financial and capital market divisions of an FI can provide the most accurate, up-to-date information on prevailing reference rates. Inter-bank lending rates can be a proxy for cost of funds in an open economy. However, FIs may also be able to obtain concessional capital at lower interest rates from multilateral or national development banks, donors, or national governments.

FIs add a risk margin to the reference rate of interest to compensate for the expected rate of non-

repayment of loans. Risk margins are often stated in basis points (each basis point equals 0.01 percent). The risk margin typically varies by loan product. An advanced loan pricing strategy can compensate for the rated risk of a particular borrower or type of credit exposure. In setting the risk margin, FIs often consider market conditions, competitor pricing, budgetary targets, and borrower's credit score. Small or short-term loans often have higher interest rates to compensate for larger transaction and administrative costs relative to the potential income from the loan. Figure 4.1 contains a formula to estimate the risk-adjusted income from a loan.

Figure 4.1 Illustrative Loan Pricing Strategy

Risk-adjusted income = [Spread + Fees - Expected Loss - Operating Costs] x (1 - Effective Tax Rate)

Spread = Difference between loan rate and bank's cost of funds
Fees = Commitment or loan origination fees
Expected loss = Probability of loss x magnitude of loss with default
Expected default frequency = Projected default percentage based on a rating system metric
Loss given default = Percent loss of interest and principal resulting from a default
Operating costs = Percent of the loan amount needed to cover staff time originating and monitoring the loan and the general costs of doing business (overhead)

For prudent management, FIs set aside a certain percentage of the loan capital as a provision for bad debt (capital at risk). An FI may either use a single percentage or a graduated scale based on borrower-specific risk, as in table 4.2.

Table 4.2: Assumed Capital at Risk for Different Credit Ratings

Rating	Percent of Loan Capital at Risk
AAA	7.5%
AA	8.0%
A	8.5%
BBB	10.0%
BB	12.0%

Risk-Adjusted Income and the Risk-Adjusted Return on Capital (RAROC)

The next step is to estimate the profitability of the loan through the risk-adjusted income and return on capital.

$$\text{Risk-Adjusted Income} = (\text{Spread} + \text{Fees} - \text{Expected Loss} - \text{Operating Costs}) \times (1 - \text{Effective Tax Rate})$$

The risk-adjusted return on capital (RAROC) equals the risk-adjusted income divided by the capital at risk. The risk-adjusted return on capital is then compared to the minimum required rate of return ("hurdle rate") set by the financial institution. The return on capital has to be above the hurdle rate for the loan to be profitable. If the RAROC does not exceed the hurdle rate, the FI can negotiate a higher interest rate or additional fees or require more collateral to reduce the expected loss in the event of defaults to raise the RAROC above the hurdle rate. Since the RAROC is also affected by the FI's cost structure, innovations in delivery of financial services that reduce costs could also be explored, such as use of mobile money technologies to reduce or eliminate the need for physical branch offices.[22] In the following example, an FI is considering a USD100,000 loan for a solar lighting system for a small business. The loan would be amortized over four years, with principal and interest paid monthly. The FI planned to charge 6.5% interest and a USD1,000 fee. After reviewing the business owner's credit history, the credit risk department assigned a risk rating of "A". The following information is used in calculating the RAROC.

- Cost of capital
- Expected loss for "A"-rated loans
- Overhead operating charge for each loan
- Bank's effective tax rate
- Capital at risk for business loans

These five factors are determined by the FI's historical experience and policy.

Table 4.3: Calculation of the Risk-Adjusted Return on Capital

Spread	4.00%
Fee income	$1,000
Expected loss	1.24%
Expected default frequency	2.47%
Loss upon default	50.0%
Operating costs	2.0%
Overhead	$100,000
Effective tax rate	32%
Capital at risk	8.5%

Risk-adjusted income = [spread + fees - expected loss - operating costs] (1 - effective tax rate)
= [4.00% x ($100,000) + $1,000 – 1.24% ($100,000) - $2,000] x (1 – 32%)
= $1,196
Capital at risk = $100,000 x 8.5% = $8,500
RAROC = $1,196/$8,500 = 14.1%

[22] CGAP Newsflash: Explore an Inventory of Branchless Banking Product Concepts. http://www.cgap.org/about/programs/applied-product-innovation

4.3.3 Product Design Considerations for CE Finance

The diversity of CE technologies and the variety and scale of applications and market players can create many opportunities for different financial products. For example, the size and structuring of loans for off-grid photovoltaic (PV) for a single home will differ from what is needed for a community mini-grid or a hydro-power plant that feeds into the national electric grid. Table 4.4 lists some examples of financial products for different types of clients and technologies.

Table 4.4: CE Financial Products by Market Segment

	Retail Finance	ESCO Finance	Project Finance
Energy Efficiency	• Consumer loans (homes and cars) • Enterprise loans (building and equipment)	• ESCO loans (investment capital and operating costs)	• Green buildings or industrial upgrades
Renewable Energy	• Trade loans • Consumer loans	• ESCO • Leasing	• RE Generation (small or large scale)

RETAIL LOANS FOR CONSUMERS AND BUSINESSES

Consumer loans may be a good entry point for many FIs interested in CE lending. These loan products can be modeled after existing housing finance, consumer asset finance, or general consumer credit products. Although the market for consumer CE loans would still need to be assessed, FIs providing other consumer loan products might not need much staff training to expand into consumer lending for CE. An FI could move into CE lending for consumers by targeting existing clients, who are generally less risky than new clients without a track record.

Two important considerations for successful retail lending for CE are marketing and ensuring that consumers are buying reliable and durable CE equipment. It may also be important to help the clients understand how much money they could save through greater energy efficiency or use of renewable energy at their homes or businesses. Partnerships between FIs and CE suppliers and installers can be helpful in marketing these loans and reducing risk by ensuring that clients understand the benefits and costs of the technologies. Partnerships with reliable suppliers can also help ensure that technology quality problems will not jeopardize client repayment rates. However, if the FI has a partnership with a poor quality supplier or installer, its business reputation can be damaged as well as its loan portfolio.

Performance guarantees and careful structuring of loan repayment schedules are also important for CE loans for the construction industry and other businesses. Performance guarantees based on energy cost savings can be used as a substitute for cash collateral, but FIs may still want additional recourse from the general operating cash flows or assets of the business.

The repayment schedule for conventional loans reflects the expected life of the equipment financed or the borrowers' ability to service the debt for energy financing. For CE loans, repayment schedules should match the expected savings from energy efficiency gains or substitution of renewable energy so that borrowers can earn positive cash flow from the investment, including any subsidies. Some borrowers will want the greater certainty of fixed interest rates to encourage them to adopt CE,

especially if they are uncertain of the benefits of the technologies. However, other borrowers may be willing to accept the greater uncertainty of variable interest rates if they are expected to result in lower total interest costs. Many variable interest rate loans are offered with ceilings on the annual adjustment in interest rates and a ceiling on the maximum rate that will be charged. FIs can help borrowers calculate the effects of selecting fixed versus variable interest rates on the profitability of CE investments.

If a FI has identified a large number of potential individual borrowers interested in small loans, it may need to use group lending methods that aggregate the loans into a larger volume to increase the loan size and reduce transaction costs. Group repayment guarantees can also decrease the risks of loan losses for the financial institution.

4.3.4 Client Segment

Trade loans target CE manufacturers, distributors, and installers. Manufacturers may need relatively large amounts of financing with long terms for fixed capital for plant and equipment and/or short-term loans for working capital for production and marketing. Distributors and installers may need credit for purchases for resale or to offer supplier credit or installment terms to buyers. Manufacturers and distributors may need letters of credit to facilitate import transactions and pay tariffs. They may also need access for foreign exchange if this is restricted. Table 4.5 indicates that FIs will have to consider different factors in assessing the creditworthiness of various types of clients:

4.3.5 CE Resources

- Three of the case studies in module 6 involve financial institutions that have developed and successfully rolled out CE consumer finance products (Sasfin, Fondesurco and Romanian Banks).
- International Finance Corporation Private Enterprise Partnership for China. 2007. Credit Analysis and Commercial Lending. Foreign Language Press. 461.pp
- The Renewable Energy Microfinance and Microenterprise Program (REMMP): Funded by USAID and implemented by Arc Finance, REMMP's goal was to increase access of underserved populations to CE products in order to improve livelihoods and quality of life among these target recipients while minimizing climate-damaging emissions.

  REMMP Program Components: The Program aimed to achieve these goals by increasing end-user access to finance through four related components:

  - Demonstrating the commercial viability of a range of consumer payment models (including microfinance, crowd-funding, remittances and pay-as-you-go models – see below for more information)
  - Facilitating investment for CE financing
  - Improving the capacity of the private sector to finance CE
  - Documenting and disseminating case studies and best practices stemming from numbers 1 to 3 above

Table 4.5: How Collateral Coverage Ratio Changes with Loan Repayments

Individuals	Distributors and Retailers of CE Products	All CE Borrowers
• Borrower capacity to repay • Job or income stability • Credit history • Residential stability • Projected amount and timing of energy cost savings • Citizenship or residency requirements • Maximum unsecured exposure (debt/total exposure) • Other exclusions, including less secure employment or business • Verification of information submitted by loan applicants • Collateral verification and appraisal • Selection criteria for appraisers/evaluators • Appraisal and valuation standards • Frequency of collateral re-appraisals or re-valuations • Maximum portfolio limits	• Type of business • Compliance with local environmental law or regulation • Number of years in business and track record with CE investments • Local registration requirements • Maximum debt exposure • Borrower verification requirements • Collateral verification and appraisal processes • Selection criteria for appraisers and evaluators • Key appraisal and valuation standards • Frequency of collateral re-appraisals and re-valuations • Maximum portfolio limits	• Compliance with local social and environmental laws and regulations • Technical and financial feasibility and technology risk analysis of the proposed investment • Enabling environment (feed-in tariffs, policies, carbon emission limits) • Market risks (prices of CE and conventional energy, world and domestic macro-economic conditions, and the policy and regulatory environment

REMMP partners included leading MFIs, microfinance apex organizations, crowd funding organizations, commercial banks, energy companies with credit facilities, energy companies with pay-as-you go mechanisms, and money transfer organizations. The focus of the program was on decentralized renewable energy technologies for households or communities. While the business models may differ, each REMMP activity demonstrated and tested an innovative financing mechanism for CE.

The project tested innovative finance mechanisms for CE in Uganda, India and Haiti. Such innovative mechanisms included:

- *Uganda - In House 'Payplan'* - SolarNow, a Uganda-based solar company, offering credit to customers on a hire purchase basis, enabling them to purchase solar home systems in monthly installments via an in-house "payplan." This payment method reduces cost barriers for customers but is management and cash-intensive.
- *India - Microfinance Crowd*-Funding: Milaap has established a low-cost revolving credit facility for MFIs engaged in energy lending in order to stimulate MFI interest in the sector and reduce borrowing costs of MFI customers. TA is also provided to Milaap's MFI sub-partners to finance a range of energy services.

- *India - Energy Company Pay-as-you-go Scheme*: Simpa Networks offers customers a pay-as-you-go metered system enabling them to purchase solar home systems.
- *India – MFI Energy Subsidiary:* Provided support to enable Bandhan to develop and launch a new multi-state energy focused subsidiary focused both on sales and credit for end-clients.
- *Haiti – Remittance Platform via Money Transfer Organization (MTO):* The strengthening and scaling of Sogexpress remittances platform in Haiti to reach more customers by developing a credit facility for customers and sales agents, and by incorporating new CE devices.

For more information, see www.arcfinance.org

Table 4.6 describes possible CE products that could be developed based on the use of funds as well as the associated risks and risk mitigating factors for each consumer/retail CE product. Module 5 contains detailed information about benchmarks for various CE technologies.

Table 4.7 describes some typical retail loan products for CE technologies and their risks and risk-mitigating factors.

Table 4.6: Characteristics of Loans for CE Uses

Uses	Product Details	Risk Rating and Key Risks	Risk Mitigating Factors
Energy Efficiency Loans			
Consumer Loans for Energy Efficient Home Construction and Improvement	***Green Mortgage Loans*** *Client segment:* Individual home buyers *Loan purpose:* Construction or purchase of homes that use CE technology or design elements *Loan term:* 10-30 years *Loan value:* 70-80% loan-to-value (LTV) *Key technologies:* (EE) Insulation, AC, appliances, lighting, water heating, stoves (RE) solar panels, small wind turbines, geothermal *Key enabling Factors:* • Reliable technical partner(s) ***Green Home Improvement Loans*** *Client segment:* I Homeowners *Loan purpose:* Improved energy efficiency for residential structures *Loan term:* 6 months – 2 years *Loan value:* Range of USD 300 to 4,000 *Key technologies:* Stoves, AC, insulation, appliances, lighting, water heating, *Key enabling factors:* • High recurrent energy cost • Rebates, subsidies • Reliable partners • Product warrantees and energy saving guarantees	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Over-indebtedness of clients • Regulatory environment and foreclosure laws and enforcement • Lack of traditional collateral (land title) • Poor quality technical designs and or installations • Cost overruns on new construction and home improvements • Poor performance of contractors • New technologies only recently introduced locally • Limited competition among suppliers and service providers, leading to lower quality	• Voucher or in-kind disbursements • Proper underwriting of capacity to repay and documentation • Base lending on cost-savings to reduce or eliminate conventional collateral • Consider a buy-back agreement with a partner supplier for hardware that can be used as collateral • Use alternative collateral (mandatory savings, deposits, fixed assets, group guarantee) • Ensure that equipment is proven and has proper warranties and after-sales servicing

Uses	Product Details	Risk Rating and Key Risks	Risk Mitigating Factors
Fuel-Efficient Vehicle Loans For Consumers	***Car Purchase Loans*** *Client segment:* Individual vehicle buyers *Loan purpose:* Purchase of energy-efficient vehicles *Loan term: 1-5 years* *Loan value:* Up to USD 40,000 *Key technologies:* Electric, hybrid ***Vehicle Fuel Conversion Loans*** *Client segment:* Individual vehicle owners *Loan purpose:* Conversion of gasoline or diesel vehicles to alternative fuels *Loan term:* 2-6 years *Loan value:* USD 500--2,000 *Key technologies:* Gasoline to natural gas or biodiesel *Key enabling factors (for both car purchase and fuel conversion loans):* • High recurrent costs for fuel and maintenance • Rebates, subsidies, or tax preferences • Reliable technical partners • Product warranties and energy saving guarantees	***Risk Rating:*** *Medium* ***Key Risks:*** • Proper underwriting of capacity to repay and documentation • Lack of traditional collateral • Theft or loss of moveable assets • Regulatory environment and enforceability of car liens • Over-indebtedness of borrowers • New technologies only recently introduced locally • Limited competition among suppliers and service providers (leading to lower quality products)	• Vouchers or in-kind disbursements • Proper underwriting of capacity to repay and documentation • Base lending on cost-savings to reduce or eliminate conventional collateral • Use alternative collateral (mandatory savings, deposits, fixed assets, group guarantee,) • Perform due diligence on vendors and suppliers. • Work with proven suppliers • Require vehicle insurance and warranties

Uses	Product Details	Risk Rating and Key Risks	Risk Mitigating Factors
SME or Large Business Loans For Energy Efficiency	***Business Facilities*** *Client segment:* SMEs and large businesses *Loan purpose:* Building improvements for energy efficiency and/or energy savings *Loan term:* Time required to recoup cost savings (project and technology dependent) *Loan value:* USD 5,000 - 300,000 *Key technologies:* Insulation and AC, lighting, building energy and management systems *Key enabling factors:* • Growing energy costs • Rebates, subsidies • Reliable partner(s) • Product warranty, energy saving guarantee ***Machinery and Equipment*** *Client segment:* SMEs, corporates *Loan purpose:* Energy efficiency and/or savings Loan term: Period required to recoup savings Loan value: USD 10,000 - 200,000 *Key technologies:* Electric motors, electric heat pumps, boilers *Key enabling factors:* • Rising energy costs • Rebates, subsidies • Reliable technical partner(s) • Product warranty, energy saving guarantee	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Over-indebtedness of clients • Regulatory environment and foreclosure laws and enforcement • Lack of traditional collateral • Inferior quality technical design and or installation • Cost overruns on new construction or renovations • Poor performance of contractors • New technologies only recently introduced locally • Limited competition among suppliers and service providers ***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Moveable assets, vulnerable to theft • Over-indebtedness of borrower • Damage to system because of improper use • Reputational and repayment risk from poor system performance or after-sales service • New technology in local market, with limited availability of suppliers and servicers	• Use voucher or in-kind disbursements • Proper underwriting of capacity to repay, documentation of borrower income • Base lending on cost-savings to reduce or eliminate conventional collateral • Consider a buy-back agreement with a partner supplier for hardware that can be used as collateral • Ensure that the equipment is proven and has proper warranties and insurance • Use voucher or in-kind disbursement • Properly underwrite capacity to repay, documentation of borrower income • Use cost-saving data as basis for lending, so that less collateral coverage is required • Use alternative collateral (mandatory savings, deposits, fixed assets, group guarantee) • Perform due diligence on vendors, suppliers; established trusted supplier relationships • Require hazard and theft insurance and warranties

Uses	Product Details	Risk Rating and Key Risks	Risk Mitigating Factors
Renewable Energy			
Consumer Home RE Loans	***Home RE Solutions*** *Client segment:* Individual homeowners *Loan purpose:* Renewable energy solutions to residential energy needs *Loan Term:* 1-5 years *Loan Value:* USD 5,000 - 100,000 *Key technologies:* Solar PV, solar water heaters, small wind turbines, geothermal heat pumps, biomass cookstoves, biogas installations *Key enabling factors:* • High recurrent energy costs • Rebates, subsidies • Reliable technical partner(s) • Product warranty, energy saving guarantee	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Over-indebtedness of the client • Regulatory environment, foreclosure laws • Lack of traditional collateral • Poor quality installations • Improper use of the systems and/or equipment • Reputational and repayment risk in case of poor system performance or poor after sales service • New technology only recently introduced to local market, with limited availability of suppliers and servicers	• Use voucher or in-kind disbursement • Properly underwrite capacity to repay, documentation of borrower income • Use cost-saving data as basis for lending, so that less collateral coverage is required. • Use alternative collateral (mandatory savings, deposits, fixed assets, group guarantee,) • Perform due diligence on vendors, suppliers; established trusted supplier relationships • Provide customer education on product use, maintenance, and safety • Require insurance, warranty

Uses	Product Details	Risk Rating and Key Risks	Risk Mitigating Factors
Enterprise or Business RE Loans	***RE for Enterprises and Businesses*** *Client segment:* SMEs *Loan purpose:* Renewable energy solutions for corporate premises *Loan term:* 1-5 years *Loan value:* USD 10,000 - 150,000 (average) *Key technologies:* Solar PV installation and farms, solar water heaters, small wind turbines or farms, geothermal heat pumps, biomass, biogas installations *Key enabling factors:* • High recurrent energy costs • Rebates, subsidies • Reliable technical partner(s) • Product warranty, energy saving guarantee	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Over-indebtedness of the client • Lack of traditional collateral • Inferior quality installations • Damage to system because of improper use • Client safety hazard (such as rotating parts and high voltage) • Reputational and repayment risk in case of poor system performance or poor after sales service • New technology only recently introduced to local market, with limited availability of suppliers and servicers	• Use voucher or in-kind disbursement • Implement sound underwriting and due diligence policies • Use cost-saving data as basis for lending, so that less collateral coverage is required. • Perform due diligence on vendors, suppliers; established trusted supplier relationships • Provide customer education on product use, maintenance and safety • Require insurance, warranty • Thoroughly vet new clients and supplier references • Build customer relationships along the supply chain and lend in small increments initially • Seek guarantees for new customers to help mitigate first loss risk
	Trade Finance *Client segment:* RE product and equipment importers *Loan purpose:* Short term trade finance *Loan term:* 3-12 months, revolving credit facilities *Loan value:* Lending limits established with customer account balances as percent of inventory costs *Key technologies:* solar, biogas, biomass equipment, cookstoves, wind turbines *Key enabling factors:* • Regulatory environment, rebate programs fueling demand • Partnerships	***Risk Rating:*** *Low-Medium* ***Key Risks:*** • Borrower track record and customer diversification • Seasonality factors • Over-indebtedness • Theft • New technologies and regulatory environment; compliance issues for vendors	

Table 4.7: Characteristics of Loans by CE Technologies

Technology	Typical Loan Products	Key Risks	Risk Mitigating Factors
Solar PV	***Consumer Solar Energy Loans*** *Loan purpose:* Solar home systems, mostly for off-grid home/small business lighting, charging phones, and powering electrical appliances such as TV and radio. Larger systems can power refrigerators or computers. *Client Segment:* Individual homeowners, Institutions (schools, hospitals) off-grid *Loan term:* 3 months-2 years *Loan value:* USD 20 for small solar lanterns, up to USD 1,500 for a home system, USD 1,000+ at institutions *Key technologies:* Solar lanterns, solar home systems *Key enabling factors:* • Low likelihood of grid extension • Active off-grid market suppliers , with business geared toward rural service delivery (products require active sales/market development effort, as well as customer education and after-sales service) • National product quality standard and reinforcement	***Risk Rating:*** *Low-Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Lack of traditional collateral • Theft • Damage to system because of improper use • Reputational and repayment risk in case of poor system performance or poor after sales service	• Use voucher or in-kind disbursement • Use alternative collateral (compulsory savings deposits, fixed asset loan, group guarantees) • Use cost-saving data as basis for lending, so that less / no collateral is required. • Consider a "buy-back" agreement with suppliers for collateral • Ensure that equipment purchased is proven and has proper warranty and insurance, through partnerships with suppliers • Anti-theft measures • Provide customer education on product use and maintenance

Technology	Typical Loan Products	Key Risks	Risk Mitigating Factors
Biogas	***Household and Institutional Biogas Digesters*** *Loan purpose:* Small-scale biogas for cooking and lighting, large systems for electricity generation. *Client segment:* Domestic biogas -Farmers with at least 5 animals (cows and pigs are commonly used, required amount depends on dung quality) Institutions such as schools, hospitals, and prisons. *Loan term:* 6 months-2 years *Loan value:* Domestic biogas systems: USD 350-2,000 Institutional biogas systems: USD 7,000+ *Key technologies:* Biogas digester *Key enabling factors:* - Sufficient number of livestock in confined area - Skilled installers - Existing national biogas technology product quality standard	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Damage from improper use • Reputational and repayment risk from poor system performance or inadequate after-sales service	• Use voucher or in-kind disbursement • Use data on cost-savings as basis for lending, to reduce importance of collateral • Ensure that quality assurance and after sales agreements are in place (and enforced) • Provide customer education on technology use and maintenance

Technology	Typical Loan Products	Key Risks	Risk Mitigating Factors
Efficient Biomass Stoves	***Consumer loans for biomass*** *Loan purpose:* Energy-efficient cookstoves, for households and institutions *Client Segment:* Urban and rural households *Loan term:* 3-6 months *Loan value:*_15-200 USD *Key technologies:* Improved cookstoves *Key enabling factors:* • Quality standards • CO2 emission reduction credits	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Lack of traditional collateral • Inferior biogas technology product quality • If carbon credits are involved, data needs to be collected on use of improved cookstoves over several years	• Vouchers or in-kind disbursements • Alternative collateral (mandatory savings, deposits, fixed assets, group guarantee) • Carbon credits to subsidize the RE product • Ensure that equipment is proven and has a warranty and good after-sales service through partnerships with manufacturers or distributors • Customer education on use and maintenance If combined with carbon credits, set up monitoring and reporting system
Wind power	***Consumer or enterprise loans for wind power*** *Loan purpose:* Individual loan for small turbines, mostly used for water pumping, or to power electrical appliances in a home or small business *Client Segment:* Off-grid households or small businesses *Loan term:* 1- 2 years *Loan value:* USD 850-10,000 *Key technologies:* Wind tower, gearbox, blades, motor, invertor, battery bank *Key enabling factors:* • Sufficient speed and reliability of wind (based on accurate, local records) • Reliable technology • Supportive regulations	***Risk Rating:*** *Medium - High* ***Key Risks:*** • Diversion of loan proceeds to other uses • Lack of traditional collateral • Poor product quality • Client safety hazard from rotating parts and high voltage	• Use of voucher or in-kind disbursement • Consider a "buy-back" agreement with suppliers for collateral • Ensure that equipment purchased is proven and has proper warranties and insurance • Provide customer education on wind power product use and maintenance, as well as safety

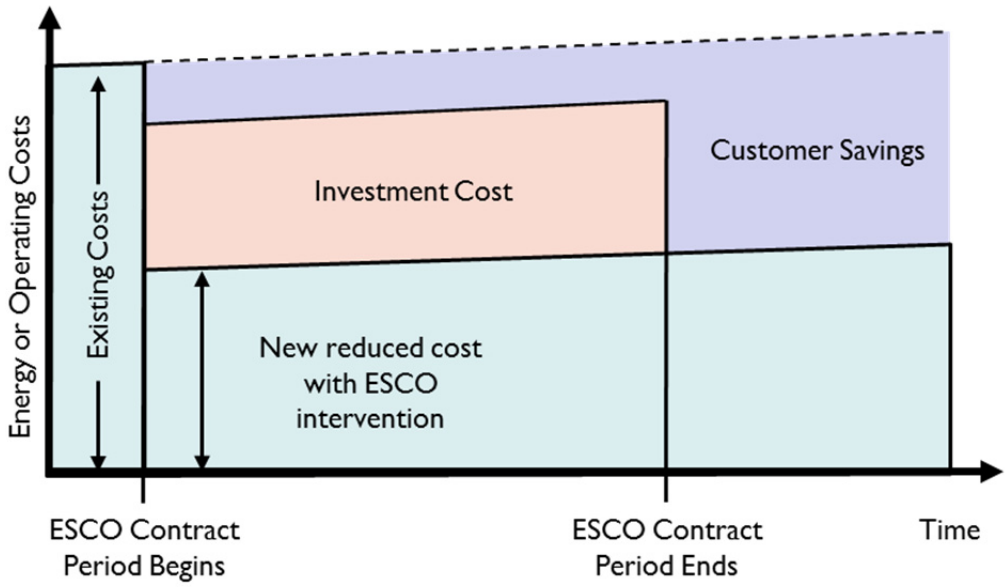
Technology	Typical Loan Products	Key Risks	Risk Mitigating Factors
Hydropower	***Consumer or enterprise loans for micro-hydro*** *Loan Purpose:* Home or small business loans for micro-hydro for lighting, charging phones, and electrical appliances *Client Segment*: Off grid, close to a river *Loan term:* 1-2 years *Loan value:* USD 150-1,500 *Key technology:* Small turbines (generally up to 10 MW) *Key enabling factors:* • Sufficient private sector knowledge • Mature technology available • Off-grid locations with hydropower potential (pico – up to 5 kW, micro – up to 100 kW) • Supportive regulations	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Lack of traditional collateral • Inferior product quality • Client safety hazards from rotating parts and high voltage	• Use of voucher or in-kind disbursement • Consider a "buy-back" agreement with partner supplier on (part of) the hardware, and value it as collateral • Ensure that equipment is proven and has proper warranties and insurance • Provide customer education on product use maintenance, and safety

ESCO LOANS

Energy service companies are an important part of the CE supply chain. ESCOs act as project developers to design, install, operate, and arrange financing for CE projects that reduce operating costs or generate income. The ESCOs take responsibility for the project's technical and performance risks. The term ESCO is sometimes extended to any organization that provides energy services. This Toolkit, uses a stricter definition of ESCOs as entities that contract projects that generate loan repayment through realized energy cost savings. The projects implemented by ESCOs are comprehensive and generally use a range of cost-effective measures to achieve energy cost savings for their customers (see Figure 4.2 on next page).

ESCOs are not legal in some countries. FIs should check into their legal status as part of their due diligence before lending to any companies that propose to act as ESCOs. The same need to check on legal issues also applies to RE projects.

Figure 4.2: How an ESCO Works



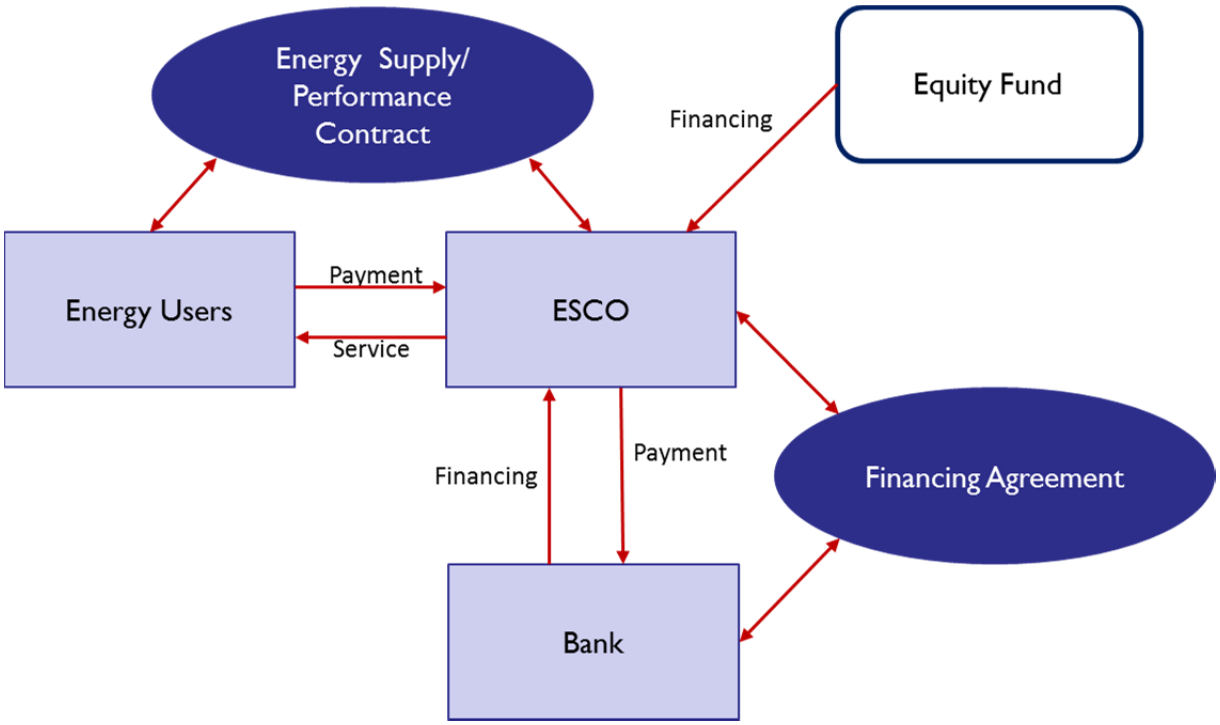
Source: Adapted from Olesen, Niels Graesboll, Regions 202020: "Energy Efficiency in European Regions. Bilbao, November 2012," http://regions202020.eu/cms/assets/Uploads/events/121108Bilbao/8-Nov-2012-Regions202020-Bilbao-EPC-ESCO.pdf

Under the strict definition of an ESCO, most projects require long-term maintenance expenditures for the life of the contract and customer training to allow the customer to sustain the savings after the contract ends through proper maintenance and education about energy usage patterns.[23]

ESCOs have special financing requirements due to the nature of their business model. ESCO projects may require large initial capital investments and the returns may be generated over a long period of time (2 to 20 years or more). The payback period for ESCO projects is very sensitive to the prices of conventional energy sources. ESCO customer payments to ESCOs are tied to their energy cost savings and sometimes other cost savings resulting from the project. This method of financing, called Energy Performance Contracting (EPC), requires a contractual agreement between an ESCO and its client that is usually linked to verifiable cost savings compared to the baseline trends. As Figure 4.2 shows, the measured income stream from future energy savings (the project's performance) and the general creditworthiness of the energy end-user are used as alternative sources of collateral.

[23] National Association of Energy Service Companies (NAESCO), "What Is an ESCO?" Washington, DC, 2011, http://www.naesco.org/resources/esco.htm.

Figure 4.3: ESCO Financing



Performance-based payments are often attractive for ESCO customers because they reduce their risks by providing guaranteed results. This is especially the case when the clients are not very knowledgeable about the potential savings from energy technologies. ESCO project finance structures customer costs so that they will result in positive net benefits. However, because performance based payments vary, they are less predictable and more difficult for ESCOs to finance.[24]

The types of financial products required by ESCOs depend on the specific type of energy performance contracting used by the ESCO. Table 4.6 describes two common EPC models used by ESCOs – shared savings and guaranteed savings. [25]

[24] U.S. Department of Energy, Energy Efficiency and Renewable Energy, "Energy Service Company Project Financing," *Clean Energy Finance Guide for Residential & Commercial Building Improvements,* January 26, 2012, http://www4.eere.energy.gov/wip/solutioncenter/finance_guide/content/energy_service_company_project_financing?print=1.

[25] Econoler, *IFC Energy Service Company Market Analysis,* International Finance Corporation, June 23, 2011, http://www.ifc.org/wps/wcm/connect/dbaaf8804aabab1c978dd79e0dc67fc6/IFC+EE+ESCOS+Market+Analysis.pdf?MOD=AJPERES.

Table 4.8: Financing Energy Service Companies

Use of Funds	Product	Key Risks	Risk- Mitigating Factors
	Shared Savings EPC (ESCO Direct Loans)		
Comprehensive EE Retrofits in Building and Industry	***Loan product:*** *ESCO Financing* *Client Segment:* ESCOs *Loan purpose:* Finance ESCO projects (energy services, equipment, installation, measurement and verification of savings) *Loan term:* 7 years + *Loan value:* Varies *Key technologies:* ESCOs develop tailored energy-saving solutions such as LED lighting, high efficiency heating and air conditioning, efficient motors and variable speed drives, and centralized energy management systems. *Key enabling factors:* • High recurrent energy cost • Contractual enforcement • Suitable warranties from suppliers or ESCO guaranteed savings • Bridge financing available as part of long-term financing typically secured by a construction bond from an insurance company.	***Risk Rating:*** *Medium to High (Long-term)* ***Key Risks:*** • Fungibility of funds • Lack of traditional collateral • Theft • Damage to system because of improper use • Reputational and repayment risk in case of poor system performance or poor after-sales service • Batteries and inverters need to be replaced after a number of years	• Make an in-kind disbursement • Make tranche disbursements • Consider a "buy-back" agreement with partner supplier on (part of) the hardware, and value it as collateral • Ensure that equipment purchased is proven and has proper warranty and insurances, e.g., through partnerships with supplier • Consider requesting that operations and maintenance (O&M) be handled by a professional contractor • Include replacements budgets • Take anti-theft measures • Provide customer education on product use and maintenance

Use of Funds	Product	Key Risks	Risk- Mitigating Factors
Guaranteed Savings EPC (ESCO Client Loans)			
Comprehensive EE Retrofits in Buildings and Industry	*Loan product:* Financing of ESCO client; backed by ESCO savings performance guarantee to client that usually equals repayments to lender *Client Segment:* Energy end-users in industry and real estate (especially commercial) *Loan purpose:* Finance energy end-user; contract with ESCO *Loan term:* 7-10 years *Loan value:* Wide range *Key technologies:* ESCOs develop tailored energy saving solutions that often include LED lighting, high efficiency heating and air conditioning, efficient motors and variable speed drives, and centralized energy management systems	***Risk Rating:*** *Medium* ***Key Risks:*** • Diversion of loan proceeds to other uses • Lack of traditional collateral • Theft • Damage to system because of improper use • Reputational and repayment risk in case of poor system performance or poor after sales service • Batteries and inverters need to be replaced after a number of years	• Make in-kind disbursement • Consider a "buy-back" agreement with partner supplier on (part of) the hardware, and value it as collateral • Ensure that equipment purchased is proven and has proper warranty and insurances, e.g., through partnerships with suppliers • Consider requesting that O&M be handled by a professional contractor • Include replacements budgets • Take anti-theft measures • Provide customer education on product use and maintenance

Product Design Considerations

- ***Use of performance guarantee as alternative collateral***. ESCO loans are often made without collateral since they are secured by the underlying energy assets and cash flows from the investment, rather than the general assets of the business. If the ESCOs are SMEs, their performance guarantee might not be perceived as an adequate risk mitigation strategy. Alternatively, guarantees could be offered through separate financial intermediaries, such as insurance or re-insurance companies.
- ***Verification of energy savings through metering.*** ESCO projects typically include comprehensive EE retrofits or rural community mini-grid set up, which often require large capital investments and have a long payback period. Much of the initial project costs pay for skilled labor, which cannot be used as collateral if the borrower fails to repay the loan.
- ***Theft or destruction of CE systems can be a problem.*** ESCO projects may include a mini-grid with renewable energy collection, storage and distribution technology in rural communities. The remote location makes it difficult to monitor and repair equipment and prevent theft or misuse. If the equipment is not working properly, it is unlikely that repayments will continue. Client education on product use, security, and maintenance can help reduce this risk.
- ***Diversion of loan proceeds (fungibility).*** Loan proceeds that are disbursed in cash can be diverted to other uses besides energy production or savings. This problem can be reduced by monitoring to

ensure that cash loans are used for intended purposes. Alternatively, FIs can provide clients with in-kind disbursements of equipment or materials or vouchers for purchases of specified items from any authorized supplier of loans.

4.3.6 Market Segments for ESCO Loans

ESCOs can be classified into four categories based on their ownership and affiliated services.

- Independent ESCOs
- Building equipment manufacturers
- Utility companies
- Energy/engineering companies

Equipment manufacturers and vendors can increase their market share by using the EPC approach. Some large companies such as Johnson Controls, Honeywell, and Siemens have used this financing method to stimulate sales.[26] Module 6 discusses two examples of financial institutions that have offered CE ESCO finance products by Sasfin and Romanian Banks.

4.4 PROJECT FINANCE

Some RE projects need to secure their financing off the balance sheet because they lack sufficient liquid or easily transferable assets to satisfy collateral requirements for conventional loans. **Project finance** refers to credit obtained for a specific activity based on the expected future revenues generated from the activity. Project finance is particularly important for financing new clients that do not have a track record of past revenues. Since non-collateralized loans are riskier for the lenders, some FIs are unwilling to make these types of loans even though it means that they are foregoing the profits from a broader base of potentially good clients. FI that are interested in providing project finance need expertise in 1) projecting the profitability of projects, 2) assessing the risks and mitigating factors associated with particular projects and their developers and implementers, and 3) monitoring the actual profitability of the projects.

The special characteristics of RE projects need to be well understood by FIs interested in project finance.

- **Long and costly development periods:** Good feasibility studies are needed for all types of project finance, but RE projects often require additional time to obtain, environmental permits from the government and authorization for power grid connections from the utility or agency operating the electric power transmission system. Large projects should undergo bidding before contracting with Engineering, Procurement and Commission (or EPC) companies. The cost of a feasibility study for hydropower varies with the size, location, type of plant, and extent of the study, but often

[26] Econoler, *IFC Energy Service Company Market Analysis:* Washington, DC, International Finance Corporation, June 2011. http://www.ifc.org/wps/wcm/connect/dbaaf8804aabab1c978dd79e0dc67fc6/IFC+EE+ESCOS+Market+Analysis.pdf?MOD=AJPERES

ranges from USD 150,000 to 500,000. When required, environmental impact assessments for large projects can also be costly.

- **Need for long-term loans:** A large RE project may have high capital investment costs and a long expected lifetime. The duration of financing needed depends on the payback period and can be 10 to 20 years or more. FIs will want to ensure that the feed-in-tariffs or power purchase agreements extend throughout the loan repayment period.
- **Complex financial and contractual structures:** Large RE projects can involve developers, contractors, equipment suppliers, equity investors or co-financers, and energy buyers. These arrangements should be formalized in contracts and it is part of the due diligence of FIs to ensure that the contracts are valid and consistent.
- **Special purpose vehicles without conventional collateral:** Large RE projects are often structured as a special purpose vehicle (SPV). This means that the project is an independent entity with operations limited to the acquisition and financing of specific assets. SPVs have a legal status and assets and liabilities that are separate from their parent companies. This means that the assets of the parent company cannot be used as collateral for the RE project and vice versa. As a result, the RE project can only offer the financed assets and contracts that generates future revenues as security for loans. Consequently, FIs must carefully assess the validity of the project developer's sales contracts and ability to supply energy and manage its financial resources.
- **Ring-fenced cash flows:** Some RE projects are structured so that certain cash flows from the sales of energy can only be used for specific purposes and in a particular order, often called a cash flow waterfall. A cash flow waterfall for a large energy project typically states that net cash flows must first be used to make required loan repayments. Then, net cash-flows can be used to make agreed equity disbursements. Cash distribution priorities may also exist among different classes of equity investors. Preferred equity holders have priority over common equity holders. After, net cash flows have satisfied the debt repayments and equity disbursements, additional amounts can be used for other purposes such as expansion or replication of the project. Ring-fencing gives creditors more control over cash disbursements than they would have under a regular business loan. As a result, FIs are often willing to allow projects with ring-fenced cash flows to take on a higher debt burden than businesses that are not subject to a cash flow waterfall.
- **Need for careful assessment of project risks:** Long-term loans based on an RE project's ability to service its debt through cash flows over many years can be risky if revenues fall below projected levels or costs are substantially higher than expected. The risks of lower market prices for the energy produced can be mitigated through long-term supply contracts with inflation-indexed prices and specified amounts of energy to be purchased. However, it is not possible to mitigate decreases in the amount of energy produced that might result from unfavorable weather conditions, accidents or natural disasters, or downtime from internal equipment failures or external problems with the grid or off-grid uses. Project developers need to do a careful financial analysis that assesses the effects of input and output price changes, and volume risks. This can be done through a sensitivity analysis or Monte Carlo simulations using software such as Crystal Ball. An FI considering a loan application should either conduct its own, independent financial analysis or critically review the one submitted by the project developer and change assumptions that are not conservative or do not adequately take risks into account.
- **Financed by a combination of debt and equity:** Many large RE projects are financed by a combination of senior debt from an FI and equity from the sponsors and other investors. The ratio

of debt to equity depends on the FI's credit policies and risk tolerance. Very large geothermal or hydroelectric-projects may benefit from joint debt financing by multiple FIs (syndication of loans) to increase the size of loans by overcoming internal funding limits and sharing risks.

4.4.1 Structuring Project Finance

Large RE projects often obtain a combination of debt and equity finance. The mix of debt and equity has a major impact on the project's debt service coverage ratio and financial returns to the equity investors. If all other things are the same, then the result is that the higher the debt to equity ratio, the higher the rate of return on equity. The effect on the net present value (also known as the present value of net benefits) depends on whether the internal rate of return (IRR) is greater than the interest rate on debt. If the IRR exceeds the interest rate, a higher debt to equity ratio will also increase the net present value.

As a result, project developers prefer to keep their equity investments as low as possible to increase their returns on equity and reduce their risks. However, lenders prefer projects with a lower debt-to-equity ratio to help ensure that cash flows can cover debt service in full and project developers share more of the risks. On the other hand, lenders can also make more money from larger loans. An energy developer's willingness to commit equity for a prolonged period can be a good indicator of the project's viability. Lenders are also interested in the type of equity contributions. From the FI's perspective, it is best if equity contributions consist of money and other financial assets. Project developers often stress their sweat equity contributions (time put into the project design, development, and promotion valued at hypothetical salary levels). FIs are typically willing to provide loans for 60 to 80 percent of the total capital required for an RE project and count sweat equity as a portion of the developer's equity contribution. However, FIs may want to negotiate how sweat equity is estimated and valued and limit the share of total equity from sweat equity.

Predictable cash flows are essential for viable, project finance. FIs should target projects that can lock in stable long-term purchase arrangements under fixed-price or inflation-indexed contracts with governments, communities, or utilities. RE projects may also benefit from tax holidays, tax credits, mitigation of exposure to global fuel prices, and carbon credits. Subsidies and tax preferences reduce project risks and FIs could take them into consideration in financing decisions.

4.4.2 Target Market Segments

Some target market segments for CE project finance are

- Power generation: wind, hydro, solar, biomass, geothermal
- Energy-efficient transport: trains, subways, trolleys, buses, and clean, fuel distribution networks
- Energy recovery from waste management

Most major FIs in developing countries have experience providing project finance. Some have already financed a limited number or small portfolio of RE projects, but have not specialized in this sector or expanded their outreach to a broad range of CE projects, or financed a wide array of project sizes. Large-scale investments, and increase their ability to understand and finance complex projects, which typically (1) mix new technological solutions, (2) combine several resource input streams (e.g. natural gas and waste gas), and (3) involve government incentives and long-term income profiles with exposure limited specifically to the project entity.

4.4.3 Resources

The case studies in module 6 include examples of financial institutions that have developed CE project finance products for example Banco Atlantida and Romanian Banks.

Several additional resources can help an FI better understand how to lend to this market.

- For background on the credit risks of project finance as well as developments in the project finance market, challenges and key characteristics of project financing structures and a comparative analysis, see: Sorge, Marco, "The Nature of Credit Risk in Project Finance." Basel, Switzerland: *BIS Quarterly Review,* December 2004, http://www.bis.org/publ/qtrpdf/r_qt0412h.pdf.
- For a more detailed introduction on project financing theory and practice, see Yescombe, E.R. *Principles of Project Finance,* San Diego: Academic Press, 2002.
- Enabling Access to Sustainable Energy (EASE) is an international partnership of energy and development NGOs that aims to expand access to modern energy products to the rural poor of developing countries. It does this by facilitating the up-scaling of modern energy products and technologies through projects that support the local energy markets. For examples of how EASE has used project finance, see www.ease-web.org

Table 4.9: Characteristics of Project Finance for CE

Use of Funds	Product	Key Risks	Risk- Mitigating Factors
Energy Efficiency			
Buildings and Industry	Long term (2 years+) financing for EE projects in industry or buildings *Loan purpose:* Investments in energy saving technology, fixtures, improvements to produce energy savings *Client Segment:* SMEs and large businesses *Loan term:* 2 yrs+ *Loan value:* USD 100,000+ *Key technologies:* Tailored energy saving solutions for facilities and industries; LED lighting, high efficiency heating and air conditioning, efficient motors and variable speed drives, and centralized energy management systems. *Key enabling factors:* • High recurrent energy cost	***Risk Rating:*** *Medium* ***Key Risks:*** • Regulatory environment/foreclosure laws • Lack of traditional collateral • Inferior quality technical design and or installations • Cost overruns on new construction or improvements • Poor performance or track record of contractors and sub-contractors • New technology only recently introduced to local market, with limited availability of suppliers and servicers	• Realistic projections of energy savings • Product warranties and Product insurance • Energy saving guarantees
Renewable Energy			
Solar	*Loan purpose:* Grid-connected solar PV plant *Client segment:* Project developer, large agricultural estates *Loan term:* 10 years+ *Loan value:* USD 3 million per MW of installed capacity (average) *Key technologies:* Solar PV modules (20 year warranty), invertors (10 year warranty) *Key enabling factors:* • Power Purchase Agreement and contractual enforcement • Data on hours of effective sunlight to estimate energy yield • Grid reliability grid and absorptive capacity	***Risk Rating:*** *Low to Medium* ***Key Risks:*** • Regulatory environment/foreclosure laws • Lack of traditional collateral • Inferior quality technical design and or installations • Poor performance or track record of supplier • New technologies on local market, with limited availability of suppliers and servicers	• Quality of design, equipment and installation • Operating & Maintenance contracts • Monitor invertors because of lead times for replacement • Measures against theft and vandalism

Use of Funds	Product	Key Risks	Risk- Mitigating Factors
Biogas	*Loan purpose:* Project finance for industrial biogas for process heat or electricity as well as management of organic wastes *Client Segment:* Clients usually large-scale livestock farms and agro-industries *Loan term:* 5 years + *Loan value:* USD 200,000 + *Key technologies:* Digester (constructed locally), gas handling system, gas using devices *Key enabling factors:* • Historic data on energy consumption and related costs (project's viability is often based on savings rather than sales) • If high methane content, potential to generate revenue from offsets of carbon emissions	***Risk Rating:*** *Medium* ***Key Risks:*** • Secure and stable supply of feedstock • Consistent quality of feedstock • Environmental risk: Additional treatment of waste(water) may be needed	• Expertise needed for the FI to review each project
Hydropower	*Loan purpose:* Generate hydroelectric power for on-site consumption or sale to the grid *Client Segment:* Local communities and industries (for example tea estates) that operate in rural mountainous regions (close to suitable hydropower sites) *Loan term:* 10 years + *Loan value:* USD 500 to 2,500 per kW of installed capacity *Key technology:* Run-of-the-River, dams, dam and conduit *Key enabling factors:* • PPA and contractual enforcement (if grid connected) • Legal issues and water rights	***Risk Rating:*** *Medium* ***Key Risks:*** • Complex projects with multiple stakeholders • Land rights and other issues in developing economies • Community lending mechanisms and regulatory environment for cooperative lending • Improper installation • Cost overruns, poor project management and stakeholder/community relationships	• If community owned, enforcement of energy bill payments • Capacity factor and water flows • Experienced project managers • Good feasibility studies with detailed budgets and due diligence

Use of Funds	Product	Key Risks	Risk- Mitigating Factors
Biomass	*Loan product:* Project finance *Loan purpose:* Electricity (for on-site use or sale to a grid,) of steam for process heat *Client Segment:* Industries that can use on-site biomass waste products (sawmilling, rice milling, sugar mills, coffee roasting and other agro-industries) *Loan term:* 7 years + *Loan value:* Direct combustion power-generation plants typically have investment costs of USD 1,500 to 3,000 per kW of installed capacity *Key technologies:* Mostly direct combustion, (burning in boilers to produce process heat or high-pressure steam for a turbine connected to an electricity generator) or Combined heat and power (CHP) or co-generation uses the electricity and waste heat. *Key enabling factors:* • Reliable and affordable fuel supply • Combustion technology and project size that suit feedstock	***Risk Rating:*** *Medium* ***Key Risks:*** • May be a new technology for the market with limited suppliers and servicers • Poor installation • Large scale project – possible cost overruns • Environmental risks (wastewater, fumes, toxic materials)	• Combustion technology and project size that suit industry • Reduce environmental pollution from solid and liquid wastes. • Control or treat air pollution • Expert needed to assess risk and viability of the project

Use of Funds	Product	Key Risks	Risk- Mitigating Factors
Wind Power	*Loan purpose:* Grid-connected wind farms *Client Segment:* Project developers, possibly in partnership with land owner and/or local community and/or supplier *Loan term:* 5 years + *Loan value:* USD 1.5 to 2 million per MW for on-shore wind farms and USD 2.5 to 3.0 million per MW for off-shore wind, excluding costs of constructing additional transmission lines and connecting to the grid *Key technologies:* turbines, towers, blades, invertors *Key enabling factors:* • PPAs and contractual enforcement • Information on average wind speeds, consistency of wind speeds (daily and seasonal	***Risk Rating:*** *Medium-High* ***Key Risks:*** • Complex projects with multiple stakeholders • Land rights and other issues in developing economies • Developer credit risk, track record • Improper installation • Cost overruns, poor project management and community relationships • Uncertainty of wind speeds	• Suppliers guarantee on 'availability' of the turbine (percentage of time a turbine can be online - usually around 95 percent) • Experienced project developer with proven track record • Community buy-in • Analysis of wind speeds based on multi-year data and use in financial sensitivity analysis

**For detailed information about benchmarks for each CE technology, see Module 5.*

4.5 TOOLS

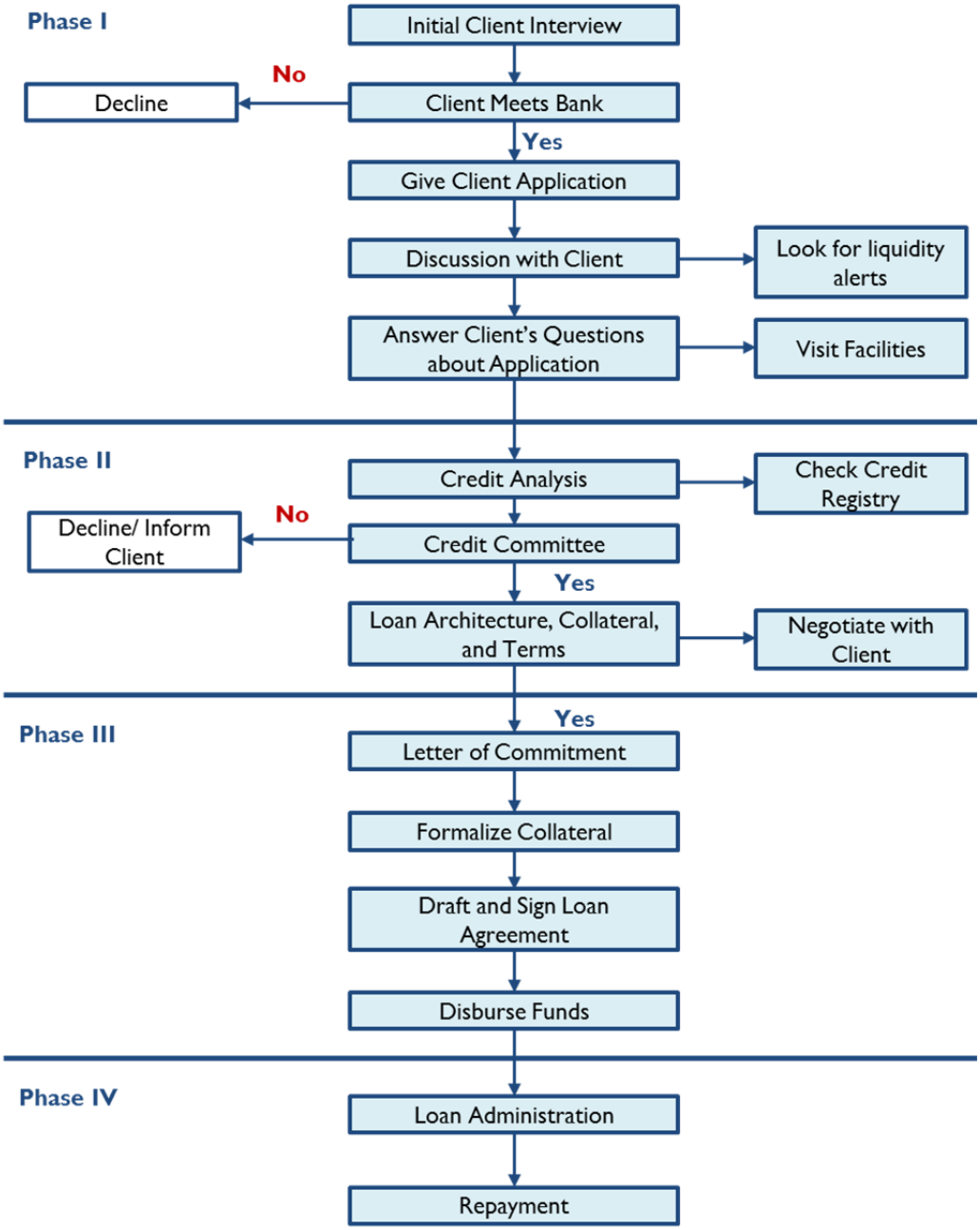
The FI will need several tools for loan officers and other FI staff in order to roll out the new products it has developed. This section presents many of the tools most useful to determining the types of credit products and systems needed to create a profitable clean energy lending line of business. FIs serious about developing or strengthening clean energy lending should review all of these tools to ensure a viable business model is prepared and operationalized by management and loan officers.

Table 4.10 lists the variety of credit development tools presented in this section. These tools are broadly applicable to different product types and can be adapted by vendors based on the particular features of a particular CE product.

Table 4.10: Recommended Tools for CE Product Development

1. Step-by-Step Lending Process and Process Checklist
2. Client Pre-Qualification Screening Form
3. Credit Risk Matrix
4. Example of a Loan Product Sheet
5. Loan Product Profitability Matrix
6. Energy Usage Templates
7. Examples of Appraisal Tools
8. Risk Rating System – Basic Structure
9. Collateral Considerations
10. Collateral Assessment Deed
11. Loan File Closing Checklist/Coversheet
12. Loan Monitoring Report
13. Energy Audit Report Template

FIGURE 4.4: STEP-BY-STEP LENDING PROCESS[27]



[27] Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

Table 4.11: Loan Process Checklist

Name of Client: _____

Steps	Form Used	Recommended Days to Completion	Date Completed
Identification and Introductions with New Customer			
First client contact with loan officer for screening	Screening form	1 day	
Informational session to inform client about CE loan products if necessary	-	Same day	
If the loan officer determines that the client has a qualifying project, assistance in completing the application form	Loan application form	Same day	
Loan officer opens client file	Client file cover sheet	Same day	
Loan officer adds client to CE pipeline report	Pipeline report	Same day	
Applicant submits additional documentation (collateral, references)	-	1 day	
Loan officer makes an appointment to call client for detailed information over the phone	Loan analysis worksheet	Same day	
Loan officer reviews all documentation and checks land records if land was proposed as collateral, coordinating with legal staff and government	Loan analysis worksheet	1 day	
Loan officer reviews borrower's relationships and assigns applicant to a group of similar borrowers in the area	Loan analysis worksheet	1 day	
Credit Analysis			
Loan officer conducts due diligence reference checks with suppliers and customers, and checks applicants bank records (accounts, outstanding debt), and market conditions and competition	Loan analysis worksheet	1 day	
Loan officer meets guarantors and checks collateral	Loan analysis worksheet	1 day	
Loan officer and CE specialist identify outstanding issues remain and decide whether to proceed	-	Same day	
Loan officer makes surprise site visit to inspect company premises, inventory, internal books, and inflow of customers	-	1 day	
Loan officer analyzes cash flows, income statement and balance sheet before structuring the loan, write-up, and final documentation check	Loan analysis worksheet	1 day	

Steps	Form Used	Recommended Days to Completion	Date Completed
Loan officer and lawyer review final documents and forward loan memorandum to relationship manager	Loan memorandum	Same day	
Relationship manager reviews and approves submission to CE credit committee	Loan memorandum	1 day	
Approval and Disbursement			
Review by CE committee		1 day	
If approved, loan approval form is signed. If rejected, client is given a list of deficiencies and may be encouraged to resubmit when they are addressed	Loan memorandum	Same day	
Client informed of loan decision	Client letter	1 day	
Loan officer requests any additional documentation required for loan conditions and closing	Loan checklist	Same day	
Loan officer registers collateral and insurance documentation with government agency	Collateral evaluation form	1 day	
Loan officer prepares loan and collateral agreements	Loan and collateral agreements	1 day	
Loan officer checks whether all disbursement conditions have been met	-	1 day	
Loan officer explains loan disbursement process to client	Client loan checklist	Same day	
Loan officer follows through on fulfillment of all conditions for loan disbursement	-	Same day	
Relationship manager checks all documentation and conditions and signs approval form	Loan approval form	Same day	
Documentation signed with client and guarantors	-	1 day	
Repayment schedule provided to client	Repayment schedule	Same day	
Loan disbursed to client		1 day	
Total Days		**16 days**	

Monitoring and Reporting			
Loan officer and client agree on monitoring schedule	Monitoring report form	As necessary	
Monitoring visits to client	Monitoring report form	Monthly	
Monthly report updates	CE pipeline report	Monthly	
Loan officer informs relationship manager of problem loans	Watch list	As necessary	
Other reporting required under bank policy	TBD	TBD	

Table 4.12: Client Pre-Qualification Screening Form

Name:		**ID Number:**	**Number of dependents:**
Address: Email address:			Telephone Numbers: Work: Home: Cell:
Current job (if any):	Company Name:		Annual salary:
Loan requested:	Loan term:	Purpose	
Description of business:			
How will you use the loan?			
Property (home, vehicles, equipment, livestock, land)			
Own capital (source and amount)			
Collateral (type and value)			
Do you have any other loans?			
Notes:			
BRANCH USE ONLY			
Comments:			

Table 4.13: Credit Risk Matrix (Based on Loan Review)[28]

Date: Activity	Risk Rating	Risk Management	Direction of Risk
	(Low/Medium/High)	(Strong/Weak)	(Stable/Increasing/ Decreasing)
Credit Initiation			
Financial analysis (cash flow, ratios): Historic			
Financial analysis (cash flow, ratios): Projected			
Non-financial analyses (industry/market/management)			
Collateral analysis			
Information from site visit			
Loan Structuring Approval Processes and Procedures			
Approval procedures and limits followed			
Loan proceeds used as approved			
Assessment of borrower liquidity for renewing lines of credit			
Credit/Collateral File Document			
All appropriate documents in loan file			
Original security and insurance documents in active file			
Collateral diversification			
Normal Loan Monitoring			
Monitoring of payments due and received and expiration of insurance			
Capacity of loan personnel to monitor			
Verification of compliance with standard or special loan conditions			
Continuous, active monitoring			
Problem Loan/Loan Workout/Loan Restructure			
Use of early warning indicators			
Timely site visit to business and collateral inspection			
Compliance with guidelines for problem loans			
Compliance with guidelines for loan re-structuring			
Control Procedures			
Guidelines for credit approval authority levels			
Signatures and controls on approvals			
Portfolio management tools			
Credit controls from internal audit			

[28] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

Table 4.14: Example of a Loan Product Sheet: Green Home IMPROVEMENT LOAN[29]

Feature	Description
Loan Purpose	Finance repairs, extensions, upgrades, or connections to water, sewage, or electric utilities and solar power for energy efficient buildings or RE production
Eligible Property	Borrower's primary residential property located within _____ kilometers from FI branch office
Eligible Borrowers	Natural persons, not enterprises or corporations. Must either own a business or be salaried. Within age bracket of 18 to 70 years.
Loan Amount	Between USD 200 and 10,000. Based on estimated project cost and repayment capacity of applicant.
Savings	No compulsory savings requirement
Collateral Requirements	Secured by real guarantees (where possible), two guarantors, or compulsory savings. Collateral varies with loan size.
Cost Share Plan (Down payment)	Loan amount up to 80% of estimated project cost. Borrower contribution (at least 20%) may be in cash, materials or labor (sweat equity).
Loan Term (Duration)	Minimum of 6 months and maximum of 36 months
Interest Rate	12% per annum on declining interest basis [1]
Administration Fee	1% of the loan amount at disbursement
Loan Disbursement	Disbursed in two tranches. The second tranche will be disbursed after verification of works on the first disbursement.
Repayment Frequency	Monthly, after a 3-month grace period
Penalties	Late payments will be subject to a penalty fee of 1% of the late installment per month
Prepayment of Loan	After at least 3 months of installments have been paid, the unpaid principal and interest can be pre-paid in full, without penalty.
Other Conditions	A married couple may apply for a loan with the spouse as co-borrower. Financial information is required for both co-borrowers and will be used in determining repayment capacity for the loan. A spouse who is not a co-borrower must sign a legal agreement waiving any right to block foreclosure in the event of default by the borrower. The client must agree not to sell or dispose of the house without prior, written permission of the FI.

[1] Due to the long duration of housing loans, the recommended practice is to calculate interest on a declining basis rather than a straight line (flat) basis.

[29] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

Table 4.15: Loan Product Profitability Matrix[30]

Product: **Thousand USD** (Insert relevant currency)	**_X** **Forecast**	**_X** **Forecast**
General Information		
Average outstanding receivables High volume (depends on portfolio structure of FI) Low volume (depends on portfolio structure of FI) Credit rates (average rate charged on product) Default rates (% of defaulting borrowers for this product)		
Income		
Interest income Fees, penalties, and other income received		
1 **Total Revenue**		
Expenses		
Expense 1 *Expense 2* *Expense 3* *Expense 4*		
2 **Total Expenses**		
3 Profit margin 4 Provision for loan losses		
5 **Earnings before interest and taxes**		
6 Taxes		
7 **Earnings**		

[30] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

Key Portfolio Indicator
Revenue/expense ratio[31] + loan loss provision (answers in %) Interest coverage ratio[32] Return on assets (ROA)[33]

Table 4.16: An Energy Use Template for a Hotel

Hotel Energy Consumption in 2012 at 60% Occupancy

Energy source	Quantity	Cost (local currency)
Liquefied Petroleum Gas (kg/year)		
Electricity (kWh/year)		
Water consumption (cubic meters/year)[34]		

Load	Number	Average Hours of Use Per Day	Energy consumption
Lights – hotel rooms			
Lights – conference center			
Lights - other			
Washer			
Dryer			
Air conditioning			
Water heating			
Air conditioning			

[31] Expense Ratio = (Total Expense / Total Revenue) × 100

[32] Interest Coverage Ratio = EBIT / Interest Expense

[33] ROA = Net Income / Total Assets

[34] Water consumption is relevant to CE technologies such as solar water heaters.

4.5.1 Tools for Appraisal of CE Loan Applications

An important part of the FI's due diligence for CE loan applications is to assess the energy savings, costs, and benefits of the proposed uses of the funds. Some tips for rapid appraisal of energy efficiency and renewable energy projects follow.

Energy Efficiency

1. Verify the technical feasibility of the proposed EE investments and compare to other options.
2. Independently estimate or verify the capital and incremental operating, maintenance, and replacement (OMR) costs.
3. Independently estimate or verify the annual energy savings (ES) in physical units. If multiple energy efficiency improvements are proposed, it is important to avoid over-estimating the energy savings from over-lapping or mutually exclusive options.
4. Multiply the ES by the price of energy (P) to get the associated energy financial savings (AEFS).
5. Amortize the capital costs over the expected lifetime of the technology and add the annual OMR costs to obtain the energy efficiency investment cost (EEIC).
6. Calculate the simple payback period (SPP) in years by dividing the = EEIC by the AEFS. Assess whether the SPP is acceptable for this loan product (based on criteria set by the FI).

Renewable Energy

1. Verify the technical feasibility of the proposed RE investment.
2. Independently estimate or verify the amount of energy that can realistically be produced per year (Q) using appropriate units for that type of energy.
3. If the applicant plans to sell the energy produced, independently estimate or verify the unit price (P) that it would receive. If the energy will be used by the producer, estimate or verify the price (P) that it would save by not having to buy energy from another source.
4. Multiply the annual quantity (Q) by the price (P) to determine the value (V) of the RE installation.
5. Project the annual operating, maintenance, and replacement costs (OMR) and subtract this value from annual value (V) to determine annual net benefits (ANB).
6. Independently estimate or verify the total investment cost (TIC).
7. Calculate the simple payback period (SPP) in years by dividing the TIC by the ANB.
8. Assess whether the SPP is acceptable for this loan product (based on criteria set by the FI).

CE lending projects vary widely in types of clients, technologies, and project sizes. There are also important differences between markets, climatic conditions, prices for EE equipment, and taxation levels, among other factors. Large or complex investments may need more sophisticated tools and advice from in-house or external experts.

The expanding practice of energy audits for homes, offices, and factories has led to the development of best practices, standards, and regulations in many countries. Standardized software packages are available, but their applicability varies with local business, building practices and regulations.

These tools can help clients gain insight into their potential energy investments. Ideally, clients would use these tools before submitting a loan application to the FI so that non-viable investments can be filtered out before processing costs have been incurred. If loan applicants have not already used these

tools, FIs can direct them to the software. Three examples of calculation tools that may be helpful in the appraisal of CE loan applications are presented below. The first two pertain to energy efficiency and the third addresses renewable energy: 1) Vietnam MEET-BIS Program for SMEs, 2) Bulgaria Residential Energy Efficiency Credit Line (REECL) Program for Households, 3) Accessing the Feasibility of CE Projects (RETScreen).

Example I) Vietnam MEET-BIS Program for SMEs (Energy Efficiency Tools)

The Vietnam: MEET-BIS Program for SMEs produced energy savings calculators for efficient lighting, motors and motor controls, pumps, and insulation. These calculators were designed to support SMEs, both on the supply and demand sides of clean energy solutions (i.e. service providers are often SMEs as well). The tools can be used by investors, banks and intermediaries and can be found at http://meet-bis.vn/tools-calculators. The activity was supported by the European Commission.

Example II) Residential Energy Efficiency (Bulgaria, REECL)

The Bulgaria Residential Energy Efficiency Credit Line (REECL) Program for Households set up an on-line calculator for estimating the energy savings in electricity equivalents and the corresponding carbon dioxide reductions from various individual energy efficiency measures for housing http://www.reecl.org/calc_sav.php. Note that the combined savings from adopting multiple energy efficiency measures might not equal the sum of the savings from the individual measures (i.e. measures should well be considered in a package.) The main website (Www.reecl.org) also contains reporting information on the financial and energy savings of the program, as well on the CO_2 effects. The activity has been supported by the European Bank for Reconstruction and Development.

Example III) Assessing the feasibility of individual clean energy projects (RETScreen)

RETScreen 4 is distributed as "an Excel-based clean energy project analysis software tool that helps decision makers quickly and inexpensively determine the technical and financial viability of potential renewable energy, energy efficiency and cogeneration projects." It is widely used to assess the viability of different forms of renewable energy, including wind energy, solar photovoltaic (PV), biomass and hydropower. The product is based on the natural resources for different types of renewable energy and relates to local resources. This 'freeware' is downloadable in 36 languages (http://www.retscreen.net/). The RETScreen institute provides (online) course to get acquainted with the tools. The activity has been supported with the contribution of numerous experts from government, industry, and academia and initiated from Canada.

4.5.2 Assessing and Reducing Risks

Table 4.17 contains a tool for rating the overall risk of a loan. The tool includes guidance on how each item should be scored on a one to five scale (in subsequent tables), with one representing the lowest level of risk. The eight scores are added to obtain the overall rating. It is best to use whole numbers for the scores, rather than fractions or decimals. If an applicant does not meet all of the criteria for a particular score, it should be assigned a lower score. FIs may find it useful to modify this tool by assigning different weights reflecting the relative importance of the items. FIs may also decide that one or more items are so important that no loans will be given to applicants receiving a score of five on those items, regardless of their total score (examples might include operating margin and cash flow risks or credit history of the principals).

Table 4.17: Risk Rating Tool[35]

RISK RATING TOOL	
(One to five scale, with one as lowest risk)	
1. Business management risks	
2. Operating margin and cash flow risks	
3. Balance sheet risks	
4. Firm competitiveness risks	
5. External industry and market risks	
6. Credit risks of the principals	
7. Foreign currency risks	
8. Risk mitigation through collateral or secondary source of repayment	
Total score	
Letter grade for total score	

Key

8-12 = A – Excellent	28-34 = D - Substandard
13-17 = B – Good	35+ = E - Doubtful
18-27 = C - Satisfactory	

Business Management Risks

Rate the ability of the company's overall management team based on experience in the firm's business, understanding of finance and financial planning, ability to operate the business by following a business plan, leadership, organizational skills, and the management succession plan.

[35] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

Table 4.17a: Business Management Risk Rating Descriptions

Rating	Description
1	**Very strong management.** The management team has ten or more years of direct experience. The business has an excellent management record, financial performance, understanding of budgeting, and ability to manage working capital. The firm recognizes the value of a high-quality workforce and provides employee training, benefits and performance incentives.
2	**Above average management.** The management team has five or more years of experience in the same business and a good professional record. The business produces adequate financial statements on a timely basis. The management team operates under a financial plan and budget and demonstrates an ability to manage the firm's working capital and term financing.[36] The firm has good management no obvious organizational shortcomings.
3	**Average management.** The management team has one to four years of adequate experience. It produces regular and adequate financial statements and a budget, but has occasionally had unexpected needs for working capital or term financing. The firm has no serious organizational shortcomings.
4	**Below average management.** The management team has less than one year of experience. The business does not produce reliable or timely financial statements or a budget or a financial plan. The company has inadequate management depth and some organizational shortcomings.
5	**Weak management.** The management team has clear deficiencies in skills and experience in the industry. The business does not produce adequate financial statements or a budget and does not adequately manage its financial resources. The firm has inadequate management and serious organizational shortcomings.

[36] *Term financing* refers to a financial product that has a specific amount that has a specified repayment schedule and a floating interest rate.

Operating Margin and Cash Flow Risks

Normally, loans are repaid out of the net cash flows generated by a business. Consequently, careful review of projected operating margins and cash flow is part of an FI's due diligence.

Table 4.17b: Operating Margin and Cash Flow Risk Rating Descriptions

Rating	Description
1	Projections indicate that the firm will have no difficulty generating sufficient cash flow to service all existing debt, including the proposed loan. Margins are substantial enough to cover contingencies that are likely to arise. Debt service coverage ratio[37] for all loans is at least 2.
2	Projections indicate that the firm will have little difficulty generating sufficient cash flows to service all existing debts, including the proposed loan, with margins sufficient to cover contingencies. Debt service coverage ratio for all loans is between 1.6 and 2.0.
3	Projections indicate that the firm can generate sufficient cash flows to service all debts including the proposed loan, but has limited margin for contingencies. Debt service coverage ratio for all loans is between1.2 and1.6.
4	Projections indicate that the firm will only have enough cash to repay all loans if optimistic assumptions hold and there are no unforeseen contingencies. Debt service coverage ratio for all loans is between 1.0 and 1.2.
5	Projections indicate that the firm is unlikely to be unable to make full loan payments on time without relying on guarantors or collateral. A portion of the debt might have to be written off. Debt service coverage ratio for all loans is less than 1.0.

Balance Sheet Risks

The financial strength of a business is measured by a company's balance sheet. A balance sheet reports on assets (what is owned), liabilities (what is owed), and equity (net worth) and provides information on liquidity, fixed capital, and leverage. Indicators that can be derived from the balance sheet include the current ratio, debt-to-net-worth ratio, and turnover rates of inventory, receivables, and payables. Informal sector enterprises and small formal sector enterprises might not have produced a balance sheet, but it may be possible to put together an approximation if adequate financial data are available.

[37] Debt Service Coverage Ratio = Net Operating Income / Total Debt Service

Table 4.17c: Balance Sheet Risk Rating Descriptions

Rating	Description
1	The firm has a strong balance sheet with a history of annual retained earnings and positive trends in net worth. The firm has a debt-to-equity ratio below 1.5, a surplus of working capital, and substantial retained earnings. It is current on its accounts payable.
2	The firm has had an average debt-to-equity ratio below 1.5 and sufficient working capital over the past year. It is current on accounts payable and has significant retained earnings, but had a higher debt-to-equity ratio or working capital shortages in previous years.
3	The firm has an average debt-to-equity ratio between1.5 and 2.0. Over the past year, it has had adequate working capital and acceptable retained earnings and was not significantly late in covering its accounts payable.
4	The firm has a debt-to-equity ratio between 2.0 and 3.0, insufficient working capital, and little or no retained earnings. Over the past year, it has been slow in covering its accounts payable.
5	The firm has a debt-to-equity ratio of 3.0 or more or has negative working capital, no retained earnings, and has been delinquent in covering its accounts payable.

Firm Competitiveness Risks

Competitiveness risks are assessed by analyzing the strengths, weaknesses, opportunities, and threats of the business relative to existing and potential competitors. They involve a combination of internal and external factors.

Table 4.17d: Firm Competitiveness Risk Rating Descriptions

Rating	Description
1	The firm has a monopoly (single seller) or monopsony (single buyer) in the local market.
2	The firm has substantial competitive advantages due to significant barriers to new entrants or differentiation of its goods and services from those of existing and likely potential competitors.
3	The firm has some competitive advantages based on costs, quality, or location, but its goods and services are similar to those of existing competitors.
4	The firm is operating in a highly competitive market with no particular advantages, but is able to continue operating at a low level of profitability.
5	The firm has a weak or deteriorating competitive position that poses a threat to current or future profitability.

External Industry and Market Risks

Industry and market risks are at a higher level than the competitiveness risks of a particular firm; they affect the national or local macro-economy. When evaluating the risk associated with extending finance to a business, the loan officer must consider external risks associated with the quality of the industry and the market.

Table 4.17e: External Industry and Market Risk Rating Descriptions

Rating	Description
1	The business is operating in a very favorable macro-economic and policy environment, with rapidly increasing demand. Most firms in the industry are growing and making good profits The industry is relatively unaffected by major cyclical variations or large fluctuations in world market prices.
2	The business is operating in a satisfactory macro-economic and policy environment with significantly increasing demand. The business has below average susceptibility to typical cyclical variations or fluctuations in world market prices.
3	The business is operating in a neutral macro-economic environment with moderately increasing demand. The industry has average susceptibility to major cyclical variations or large fluctuations in world market prices.
4	The business is operating in a mixed macro-economic environment with demand increasing at the same rate as population growth. The industry has above average susceptibility to major cyclical variations or large fluctuations in world market prices.
5	The business is operating in an unfavorable macro-economic and policy environment with stagnant or decreasing demand. The industry is very susceptible to major cyclical variations or large fluctuations in world market prices.

Credit Risks of the Principals

The credit history rating pertains to the business itself and its principal owners and proposed loan guarantors. If the owners have poor individual credit histories, there is a higher risk that business assets may be diverted for individual benefit or be badly managed. The credit history of the guarantors may affect their ability to provide guarantee capital in the event of a business default.

Table 4.17f: Credit Risk of the Principals Rating Descriptions

Rating	Description
1	**Excellent credit history.** Reviews of past bank and supplier credit have shown a perfect record of on-time payments. The business and its owners do not have any negative information in credit bureau files.
2	**Very good credit history.** Reviews of past bank and supplier credit have shown that all prior debts have been repaid, but a small number of payments may have been slightly late.
3	**Fair credit history.** Reviews of past bank and supplier credit have shown that all prior debts have been repaid, but a small number of payments may have been moderately late or a large number of payment have been slightly late. All repayment issues have been resolved, but the business or its owners may have a limited amount of negative information in credit bureau files. The company is able to explain these problems and has taken adequate steps to resolve problems. The company's repayment has been satisfactory over the past year.
4	**Lack of credit history.** The firm has no prior experience with bank loans or supplier credit.
5	**Unsatisfactory credit history.** Reviews of past bank and supplier credit have shown significant problems with on-time payments. The business or its owners may have substantial negative information in a credit bureau. The company is unable to explain these problems or the explanation is not satisfactory. The company has not taken satisfactory steps to resolve problems and there is significant risk of future problems. The business or owners have outstanding tax liens or previous bankruptcies.

Foreign Exchange Risks

Changes in currency exchange rates can have a direct effect on the ability of a firm to repay loans denominated in foreign currency. Exchange rates can also have a major effect on the profitability of a local currency due to major changes in the input costs and revenues of a business or burden of other debts denominated in foreign currency. Businesses can mitigate foreign currency risks through hedging, but that can be costly. Consequently, an FI needs to consider the company's ability to absorb or manage the risks associated with changes in exchange rates.

Table 4.17g: Foreign Exchange Risk Rating Descriptions

Rating	Description
1	**No exchange rate exposure.** The business has no foreign currency-denominated debt and has only minimal expenditures in foreign currency or reliance on export sales.
2	**Low exchange rate exposure.** The business has no foreign currency-denominated debt. Although the business makes some purchases that are priced in foreign currency or has some export sales, they are a relatively small proportion of the company's cash flows.
3	**Balanced exchange rate exposure.** The business makes regular purchases in foreign currency or has U.S. dollar-denominated debt, but has counter-balancing foreign currency sales sufficient to cover these payments. Since the exposure is relatively balanced between sales and expenditures, the impact of exchange rate changes on cash flows is low.
4	**Medium exchange rate exposure.** The business makes regular purchases in foreign currency or has U.S. dollar-denominated debt, and has export sales that are moderately less than the foreign costs. Foreign exchange exposure is a moderate risk to the cash flows of the business.
5	**Substantial exchange rate exposure.** The business makes regular purchases in foreign currency or has U.S. dollar-denominated debt and has export sales that are substantially less than the foreign currency costs. The ability of the business to remain a going concern and repay loans would be jeopardized by a large change in the value of the local currency.

Risk Mitigation through Collateral or Secondary Source of Repayment

It is best for a business when it can repay a loan from the profits of the financed activities. A less preferable alternative is for a business to repay a loan from the profits of other activities that were not financed by the loan. A more undesirable situation for a business is being forced to draw down its general assets to repay a loan. As long as the FI is repaid, it does not really care about the source of the funds for the loan repayment. However, there is a greater risk that a business will not repay its loans if the financed activity is unprofitable.

In the event of a default, the FI may be able to recover all or some of the bad debt from collateral or a secondary source of repayment such as an external guarantor. Nevertheless, it can be costly for the FI to take legal action and get a judgment enforced to seize collateral or collect from a guarantor. Also, there may be costs in converting non-monetary collateral into cash and the value of some types of collateral (such as land and property) may have decreased or increased. As a result, it is always the goal of the financial institution to be repaid from the operations of the business that incurred the debt. However, even well-managed businesses can face financial difficulties from time to time. For this reason, prudent lenders assess the strength of collateral and other repayment sources.

Table 4.17h: Risk Mitigation through Collateral or Secondary Source of Repayment Rating Descriptions

Rating	Description
1	The financial institution will have a first position on collateral.[38] The collateral coverage ratio (liquidation value to loan value) is greater than 2.0 or the company has offered highly liquid collateral (e.g., cash in an escrow account or certificates of deposit). The company may also have strong secondary sources of repayment (profits from an affiliated business) or highly reliable third-party guarantees.
2	The financial institution will have a first position on collateral. The collateral coverage ratio is between 1.75 and 2.0 and the collateral has satisfactory liquidity (typically, residential or commercial real estate in a stable or increasing market). The company may also have adequate secondary sources of repayment or reliable third-party guarantees.
3	The financial institution will have a first position on collateral. The collateral coverage ratio is between 1.5 and 1.75, or at least 1.75 for subordinated debt.[39] The collateral may be less liquid or more difficult to control (e.g., equipment, vehicles, or inventory).
4	The financial institution will have a first position on collateral with a collateral coverage ratio of 1.0 to 1.5 or between 1.5 and 1.75 for subordinated debt. The collateral may be illiquid or difficult to control (e.g., vehicles or inventory).
5	The loan has no collateral requirement or the collateral coverage is less than 1.0 for first position collateral less than 1.5 for subordinated debt.

[38] When an FI in the 'first position on collateral' or 'first lien position' it is in the priority position and will be the first to benefit from liquidation of the collateral should the loan default.

[39] Subordinated debt is debt which ranks after other debts should a company fall into liquidation or bankruptcy.

Table 4.18: Key Questions on Collateral[40]

Type of Collateral	Questions to Consider
Residential or commercial real estate *Conservative liquidation value = 60-70% of appraised value*	• Who owns the property? • Would losing this property have a significant effect on the borrower's operations or well-being? • Are local property values constant, increasing, or declining? • What is the condition of the property? Has the property been renovated recently?
Equipment *Conservative liquidation value = 40-50% of book value*	• Who legally owns the equipment? • How old is it? What is its current condition and how is that likely to change over the loan repayment period? • Would there be a market for the equipment if the FI has to sell it? (Specialized equipment may be difficult to find a buyer.) • How important is the equipment to the borrower's operations? Is the equipment currently in use? • How difficult is it for the equipment to be moved?
Vehicles *Conservative liquidation value = 30-40% of book value*	• Who is the legal owner of the vehicle? • How old is the vehicle? What is its current condition and how is that likely to change over the loan repayment period? • How important is the vehicle to the borrower's operations? • Can the vehicle be kept out of service during the repayment period of the loan? • Is the vehicle adequately insured the if the borrower continues to use it?
Inventory *Conservative liquidation values: Raw materials = 0-10% of cost value* *Work in progress =0-10% of sale value of finished products* *Finished products = 50-60% of sale value*	• What is the average level of inventory held by the business? What is the inventory turnover rate? • How important is the inventory to the borrower's operations? Is this inventory that the borrower does not expect to sell? • Should the inventory be safeguarded? • What is the shelf life of the inventory? Is there a risk of obsolescence during the loan repayment period? • How costly would it be for the financial institution to sell this inventory? Would it be able to recover the full value?
Accounts Receivables *Reasonable liquidation value = 50-60% of value*	• May be used as collateral if the borrower has stable or increasing sales and customers with reliable payment records. • How costly would it be for the financial institution to collect these receivables? Would it be able to recover the full value?

[40] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

If the business does not take out any other loans, the collateral coverage ratio tends to improve with each repayment of the loan principal because the outstanding loan balance decreases (Table 4.19). On the other hand, the value of vehicles and equipment used as collateral will decrease over time due to depreciation. The value of land collateral is not subject to depreciation.

Table 4.19: How Collateral Coverage Ratio Changes With Loan Repayments

Loan: USD 450 million for 24 months at 24% interest (equal monthly payments, simple interest). Collateral liquidation value: USD 675 million in Month 0 Assumes land as collateral (no depreciation).					
Collateral Coverage					
Month 0	**Month 3**	**Month 6**	**Month 9**	**Month 12**	**Month 18**
1.50	1.67	1.89	2.21	2.68	5.07

Table 4.20: Collateral Assessment Deed[41]

Borrower			Loan agreement #
			Collateral agreement #
Date			Appraiser
Raw material	Inventory	Equipment	Transportation
Type of Warehouse			
Warehouse	Office	Sales point	Private house
Stored in the borrower's private warehouse			Stored in a third-party warehouse
Exact address of the collateral entity			

[41] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

Monitoring Timing of Collateral				
1.	Free cash flow[42] timing			
2.	Monitoring of minimal balance			
3.	Timing of bank sealing for warehoused collateral			
4.	Customs control for items for import or export[43]			

Responsible for Monitoring		Name	
1.	Monitored by bank manager		
2.	Monitored by third party		

Description of Collateral Items					
Item		Purchase Price Per Unit	Liquidation Price Per Unit	Quantity	Total Liquidation Value
1					
2					
3					
4					
5					

(Expand list as needed) exceeds 10 units, attach a full list to this document).

Monitoring frequency	

Credit manager signature _____
Confirming information/
Controller _____
Confirming information/

[42] *Free Cash Flow* (FCF) is calculated as EBIT(1-Tax Rate) + Depreciation & Amortization - Change in Net Working Capital - Capital Expenditure

[43] For goods which might have to cross international borders, customs/duties might have to be applied and affect the value of collateral.

Table 4.21: Loan File Closing Checklist[44]

Borrower: _____ Loan Amount: _____
Reference # _____ Branch: _____

Individual Borrowers	Original (check when complete)	Copy (check when complete)	Comments
Prior to Disbursement			
Screening form			
Application form signed by the borrower			
Site visit form (signed by borrower and loan officer)			
Write-up/loan analysis with spreadsheet, signed by the loan officer			
Approval form (signed by the voting credit committee members)			
Copy of all filled-in pages of borrower's passport			
Copy of documentation supporting ownership of collateral			
Consent of spouse (if jointly owned property is collateral)			
Loan agreement with repayment schedule (signed by both parties)			
Collateral agreement			
Monitoring schedule (use of loan funds and observed status of business and collateral)			
Collateral insurance			
Proof of full repayment of previous loans (for repeat loans)			
Rent agreement (for rented land or facilities)			
After Disbursement			
Periodic re-evaluation of collateral (quarterly for problem loans and annually for performing long-term loans)			
Loan restructuring form (if applicable)			
Monitoring reports (including notes on phone calls or site visits)			
Comparison of projected and actual cash flows			
Loan payment receipts			

[44] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

Additional Document for Registered Legal Entities			
Charter			
Legal registration of the entity			
Audited financial statements (annual)			
Certification from the tax inspection on outstanding liabilities			
Bank statements (last 12 months)			

Loan Officer: _____ Branch Manager: _____

Review by Lawyer/General Manager: _____ Date _____

4.5.3 Loan Monitoring

While CE lending is similar to non-sector specific lending in many ways, there are factors (such as weather, product quality, installation and usage) that can drastically affect the success of the product. For this reason, it is critical to have an effective and thorough monitoring program in place to pre-empt potential problems. The FI can use its standard monitoring process; this section is here to emphasize the importance of monitoring when entering the CE market due to the increased number of variables throughout the CE supply chain. Below is a sample loan monitoring report that the FI can use and adapt to reflect the terms of the product to be rolled-out.

Table 4.22: Loan Monitoring Report[45]

Client/Project #		**Borrower's Name**		**Loan Amount**	
				Loan Term	
Bank Branch		**Loan Officer**		**Annual % Rate**	

		Before Loan	Month 1	Month 2	Month 3	Month 4	Month 5
1.	Monitoring date						
2.	Outstanding balance of loan						
3.	Principal in arrears/ Days overdue						
4.	Projected sales						
5.	Actual sales						
6.	Cash						

[45] Adapted from Chemonics and Enclude, *Strengthening Agricultural Value Chain Lending Toolkit,* Washington, DC: USAID for the Financial Sector Knowledge Sharing Project,, September, 2012. http://www.chemonics.com/OurWork/OurProjects/Documents/FS%20Share_Agricultural%20Lending%20Toolkit_Final_Sept%20_2012.pdf

7.	Accounts receivable and advances						
8.	Accounts payable						
9.	Working capital						
10	Capital investment						

Number and date of monitoring	Describe the e purpose and stages of the loan, actual versus projected indicators, changes in the competitive environment, reasons for changes in profitability, timeliness of receivables, payables, money out of the business through repayment of other loans, dividends, and other risks encountered or emerging over the loan period.
1. (date)	

4.5.4 Energy Audit Report Summary Template

If an energy audit has been conducted for a proposed energy efficiency project, the FI should obtain a copy of the full report and review it carefully. FIs may also find it useful to ask for a summary of the full energy audit. This section can be used as a template for an energy audit report summary, including key headings for text and sample tables.

The summary of the energy audit should begin with the following information:

Introduction

- Name and location of the business that had an energy audit
- Date of the energy audit
- Time horizon for the energy audit
- Name and location of the company or individuals conducting the energy audit
- Brief summary of the credentials and experience of the energy auditors

Background on the Business Participating in the Energy Audit

- Main products and services
- Production and sales over the last 2-5 years
- Projected future production and sales
- The market and major clients of the business
- Description of the main production processes used by the business
- Energy consumption (types, quantity, seasonality, and costs) over the last 2-5 years
- Price and availability trends of the current energy sources over the last 2-5 years
- Expected future trends in price and availability of the current energy sources

- Projected energy consumption without the project (types, quantity, and costs)
- Projected energy consumption with the project (types, quantity, and costs)
- Major policy and regulatory issues affecting the production and energy decisions of the business

Proposed Energy Efficiency Options

- Detailed description of each of the energy efficiency options being considered
- Types and amounts of energy savings
- Capital costs
- Incremental operating, maintenance, and replacement costs
- Financial analysis (payback period and present value of net benefits)
- Constraints and implementation issues
- Roles and responsibilities for project implementation
- Risks

Table 4.23 below summarizes the attributes of proposed energy efficiency projects for evaluation by the FI for lending. **Table 4.23: Summary of Proposed Energy Efficiency Project**

Energy Efficiency Options (specify below)	**Type and Units of Energy Saved**	**Value of Energy Savings** (local currency)	**Expected Lifetime**	**Capital Cost**	**Average Annual Operating, Maintenance, and Replacement Costs**	**Payback Period** (years)	**Present Value of Net Benefits**
Option 1							
Option 2							
Option 3							
Option 4							
Option 5							

* Add rows for additional options if needed.

Table 4.24 presents a format to outline an action plan for the energy efficiency project(s) recommended in the previous section can support such an action plan.

Table 4.24: Action Plan for the Energy Efficiency Project

Energy Efficiency Options (specify below)	Technical Assistance Required?	Sources of the Technology	Responsible Units or Staff	Target Date
Option 1				
Option 2				
Option 3				

Appendices

- Financial statements (audited if possible) or key financial information
- Technical specifications of equipment and machinery

MODULE 5: TECHNOLOGY OPTIONS

PURPOSE

This module provides background information and benchmarks for CE technologies.

HOW TO USE THIS MODULE

A primer on CE technologies.

Photo Credit : USAID

5.1 ENERGY EFFICIENCY

Energy Efficiency in Buildings

Buildings account for approximately 20 percent of all CO_2 emissions produced in developing countries primarily from electric power for

- Lighting,
- Heating, ventilation, and air-conditioning (HVAC),
- Office equipment usage,
- Escalators and elevators, and
- Water heating (mainly institutions and hotels).

Buildings have high potential for reducing energy use as a result of improved technologies, especially if there are financial incentives for owners and tenants to decrease energy consumption.

- **Owners** can reduce their energy bills and maintenance costs due to lower heating, cooling, and lighting loads although initial capital costs may be higher.
- **Tenants** who pay their own utility bills directly or indirectly through their rent payments may also save money over the long term after the owner's capital costs of EE improvements have been recovered.

Energy Efficiency in Industry

Industrial energy efficiency affects a wide variety of production processes, such as

- Water heating,
- Steam systems,
- Boilers,
- Compressed air,
- Motors, and
- Industry-specific equipment.

The savings from industrial energy efficiency investments can often be increased when combined with better management practices.

- Monitoring of energy consumption
- Reduction of peak electric loads if higher prices apply at heavy demand periods (peak load pricing)
- Reliance on an energy manager to monitor and regulate consumption
- Staff training to encourage behavioral changes (e.g., turning off unnecessary lights and equipment)

5.1.1 Key Considerations for Financing Energy Efficiency

In financing energy efficiency investments, FIs may want to consider

- Allowing a performance guarantee as an alternative to conventional collateral;
- Setting size and timing of loan repayments to correspond to the projected annual savings; and
- Aggregating loans for multiple small projects by working with EE suppliers and installers.

5.1.2 Performance Guarantees

Energy efficiency loans for buildings may lack conventional collateral since commercial and residential property is often already mortgaged. FIs interested in EE financing may need to accept alternative approaches to securing loans, either out of the money borrowers save from lower energy expenditures (cash-flow based lending) or the EE assets that have been financed (e.g., leasing or hire-purchase payments). Asset-based collateral may be difficult if labor costs for installation comprise a significant portion of the total costs since installation costs cannot be recovered if the FI has to sell the financed equipment is after a loan default.

Performance guarantees from manufacturers or installers are the most common risk mitigation mechanisms for energy efficiency loans. These guarantees provide assurance that investments will produce a stated efficiency gain for a specific period of time if properly maintained. If the agreed efficiency gain is not achieved, the guarantor will replace the equipment. Energy service companies (ESCOs) may offer more complex guarantees that ensure that specified cash savings are obtained. However, it may be difficult for ESCOs to cover the costs of energy savings guarantees out of their cash-flows, especially if they are relatively small or young. As a result, ESCOs often have to offer performance guarantees through financial intermediaries such as insurance or re-insurance companies.[46]

5.1.3 Loan Amortization and Interest Rates

Loan amortization schedules should be structured to match the projected energy cost savings, and allow for positive net cash flows from the investments, after subsidies. By contrast, conventional loan terms for equipment reflect the ability of the borrower to service debt and the expected life of the equipment. It is sometimes argued that fixed interest rate loans are more likely to encourage clients to take out CE loans. However, in some cases, variable interest rate loans may be cheaper than fixed interest rate loans because of lower total interest charges and fees. To reduce the risks of large interest rate changes for borrowers, variable rate loans often have an annual and life-of-loan cap on the maximum change in interest rates. A variable interest rate may deter CE borrowers if there is no interest rate cap or the cap is too large.[47]

5.1.4 Aggregation

Since many energy efficiency projects for buildings and SMEs are small, FIs need mechanisms to reduce transaction costs so that these loans can be profitable. FIs can combine multiple loans for small

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[46] Anouk Verheijen, Chemonics, "SME Energy Efficiency Finance Roadmap: Financial Sector Program," South Africa, USAID, April 2013. http://fspblog.finfindeasy.co.za/wp-content/uploads/1-EE-Roadmap-and-Case-Study-Final.pdf

[47] Ibid.

borrowers into large loans for fewer borrowers. Loans can be aggregated by financing local subsidiaries or external FIs (franchising or wholesale loans), lending to associations or groups of retail clients, or ESCOs. FIs can also reduce transaction costs by adding energy efficiency loans onto other types of loans to existing clients.[48]

5.1.5 Resources

The following resources provide information on energy efficiency technologies as well as examples of projects that have been implemented in a range of developing and developed countries. FIs can use the resources here to gain a deeper understanding of a certain technology. By regularly monitoring REEEP and ERC, an FI can stay up-to-date on the EE market, technologies and trends.

- CE Info Portal of the Renewable Energy and Energy Efficiency Partnership, website: www.reeegle.info
- The Energy Research Centre (ERC) contains case studies of energy efficiency projects of South African companies, website: http://www.3e.uct.ac.za
- Robert P. Taylor, et. al. *Financing Energy Efficiency: Lessons from Brazil, China, India, and Beyond*, Washington, DC, The World Bank, 2008, http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2008/02/18/000333037_20080218015226/Rendered/PDF/425290PUB0ISBN11OFFICIAL0USE0ONLY10.pdf

[48] Ibid.

5.2 RENEWABLE ENERGY[49]

Renewable energy is produced by naturally occurring, self-replenishing sources or processes. This section discusses five types of RE resources:

- **Hydropower:** Transformation of the force of moving water into mechanical energy and, in some cases, electricity
- **Biomass:** Biological material from living or recently living sources, includes residuals from agriculture and forestry
- **Biogas:** Combustible gas produced by anaerobic digestion (bacteria break down organic matter in the absence of oxygen)
- **Solar Energy:** The energy in sunlight can be used for heating air or water or converted into electricity through photovoltaic panels.
- **Wind Power:** Conversion of wind energy into electricity or mechanical energy through wind turbines, windmills, or wind pumps.

Renewable energy can be implemented in stand-alone or grid-connected systems. Stand-alone systems either do not involve electricity or produce electricity that does not feed into a public grid. The energy is either consumed on the spot or stored in a battery. Grid-connected systems allow electricity to be fed into a public grid, which can be national, regional, or local. Mini grid developments produce electric power for a local area, such as a village or neighborhood, via a local distribution system that is not connected to the national grid.

Many large RE projects are developed through an energy performance contract (EPC). An EPC contractor conducts a detailed engineering design, procures equipment and materials, and builds the plant. This type of contract typically mitigates technology risks through energy production guarantees and penalties for construction delays and underperformance.[50]

Small-Scale Hydropower

This section provides an overview of basic technical and financial issues for hydropower. It also discusses some important factors for due diligence of loans for "run-of-the-river" projects, the most common type of small-scale hydropower in many developing countries.

The Basics of Hydropower

The three most common methods of harnessing the energy of moving water to generate electricity are

- **Run-of-the-river:** Power is generated by tapping the downward flow of water in a river. The water is diverted and directed downstream into a powerhouse that contains a turbine (Figure 5.1).
- **Dams:** An impoundment is constructed in a natural water course to push up the level of water. The stored water flows through a powerhouse, usually at the base of the dam.

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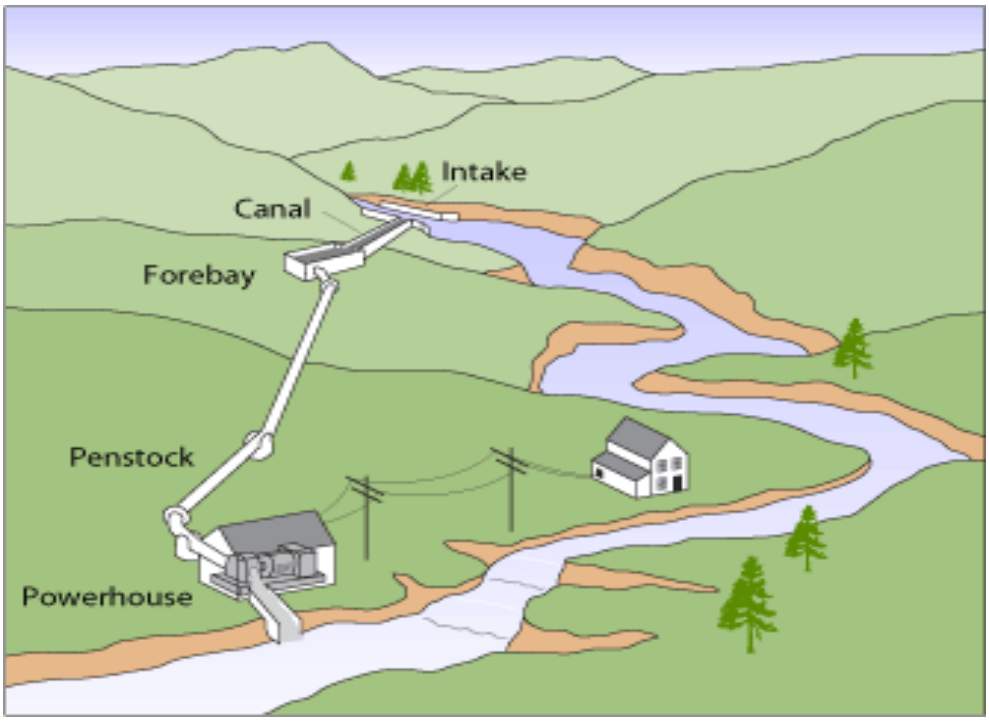
[49] This section draws heavily from Enclude's (formerly Triodos Facet), *Reference Manual: Appraisal of Small Renewable Energy Projects,* April 2012.

[50] Chemonics, "SME Energy Efficiency Finance Roadmap: Financial Sector Program," April 2013..

- **Dam and conduit:** A dam is built to capture and store water and a conduit directs the water to a fall.

Figure 5.1: Basic Components of a Run-of-the-River Hydro Scheme



Source: Enclude (formerly Triodos Facet), *Reference Manual: Appraisal of Small Renewable Energy Projects,* April 2012, p. 37.

Key Considerations in Financing Hydropower Projects

The three main issues a lender should consider in reviewing a proposed hydropower project are

- Planned capacity factor and water flows,
- Risk of capital cost overruns and construction delays, and
- Legal issues (licensing, land and water rights, and environmental impact)

Planned Capacity and the Capacity Factor

The planned capacity of a hydropower unit depends on the height of the available water drop and the volume of water flows. The planned capacity is the result of decisions made on the siting and design of the system.

The reliability of hydrological data (upstream and downstream river flows and precipitation) are critical to the feasibility of hydropower. These data are used in forecasting water flows and power production. If these forecasts are inaccurate, the financial viability of the hydropower project and its debt service repayment capacity may be jeopardized.

A water flow duration curve shows the cumulative frequency (percent of the time) that the historical flows have been met or surpassed over a defined period of time. Ideally, for small-scale hydropower,

water flow data would be available for at least 30 years. Unfortunately, this is often not possible in developing countries. If the variability of water flows is low, 10 years of data may be adequate for planning small-scale hydropower. Another alternative is to use hydrological models based on precipitation data for a larger catchment area.

If sufficient local data on historical water flows are not available, water flow measuring devices should be installed in the river and at least one year of flow data should be obtained before planning a project. These data can be used for allow a statistical correlation of measured flow with rainfall in the project's water basin for extrapolations.[51] If possible, the data should also be correlated with historic flow records for other nearby rivers.

FIs need to understand that hydropower units do not usually operate at their planned capacity. The capacity factor (load) is the percent of rated capacity that is actually used to generate electricity. This measure of the reliability of energy production varies by season, with rainfall and, where applicable, snowmelt. The capacity factor also depends on project optimization strategies. FIs should review volume flows and capacity factors and assess their plausibility by considering

- Completeness of the hydrological study,
- Expertise and reputation of the consultant or firm conducting the study,
- Methods used for the generation of forecast, and
- Data quality.

FIs should also review the project's methods for mitigating the risk of unreliable water flow data by

- Obtaining independent hydrology study revisions,
- Assessing the project's performance under pessimistic generation scenarios,
- Creating a cash reserve (escrow account) to cope with financial losses during dry periods,
- Reconfirming upstream and downstream water use, and
- Ensuring adequate water basin protection programs.

Investment Costs and Capital Cost Overruns

Investment costs for a hydroelectric plant typically run between USD 1,500 and 2,500 per kW of installed capacity, but depend on the

- Design head and volume flow (hydrology and topography),
- Regulatory requirements and taxes,
- Size of civil engineering works,
- Site access,
- Source of equipment and basic materials,

[51] For a discussion on methods to obtain water flow duration curves in the case of lacking long-term local data, see: Paul Copestake and Andrew R. Young, "How Much Water Can a River Give? Uncertainty and the Flow Duration Curve," Proceedings of the British Hydrological Society's 10th National Symposium, September 15-17, 2008, http://www.sepa.org.uk/science_and_research/data_and_reports/idoc.ashx?docid=2e619b9c-8ab0-461d-8fec-d3c8c9a6fb38&version=-1

- Length of the energy cables connecting the market, and
- Land costs.

Hydroelectric projects often have higher risks during construction and pre-operating phases than in operations. EPCs are recommended to reduce some of the risks. One miscalculation by a single contractor during the construction phase can force revisions in the work of all of the other contractors. Consequently, lenders must evaluate all aspects of the design and construction or require an independent technical review at both stages.

FIs should also review the construction cost estimates from the contractors. To mitigate any capital cost overruns or construction delays, the contract between the project developer and contractors should include disincentives for cost and schedule overruns. Project developers should require contractors and equipment suppliers to provide a warranty and FIs should verify the existence and validity of the warranties.

Legal Issues and Water Rights

Project developers a must determine whether any water rights or competition issues will impede the project and FIs need to confirm this information as part of their due diligence. FIs must also ensure that social and environmental impacts have been thoroughly addressed, including impacts on aquatic ecosystems, floodplain agriculture, and community uses of water. Populations adversely affected by the hydropower project should share in project benefits.

Resources

The following resources provide additional information on small-scale hydropower technologies as well as examples of projects that have been implemented in a range of developing and developed countries. FIs can use the resources here to gain a deeper understanding of the available technologies.

- Smail Khennas and Andrew Barnett, *Best Practices for Sustainable Development of Micro Hydro Power in Developing Countries,* UK Department for International Development and the World Bank, March 2000, http://practicalaction.org/docs/energy/bestpractsynthe.pdf.
- Energy Sector Management Assistance Program, *Mini Hydropower Development Case Studies on the Malagarasi, Muhuwesi, and Kikuletwa Rivers,* Volumes I, II, and III, 2002, http://www.esmap.org/node/704., http://www.esmap.org/esmap/node/705 and http://www.esmap.org/esmap/node/706.
- GIZ, "Mini Hydro Power Projects for Capacity Development (MHPP2) Best Practices Guideline for Off-Grid Micro Hydro Power Schemes for Rural Electrification," September, 2011. http://energy-indonesia.com/006Hydro/bpg.pdf
- International Center on Small Hydropower, *A Practical Guide to Assessment and Implementation of Small Hydropower accessed July 30, 2013,* http://reca-corp.com/files/57897255.pdf
- Microhydropower.net, "Hydropower Basics: Civil Work Components," accessed July 28, 2013, http://www.microhydropower.net/basics/components.php.
- Microhydropower.net, "Hydropower Basics: Turbines," accessed July 28, 2013, http://www.microhydropower.net/basics/turbines.php.

- Practical Action, "Micro-Hydropower," accessed July 28, 2013, http://www.practicalaction.org/docs/technical_information_service/micro_hydro_power.pdf.

5.2.1 Biomass

Biomass energy refers to the use of plant material or animal waste as a fuel source, either directly or after conversion to other solid (charcoal or briquettes), liquid, or gas forms. Biomass can be burned directly in simple stoves or boilers or converted to on- or off-grid electricity. Some biomass fuels are well-established and "bankable," such as power generation from wood chips. Others, such as biomass ethanol, may require legal mandates or subsidies for viability.

Introduction to Biomass Energy Technology

Each type of biomass material has different properties, such as heating value, moisture and mineral content, and potential pollution. These characteristics may affect the choice of technology and the feasibility of use of the biomass resource. Some potential biomass resources are not financially viable for energy purposes because of costs, logistics, or higher-value competing uses (such as timber for construction). Since unconverted biomass is often bulky and may have a low price-to-weight ratio, transport costs can be high if the biomass resources are moved long distances.

Biomass energy often has strong potential for industries that can generate organic byproducts near their production or processing sites (such as sawmilling, rice milling, coffee roasting, and other agro-industries). Biomass energy projects are frequently developed or co-owned by large-scale producers or processors requiring large amounts of energy for boiler feedstock or electricity (e.g., timber, coconut, sisal, and sugarcane). Some of these operations can generate a surplus above their own energy requirements for sale to local industries or the electric grid. Gasification may be a feasible option for small-scale agro-industries that currently operate on diesel, or face high cost and reliability issues with electricity.

Key Considerations for Financing Biomass Projects

Four important issues for lenders evaluating biomass projects are

- Biomass feedstock supply cost and reliability,
- Technology,
- Capital costs and revenues, and
- Byproduct and waste handling.

Biomass Feedstock

Access to a reliable and affordable biomass fuel supply is the key issue for biomass fuel projects. On-grid biomass power projects often need to be large to achieve economies of scale and their size is typically limited by the availability and cost of the preferred feedstock. Firms that do not own a dedicated source of biomass from their own production and processing activities should undertake significant up-front efforts to ensure an adequate fuel supply, preferably from multiple sources. Large investments in biomass energy technology may fail if they are dependent on a single supplier of feedstock that may close or relocate.

FIs should confirm the sustainability and security of the biomass fuel supply by reviewing the current uses, price fluctuations, logistics and transport costs, and potential future changes in supply and demand. A biomass resource that was previously abundant and cheap can become costly when multiple, large biomass energy projects are established.

Mitigation:

- Solid research
- Long term supply contracts or co-ownership of the resource
- Technology allowing for multiple fuels
- Sensitivity analysis
- Cash and feedstock reserves

To mitigate these risks, project developers may sign long-term supply contracts with biomass suppliers. However, these may be of limited value when a resource becomes scarce and suppliers exit the business or are able to sell to other buyers at higher prices. One method of securing long-term supply is to include periodic additional incentive payments to suppliers that deliver feedstock over a long period. If high enough, these incentive payments may encourage their commitment to maintaining the supply relationship even if other buyers offer higher short-term prices. However, incentive payments are unlikely to be high enough to compensate for large increases in spot market prices. Another option that is likely to be more effective than incentive payments is to arrange for a major biomass resource supplier to have co-ownership of the project. All other things equal, the FI's risk may be lowest if there is a captive and concentrated feedstock source owned by the borrower. Another risk mitigation measure is designing projects that can utilize multiple biomass fuels and quickly and inexpensively switch among them.

Other strategies can help mitigate the feedstock risks. One approach is to develop a thorough understanding of the sector supplying the feedstock by studying the factors affecting production, processing, pricing, seasonality, and relationships among the various stakeholders in the value chain. Another approach is to recognize that biomass prices and availability may vary and conduct a sensitivity analysis of the effect of pessimistic feedstock scenarios on the project's financial performance. A third approach is for the project to maintain a large inventory of biomass and build cash reserves to accommodate significant supply disruptions.

Technology

Biomass projects should rely on technologies proven to work in similar applications. Developers should identify reputable technology suppliers that offer sufficient warranties. Verifying the viability of the technologies and suppliers is part of the due diligence responsibilities of the financial institution.

The technology must also match the size of the installation. Direct biomass combustion for steam is typically only viable at a scale of at least 2 to 3 megawatts. At smaller sizes, biomass gasification would be more appropriate. The combustion and pollution control systems must be designed to fit the characteristics of the types of biomass that will be used. For example, rice husk has a high mineral and ash content that may cause significant slagging or clinker formation due to melting and agglomeration of the ashes in combustion. Burning rice husks can also be a lung irritant due to the high silica content.

Different technologies may be needed if multiple fuels with different properties are used to mitigate supply risks. If multiple fuels are used, FIs should verify that the proposed technologies are suitable.

For a large project, the may need to hire an independent expert to weigh in on the proposed project and engineering designs. The FI will also need to do due diligence on suppliers and contractors, including references checks.

Investment Costs

The capital costs of a biomass projects can vary widely depending on the project size, technologies, source of equipment, and import tariffs. FIs should ensure that they have considered all costs, including project development, electro-mechanical equipment, land, civil works, loan interest, and working capital. The construction costs of direct combustion for electric power range from USD 1,500 to 3,000 per kW of installed capacity.

A basic fixed-bed gasification system can cost between USD 1,000 and 2,000 per kW, including site development, the generator set (genset), civil structures, the gasifier, and auxiliary systems.[52] Systems that burn gas in a furnace for process heat, rather than electricity, can have significantly lower costs because they do not require a generator set or gas cleaning system.

Water Requirements, Byproducts, and Waste Handling

Biomass projects require considerable amounts of water for steam generation and cooling. Biomass thermal power plants using a steam turbine consume 1.1–1.8 liters of water per kWh generated, depending on the technology and scale of operation.[53] Gasification systems require about half as much water as biomass thermal power plants.

Water availability and environmental impacts must be carefully considered during project development. Water used for cooling is much warmer when returned to its source and higher temperature can harm aquatic life. Biomass projects can also generate solid, liquid, and gaseous waste that may harm the environment if inadequately controlled. Air pollutant emissions vary with the fuel, technology, and environmental controls adopted. Sulfur emissions are typically lower for biomass power than coal-fired electricity, but may still be a concern. Biomass byproducts may include nitrogen oxides, carbon monoxide, particulates, and volatile organic compounds which can be problematic with biomass energy projects. Emission control systems and proper operating procedures should be used to reduce potentially harmful emissions.

Financial institutions should review the proposed pollution control measures for biomass energy projects to ensure that they comply with environmental laws and regulations and good practices. FIs should also monitor implementation of agreed environmental control measures to reduce the risk that a facility will not be allowed to operate for environmental reasons.

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[52] "The fixed-bed gasifiers were designed on the premise of converting forest and agricultural residues into a valuable resource for distributed heat and power." Energy and Environmental Research Center, "Fixed-Bed Gasifier," 2013, https://www.undeerc.org/equipment/Gasification-and-Gas-Cleanup-Systems/Fixed-Bed-Gasifier.aspx.

[53] U.S. Department of Energy, *Energy Demands on Water Resources: Report to Congress on the Interdependency of Energy and Water:* Washington, DC, December 2006, www.sandia.gov/energy-water/docs/121-RptToCongress-EWwEIAcomments-FINAL.pdf.

Resources

The following resources provide additional information on biomass technologies as well as examples of projects that have been implemented in a range of developing and developed countries. FIs can use the resources here to gain a deeper understanding of the available technologies, key challenges and best practices.

- Asthana, Arvind Kumar, *Biomass as Fuel in Small Boilers: India:* Asian Productivity Organization, 2009, http://www.apo-tokyo.org/00e-books/GP-17_Biomass.htm.
- COGEN3, *Cogeneration Project Development Guide,* 2nd edition, 2004, http://www.cogen3.net/pdgform.html.
- Kartha, Sivan and Larson, Eric D., "Bioenergy Primer, Modernised Biomass Energy for Sustainable Development:" New York, USA, United Nations Development Programme 2000, http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/bioenergy-primer-modernised-biomass-energy-for-sustainable-development/Bioenergy%20Primer_2000.pdf.
- Wickwire, Susan, *Biomass Combined Heat and Power Catalog of Technologies:* USA, U.S. Environmental Protection Agency, 2007, http://www.epa.gov/chp/documents/biomass_chp_catalog.pdf.
- Peter Quaak, Harrie Knoef, and Hubert Stassen, "Energy from Biomass: a Review of Combustion and Gasification Technologies - World Bank technical paper no. WTP 422, Energy series:" Washington, DC, The World Bank, 1999, http://documents.worldbank.org/curated/en/1999/03/437335/energy-biomass-review-combustion-gasification-technologies.

Biogas

Biogas is a combustible gas produced through anaerobic digestion of liquefied organic material by bacteria in the absence of oxygen. Anaerobic processes are accelerated in a digester—an airtight tank or covered lagoon. Biogas is produced from liquid waste, while biomass gasification uses solid raw materials.

Introduction to Biogas

Biogas can be used for a variety of industrial and household applications. Suitable feedstock for biogas includes sewage sludge, animal manure, municipal solid waste, and agro-processing residuals. Biogas production has other benefits besides energy production; it can also reduce pollution and odors from disposal of untreated wastes and GHG emissions and produce fertilizer as a byproduct.

The commercial market for biogas systems varies across countries. Southeast Asia and parts of Africa represent the more mature markets. Biogas may be produced at the household, farm, and industrial levels with technology differences that vary by size.

Domestic biogas from livestock manure has been most extensively used in Asia. Household livestock holdings (generally with at least five animals)[54] can meet domestic energy requirements for cooking, replacing use of unprocessed dung, fuel wood, or charcoal.

Industrial biogas is becoming more common, particularly for medium to large livestock farms and agro-processing industries. Pollution control requirements can be a major motivation for biogas production on large livestock farms. Industrial biogas systems can generate process heat and electricity for agro-industrial operations that generate large volumes of organic wastewater, such as starch or palm oil mills. Since most developing countries do not have extensive experience with industrial biogas, outside expertise may be needed in designing new projects. While the need for outside expertise can be a barrier, developing countries could acquire this expertise through Build-Own-Operate-Transfer (BOOT) investment structures, described below.

Key Considerations for Financing Biogas Projects

Key issues to consider when financing industrial biogas projects include

- Waste stream quality and volume,
- Technology,
- Investment costs and revenues, and
- Byproducts and waste handling.

The pH, the water-to-solids ratio, the carbon-to-nitrogen ratio, and the mixing of the digesting material can also affect the rate and amount of biogas production. In the production phase of industrial biogas, these parameters should be monitored and adjusted as needed before feeding the digester.

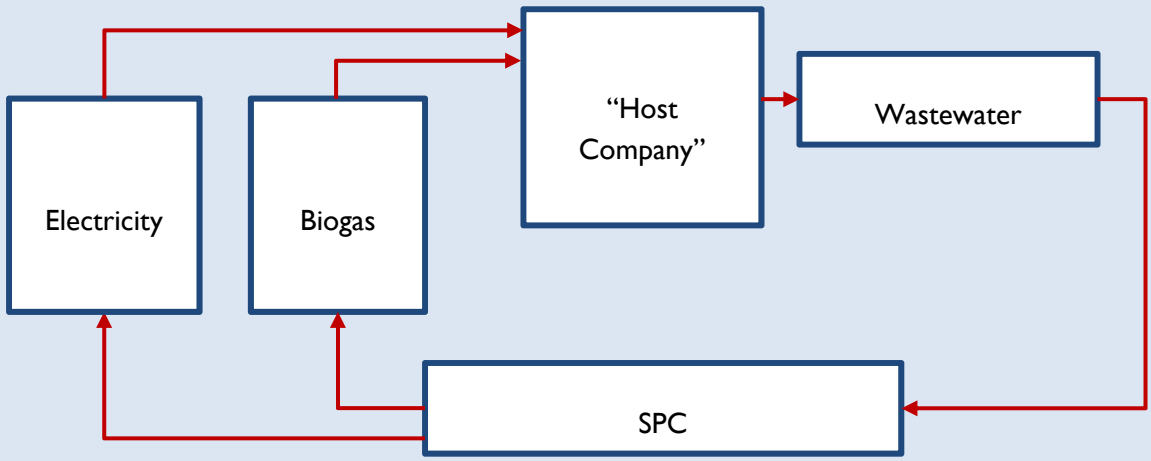
[54] OECD, *Biogas Production,* http://www.oecd.org/env/outreach/36203835.pdf.

Figure 5.2: BOOT Investment Structure

The BOOT investment structure involves setting up a project as a separate legal entity (a Special Purpose Company, or SPC). The project is developed at a host company industrial facility by a developer who manages the project design, financing, and engineering with little or no investment from the SPC. The host supplies land and wastewater to the SPC, which in turn supplies electricity and gas to the host at rates 10-20% below current tariffs.

The contract should specify the minimum quality and quantity of wastewater volume to protect the project's interest. BOOT contracts between the project and host usually run for 10-12 years. Once the contract terminates, project assets are transferred to the host.

Starch and palm oil mills in Southeast Asia have successfully implanted BOOT projects.



Source: Enclude (formerly Triodos Facet), 2012, p., 61.

Technology

Multiple biogas technologies exist for industrial applications, and project developers and lenders should consider them in the feasibility and design phases. The performance of a particular technology may vary with the type of waste, scale, and climate.

The technology supplier selected should have a long track record and significant experience with the type of waste streams that will be used. The system must be expertly designed to ensure that the process will generate gas under the operating conditions at the site.

Some waste streams will generate large volumes of sulfur in the biogas (e.g., modified starch production). If the project is designed to generate electricity, gas scrubbers should be installed to remove the sulfur, which can corrode the generating equipment.

Investment Costs and Revenues

The cost of a domestic biogas system will depend on its size, typically ranging from USD 500 for a household system (based on four zero-grazed cattle) to USD10,000 for larger livestock-based systems. The investment costs for industrial biogas vary widely depending on the type of waste treated, the application (e.g., grid connection versus stand-alone, electricity or gas only), the scale, and the technology.

Because industrial systems treat waste at higher throughput rates than domestic systems, they have substantially lower operating costs per unit of gas production. Industrial biogas can be cost-competitive with fossil fuels.

Project viability is typically derived from user cost savings rather than sales because biogas projects often replace other household or industrial fuels. In assessing project feasibility, project developers may need to analyze trends in past and future energy prices. FIs should review the price assumptions and sensitivity. Additional benefits of biogas projects, such as lower costs for required waste treatment, should also be included in the financial analysis, where relevant. If waste treatment is not required by law, reduction of pollution and odors affecting other people and firms would be additional benefits that might not be reflected in the financial analysis.

Biogas projects also have the potential to generate additional revenue from carbon offsets because of the high methane content of the feedstock. Methane is 25 times more effective at trapping heat in the atmosphere than carbon dioxide.[55] Therefore, capturing and burning methane may result in a significant decrease in emission levels, a reduction that may be monetized under carbon credit programs such as the Gold or Voluntary Carbon Standard. Carbon credit funding has contributed up to 60 percent of total project revenue in some cases. Since obtaining carbon credit funding is time-consuming and costly, FIs generally want to verify that a project is financially viable without the carbon credits.

Byproducts and Waste Handling

Biogas systems can clean the waste stream significantly. However, depending on local environmental standards, wastewater exiting the biogas digester may still contain levels of organic matter or other contaminants that remain too high to meet regulatory standards for disposal without additional treatment. The costs of any additional pollution control systems needed to ensure that the project complies with environment regulations must be included in the financial analysis and plan. Ensuring that financed projects will meet existing and planned environmental regulations is part of the due diligence responsibilities of a financial institution.

Resources

The following resources provide additional information on biogas technologies as well as examples of projects that have been implemented in a range of developing and developed countries. FIs can use the resources here to gain a deeper understanding of the available technologies, key challenges and best practices.

- Kartha, Sivan and Larson, Eric D., "Bioenergy Primer, Modernised Biomass Energy for Sustainable Development:" New York, USA, United Nations Development Programme 2000, access date July

[55] On a timescale of 100 years (see http://unfccc.int/ghg_data/items/3825.php)

30, 2013 http://www.undp.org/content/dam/aplaws/publication/en/publications/environment-energy/www-ee-library/sustainable-energy/bioenergy-primer-modernised-biomass-energy-for-sustainable-development/Bioenergy%20Primer_2000.pdf..

- United Nations Economic and Social Commission for Asia and the Pacific, *Recent Developments in Biogas Technology for Poverty Reduction and Sustainable Development:* Beijing, China, United Nations Asian and Pacific Center for Agricultural Engineering and Machinery (APCAEM), 2007, http://www.unapcaem.org/publication/F-Biogas.PDF.
- U.S. Department of Energy, Federal Energy Management Program (FEMP), "Biogas," August 2011, http://www.wbdg.org/resources/biogas.php.
- Food and Agriculture Organization of the United Nations, "Biogas Production," *Integrated Energy Systems in China: The Cold Northeastern Region Experience,* 1994, http://www.fao.org/docrep/t4470e/t4470e09.htm#6.2. biogas production.

Solar Photovoltaics

Solar PV panels convert energy from the sun into direct current (DC) electricity. In developing countries, PV panels are typically used in stand-alone systems that are not connected to a national grid and use a battery for energy storage. Examples of stand-alone solar PV systems include

- **Solar Home Systems:** These household applications are the most common PV systems. They are used by rural households to power lights, radio, television, refrigerators, and mobile phone chargers. Solar home systems also power small retail businesses.
- **Solar Lanterns:** These small and quite recent (2013) PV products are "plug and play" lamps used to provide light and sometimes charge cell phones. They are easy to use and have no special installation requirements other than exposure to light.
- **Institutional Solar PV Systems:** These systems primarily power light and refrigeration at off-grid public institutions, such as hospitals or schools.
- **Commercial Solar PV Systems:** These provide electricity to telecommunication towers, off-grid tourist lodges, or water pumping systems.
- **Solar PV powered mini-grids:** Neighborhood or village systems power a group of households, often in hybrid systems with a diesel generator.

Surplus PV electricity may be sold to the national grid, where regulations and feed-in tariffs allow. Such grid-connected solar PV systems are common in many areas. Germany, for example, generated over12,000 GWh of PV electricity in 2010.

Key Considerations for Photovoltaic Projects

- **Trade Finance:** The primary demand for commercial finance for photovoltaic systems is currently in trade and end-user finance. Many solar energy companies require trade finance to import equipment and finance rolling stock. The commercial market for PV modules is growing, and FIs have a profitable market providing letters of credit or working capital to PV trading companies.
- **End-User Finance for Photovoltaic Projects:** The project costs for household and microenterprise users of photovoltaics are generally small (USD 200–10,000), perhaps making them

less attractive to larger FIs. The financing requirements of large commercial systems or mini-grid projects are likely to exceed USD 50,000 and are more attractive for commercial banks.

Several end-user financing schemes have been piloted by financial institutions worldwide with varying success. These schemes include

- Microfinance managed by energy companies. (This is different from ESCO financing because the energy companies offer financing for individuals to purchase their own equipment, as opposed to the ESCO model where the end-users do not own the RE equipment.),
- Remittances, and
- Pay-as-you-go models.

Finance for **Grid-Connected** Solar Photovoltaic

Revenues: The revenues of a solar PV power plant may include sales to the national power company and local retail sales. Have the sales prices been set by law, and are they specified in contracts? Are carbon credit revenues likely to be obtained?

- **Capital Costs:** The capital cost of a grid-connected PV plant in developed countries is approximately USD 5 million per MW of installed capacity. The costs are likely to be higher in developing countries due to less local experience and competition. The developer may need to fly in technical experts from abroad. Solar modules and inverters may cost more because of higher transport costs and the lack of economies of scale.
- **Operation and Maintenance Costs:** Operation and maintenance costs include depreciation, administration, taxation, and financial charges.

The operation and maintenance costs for a solar PV system are predictable and standard and can easily be estimated from information received from technology suppliers. High-quality solar modules and inverters have a long product life. Typical warranties are 20 years for the solar module and 10 years for inverters.

Table 5.1: Key Factors in Financing Stand-Along PV Systems identifies the key factors to consider when financing stand-alone PV systems, and provides guidance on possible ways to mitigate project risks.

Finance for Grid-Connected Solar Photovoltaic

- **Revenues:** The revenues of a solar PV power plant may include sales to the national power company and local retail sales. Have the sales prices been set by law, and are they specified in contracts? Are carbon credit revenues likely to be obtained?
- **Capital Costs:** The capital cost of a grid-connected PV plant in developed countries is approximately USD 5 million per MW of installed capacity.[56] The costs are likely to be higher in developing countries due to less local experience and competition. The developer may need to fly in technical experts from abroad. Solar modules and inverters may cost more because of higher transport costs and the lack of economies of scale.
- **Operation and Maintenance Costs:** Operation and maintenance costs include depreciation, administration, taxation, and financial charges.

The operation and maintenance costs for a solar PV system are predictable and standard and can easily be estimated from information received from technology suppliers. High-quality solar modules and inverters have a long product life. Typical warranties are 20 years for the solar module and 10 years for inverters.

[56] The USD 5 million per MW figure is as reported by Altprofits in 2009 (http://www.altprofits.com/ref/eco/eco.html). However, prices are coming down. For instance, in 2010, Zweibel reports a value of USD 3 per watt for large low-cost solar PV systems (see section 2.2 http://solar.gwu.edu/Research/EnergyPolicy_Zweibel2010.pdf).

Table 5.1: Key Factors in Financing Stand-Along PV Systems

Risk	Guidance
Grid extension	• Are communities likely to be connected to the grid?
Poor-quality, inefficient designs and equipment that cause system breakdowns	• Are technical systems designed by well-qualified PV specialists who understand best practices? Has the project developer consulted with off-grid PV specialists for an independent review? • If the project involves many small systems, are they standardized to reduce complexity? • Do contracts with PV suppliers include detailed technical specifications and strong certification, warranty, and commissioning conditions?
Procurement and implementation rollout delays	• Does the developer closely supervise equipment supply and installations? • What are the capacities and reputation of the importer/installation company?
System breakdowns due to lack of maintenance and/or battery replacements	• Are there secure firm commitments for recurrent budgets for maintenance and component replacements? Will beneficiaries cover the operation and maintenance costs for community systems? • Will operation and maintenance be done in-house or outsourced? • If in-house, does the developer have existing capacity, or will this need to be developed? • How will the developer monitor PV system maintenance and performance to anticipate and address problems before failures occur? • Have there been adequate consultations between the community and project developers to help ensure sustainability? • How will purchasers of solar home systems be trained on use and load management?
Theft and vandalism	• Has the developer identified security risks and mitigating measures? • Is there good awareness of security issues?
Adverse environmental impacts	• Will the light bulbs contain mercury? Will lead-acid batteries be used? Has the recycling or disposal of light bulbs and batteries been arranged?

Source: Enclude (formerly Triodos Facet), 2012, p. 69.

Main Risks and Mitigation Tools

The developer must closely supervise equipment supply and installations, and should carefully assess the reputation and capacities of the importer and installation company. The technical system also needs to be designed by highly-qualified PV specialists, who should be assessed by the financial institution, as efficient designs and low-quality equipment can lead to system breakdowns and output shortfalls. Fortunately, in more mature PV grid-connected markets, financial institutions can contract specialized companies to provide detailed feedback and projections on generation capacity for prospective solar PV projects.

PV panels require regular cleaning to avoid dust or grease collecting on the modules. If individual panels within the systems break down, they will have to be replaced. Although solar panels usually carry a long warranty, FIs should pay careful attention to maintenance plans.

Furthermore, the performance of the inverters needs to be monitored, and pending problems should be addressed before failures occur, because long lead times for replacement components or new inverters can result in lengthy outages.

Risk of theft and vandalism needs to be mitigated with fences and security measures, such as guards and cameras. Security risks are higher if PV modules are placed on the ground, rather than rather than the roof of a building or integrated into the structure of a building.

Resources

The following resources provide additional information on solar photovoltaic technologies as well as examples of projects that have been implemented in a range of developing and developed countries. FIs can use the resources here to gain a deeper understanding of the available technologies, key challenges and best practices. FIs can monitor the EPIA website to keep up-to-date with relevant trends in the market.

- European Photovoltaic Industry Association website, accessed November 20, 2013, http://www.epia.org/
- Solarbuzz Solar Market Research and Analysis website, accessed November 20, 2013, http://www.solarbuzz.com
- Kevin Ummel, "The Deployment Dilemma: Where Should We Put Wind and Solar Power?": Washington, DC, USA, Center for Global Development, April 10, 2013, http://www.cgdev.org/blog/deployment-dilemma-where-should-we-put-wind-and-solar-power#disqus_thread

Wind Power

Wind power can be used to generate electricity and mechanical energy for water pumping or soil drainage. A wind farm is an area of land with a group of energy-producing windmills or wind turbines.

The Basics of Wind Power

The installed capacity, efficiency, and visual design of wind turbines have significantly improved since the 1980s. The design and quality of the turbine is the most important component affecting the technical performance of wind power. Well-known manufacturers of wind turbines in mature markets include Vestas, Enecon, Siemens, Nordex, General Electric, Suzlon, Vuurlander, and Repower.

The majority of commercial turbines today operate on a horizontal axis with three evenly spaced blades. The blades are attached to a rotor, and power is transferred from the rotor through a gearbox to a generator. The gearbox and generator are contained within a housing called a nacelle. Some turbine designs use a direct drive rather than a gearbox, transmitting the electricity down the tower to a transformer, and eventually into a grid network.

Wind turbines can operate across a wide range of wind speeds—from 3-4 meters per second to 25 meters per second (90 kilometers per hour or 56 miles per hour).

Wind turbines come in a variety of sizes and power ratings. The largest has blades spanning over 100 meters, and stands 20 stories high. Utility-scale turbines range in size from 50 to 750 kilowatts. Small single turbines below 50 kilowatts are used for homes, small businesses, telecommunications dishes, or water pumps. A small turbine may have rotors between 2.5 and 7 meters in diameter and stands 10 meters or higher.

The availability of a turbine refers to the percent of time that a turbine can operate after accounting for maintenance and repair time. Reputable suppliers typically offer guarantees of 95 percent "availability" of the turbine.

Key Considerations for Wind Power Projects

The most important factors in reviewing a wind power project are

- Technology and project development,
- Wind speeds, and
- Investment costs and revenues.

Technology and Project Development

Wind power projects may require financing for

- Development costs of the project developer,
- Costs of Engineering, Procurement, and Construction (EPC) or other contractors,
- Costs of purchasing and installing equipment, and
- Operation and maintenance costs.

To mitigate risks, FIs should ensure that contractual arrangements and warranties are all in order. FIs should include contingency financing to cover the cost of equipment delivery and installation. Although wind power equipment manufacturers generally can deliver products in the same year they are ordered,

it can be complicated and costly to transport bulky turbines and blades to rural or remote areas. In some cases, new roads may even be required.

If financial institutions do not have in-house expertise to evaluate the technology risks, a third-party expert should review the project. In mature markets, FIs may contract with a local technical consulting firm that specializes in assessing wind farm projects. In other cases, foreign expertise may be needed.

Wind Speeds

Wind speeds fluctuate daily and may be subject to seasonal variations that affect power production. A project proposal must include an analysis of the following characteristics of wind resources:

- Average wind speeds,
- Consistency of wind speeds and (seasonal) fluctuations, and
- A sensitivity analysis, covering a multi-year period, of the effects on power generation projections and financial viability.

The surface roughness at measuring sites must be taken into account in measuring wind speeds. Wind speeds must also be measured at heights of 30 meters or more. Project developers are responsible for ensuring that the wind speed measurements conform to standards. Because wind speed projections are critical to the financial viability of wind power projects, careful review of the measurements and projections is an important element of the due diligence review for financing. FIs that do not have in-house expertise in this area should contract with an expert on wind yield studies.

Investment Costs and Revenues

Wind farm costs vary considerably, but costs per MW typically range from USD 1,500,000 to USD 2,000,000 for on-shore wind and USD 2,500,000 to USD 3,000,000 for off-shore wind. These estimates exclude ancillary costs for construction of additional transmission lines, access roads, or connections to the main grid.

Resources

The following resources provide additional information on wind power technologies as well as examples of projects that have been implemented in a range of developing and developed countries. FIs can use the resources here to gain a deeper understanding of the available technologies, key challenges and best practices. FIs can monitor the WWEA website to stay up-to-date with wind power trends.

- Wind Energy - The Facts (WindFacts) was a European project financed by the Intelligent Energy-Europe program of the Executive Agency for Competitiveness and Innovation (Nov 2007 to Oct 2009. Documents produced by this program can be found on their website, accessed November 2013, http://www.wind-energy-the-facts.org
- Royal Academy of Engineering, "Wind Turbine Power Calculations:" United Kingdom, accessed July 28, 2013, http://www.raeng.org.uk/education/diploma/maths/pdf/exemplars_advanced/23_Wind_Turbine.pdf.
- I Love Windpower website, accessed November 2013, http://www.i-love-windpower.com
- World Wind Energy Association website, accessed November 2013, http://www.wwindea.org)

Table 5.2: Recommended Data Collection for an FI's Management Information System

Type of Data To Be Collected by Department	
Marketing Department	**Sales Department**
• Product performance – By sales volume – By originator • Existing loans • Pre-booking	• Contact database • Existing borrowers • Other Potential borrowers • Payees • Activities of loan officers: – Contact logs – Submission/approval ratio – Volume funded • Support – Pricing support • Loan proposals
Financial Department	
Accounting	**Documentation**
• General ledger • Cash accounts • Department accounts • Treasury (Asset/Liability management) • Funding decisions	• Documentation • Checklist • Document generation • Notes • Funding
Loan Servicing Department	
• Billing • Collection • Equipment management (Disposal of equipment, Going off lease, Repairs and maintenance) • Portfolio management	
Office of the Director	
• Human resources (employee and training records) • Legal matters • Information technology • General office matters	
Credit Department	
• Application information • Credit bureau information • References received • Credit analysis • Notes	

MODULE 6: CASE STUDIES

PURPOSE

This module presents case studies of several types of successful CE lending by FIs in developed and developing countries.

HOW TO USE THIS MODULE

Learn about profitable CE lending products and programs.

MODULE 6: CASE STUDIES

This section contains four case studies of FIs that have entered the CE lending market in developed or developing countries. The information was collected through interviews with the financial institutions.

1. Banco Atlantida (Honduras)
2. Fondesurco (Peru)
3. Romanian Banks (Romania)
4. Sasfin (South Africa)

6.1 BANCO ATLANTIDA (HONDURAS)[57]

Banco Atlantida is a private bank that was established in Honduras in 1913. In the 1970s and 1980s, the Government of Honduras implemented some CE projects. In 2013, there was significant interest in renewable energy financing due to the growing demand for electricity and high cost of imported fossil fuels. Private investors and developers had funded some projects for hydropower, wind energy, biomass, and biogas. Although significant PV projects were not underway, data indicated that they could be viable.

Project developers were able to negotiate long-term, off-take agreements with the parastatal electric utility at fixed prices (power purchase agreements). Banco Atlantida and a small number of other banks have financed some large RE development projects.

Table 6.1: Banco Atlantida's CE Lending

Total value of CE finance portfolio as of 2013	USD 50 million
Number of approved applications as of 2013	12 projects, mostly hydropower
Year when CE financing began	2010
Types of CE loan products	Project finance for medium-scale investments

[57] Mario Arturo Rojas Simon, Head, Renewable Energy Unit, Banco Atlantida, interview with Arjan Visser of Enclude (formerly Triodos Facet), June 8, 2013.

Banco Atlantida identified CE lending as a long-term strategic opportunity. E & Co. was one of its early partners in RE financing. The IFC later gave Banco Atlantida a US $50 million credit line and technical assistance support. Banco Atlantida hired local consultants to assess the technical feasibility of project proposals and ensure compliance with government permitting and environmental and social laws and IFC policies. A social and environmental compliance expert monitored implementation of the agreements with local partners after projects had been commissioned. Banco Atlantida had good relationships with the parastatal electric utility (ENEE) and the Ministry of Environment. Loan applicants must submit information on all compliance requirements to the bank's credit committee early in the loan appraisal process.

Banco Atlantida offered project finance for the following types of CE:

- Energy efficiency for buildings, transport, and industry,
- Solar Photovoltaics,
- Biogas,
- Biomass and clean cookstoves,
- Wind power, and
- Hydropower

Loans can be used for capital costs for RE technology; civil engineering works (concrete, canals, roads); and cables, wiring, and auxiliary equipment. Banco Atlantida does not finance measurement equipment for feasibility studies.

6.1.1 First Steps in CE Finance

Banco Atlantida's renewable energy loans differed from its other loan products. The loan tenure was longer than for other commercial loans and was linked to the terms of the power purchase agreement (typically, 15-20 years).

The main reason for rejection of other potential deals was the applicant's lack of experience in preparing the documentation, especially for financial information. Unsuccessful applicants often only focused on the technical aspects of a proposal or provided a limited financial model. For the most promising applications that it could not finance, the bank provided advice or referred applicants to professional service providers or potential financial partners. Costs and revenues for the financed RE projects often diverged from the projections because of unforeseen natural events. For example, hydropower projects were very susceptible to seasonal changes in water flows.

6.1.2 Marketing

Banco Atlantida has found cross-selling of its CE loan products to corporate clients effective. Banco Atlantida actively marketed RE loans at national and regional conferences across Central America. For example, in 2013, it sponsored an event to showcase RE projects and link them to other investors in country. Banco Atlantida has also trained staff in its commercial and risk departments on RE technology, contracts, and finance. Banco Atlantida was working to expand its RE expertise beyond hydropower. It planned to look at the market for financing industrial EE projects and biomass and biogas heating.

6.1.3 Internal Organization and Staffing

The renewable energy finance unit was part of a new department that included a project finance unit and a syndication unit. More than 20 staff members were involved in RE financing. The Trust Bank Department served the legal entities registered for each RE project developer by managing cash flows. For commercial activities related to RE finance, there was close cooperation between the bank's Corporate Banking Department and its regional offices in country. The bank's Risk Department played an important role in appraisal of RE projects before they went to the main credit committee for approval.

6.1.4 Partnerships and Special Programs

To support its growing portfolio of projects, Banco Atlantida was looking to increase its pool of service providers. The bank did not subsidize CE loans, but encouraged project developers to seek subsidies from other sources, such as carbon credits.

6.1.5 Lessons Learned

Banco Atlantida considered its overall experience in CE financing to be positive. The availability of long-term, off-take agreements to be the most positive factor the RE lending market. It relied on power purchase agreements as the basis for financing project cash flows, although it also required collateral from some project developers, depending on their credit history and project size. The bank viewed the availability of equity financing in addition to loan capital as the most critical factor in its successful rollout of the CE finance activities. Banco Atlantida noted that some projects have faced implementation challenges due to the lack of experience and capacity of local landowners. It recommended that FIs considering entry into RE financing in other countries assess the regulatory incentives and prices for renewable energy.

6.2 FONDESURCO (PERU)58

Fondesurco, was one of the first microfinance institutions to offer rural loans in Peru. It began operations in June 1994 and has become the leading provider of financial services in rural areas of the country. Fondesurco's mission was to provide low-income people with access to financial services while maintaining profitability for sustainable operations.

Peru has one of the highest annual insolation rates in the world (2,300 kWh/m^2) and a mature microfinance market that has reached low-income populations. However, the role that microfinance can play in accessing energy services was relatively unexplored. Only 28 percent of the rural population has access to the electric grid.[59] Areas with electricity service regularly experience blackouts and damaging power surges, resulting in the need to rely on costly back-up generators using fossil fuels. Renewable energy could be a feasible solution for households and small and microenterprises (SMEs), but these clients have limited access to financing to overcome the capital cost barrier for technologies that can be financially viable over the long term.

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[58] Jonathan Nuñez, Fondesurco, interview with Manuel Alegre of Enclude, July 7, 2013.

[59] Alliance for Rural Electrification, accessed November 2013, http://www.ruralelec.org/9.0.html

In 2011, Fondesecuro began participating in the Energy Inclusion Initiative created by Appui au Devéloppement Autonome[60] (ADA) and MicroEnergy International.[61] The Energy Inclusion Initiative helps local financial institutions and MFIs finance the purchase of certified CE equipment that costs between about USD 135 and 1,200 by households and SMEs. The equipment includes solar water heaters (SWHs) and improved cooking ovens (ICOs).

Table 6.2: Fondesurco's CE Lending

Country of Operation	Peru
No. of Active Clients as of 2013	10,975
Year when CE financing began	1994
Gross Loan Portfolio as of 2013	USD 21,350,222
Other Information	Fondesurco had 18 branches. The portfolio was 93% rural. About 70% of clients only had loans from Fondesurco.

6.2.1 First Steps into CE Financing

Fondesurco also developed its own Green Performance Agenda focusing on renewable energy loan products separate from the Energy Inclusion Initiative funding. Their motivation for expanding CE lending was to reduce risk in its own portfolio because clients with green energy performed better than those dependent on conventional energy. Fondesurco also concluded that climate change was an important risk affecting their clients with loans for agriculture or livestocksince farmers who had not adapted to climate change have a higher risk of loan defaults and late payments. As a result, the institution decided to help its agricultural clients, 50 percent of its total portfolio, become more resilient to climate change. This was also consistent with Fondesurco's objective of poverty alleviation and local communities had expressed interest in green lending. Fondesecuro's expansion in CE lending was also stimulated by the

- High potential of solar energy in the areas it served,
- Market study showing that there was a sufficient demand for energy efficiency loans and that these could be profitable, and
- Clear links between environmental protection and poverty alleviation.

6.2.2 CE Finance Initiatives

Fondesurco developed two tools to improve its green lending.

- Exclusion List: Activities will not be financed because they may be harmful to the environment. The list was used by its loan officers, but has not yet become publicly available or disseminated throughout the whole organization.

[60] "ADA is a Luxembourgish NGO that works to promote inclusive finance worldwide," accessed November 2013, http://www.ada-microfinance.org/en

[61] "The MicroEnergy Project was launched in 2001 as a research cooperation project between the Technical University of Berlin and the successful microenergy provider Grameen Shakti. In 2004, MicroEnergy International was then founded as a private company in order to implement the research results," accessed November 2013, http://www.microenergy-international.com/index.php?id=555

- Environmental Risk Assessments: Loan officers conducted an informal, ad hoc environmental screening during the loan application process. However, it was subjective and the loan officers varied in their environmental knowledge. Fondesurco was considering adopting standard indicators to screen and classify clients by their environmental profile more systematically.

FondeENERGÍA

In 2010, Fondesecuro began pilot lending for solar water heaters and improved cooking ovens (FondeENERGÍA loans). As a first step, the MFI conducted a field study to identify its clients' demand for energy efficient technologies that could either generate additional income or reduce costs. The target market segments were low-income, rural families and micro-entrepreneurs in lodging, restaurants, and baking (3).

Table 6.3: Target Customer Segments of Fondesurco

Products	Users/Clients	Use
SWH	Lodges	Hot water for guests
	Restaurants	Dishwashing
	Households	Hot water for family members
	Cheese makers	Cleaning containers and tools
	Bakers	Baking food
ICO	Restaurants	Cooking food
	Households	Cooking food

Fondescuro established two teams for the development, rollout, and monitoring of the energy loans and set up the following process:

1. Clients go to a branch office to discuss a potential loan application.
2. The loan officer goes to the field for due diligence data on the client and technology requirements (such as the size of a solar water heater needed).
3. The client obtains a pro-forma cost estimate from a local supplier.
4. The technology supplier calculates the extra equipment needed.
5. If the application is well documented, Fondesurco provides a loan for 90 percent of the cost from FondeENERGÍA (the remaining 10 percent comes from the client's own contribution).

From 2010 to June 2013, the total value of loans disbursed for the solar water heaters and the cooking stoves was USD 131,000. The repayment period varied from 3 to 18 months.

6.2.3 Marketing

Fondesecuro designed and implemented its energy loan marketing strategy in 2011 after it launched the Renewable Energy System) Communication Plan. The objective of this communication plan was to expand the market for the FondeENERGÍA products in each branch offering this loan product by informing clients about solar water heaters and ovens. An evaluation of the communication plan pilot made the following recommendations:

- Internal Communication: Train loan officers on the major attributes and advantages of the energy efficient products
- External Communication:
  - Promotional activities in branches

- Direct outreach and communication to potential clients

Fondesurco followed these recommendations and identified the best locations for external communications (for example, rural fairs).

6.2.4 Internal Organization and Staffing

Fondesurco created a new managerial position to deal with environmental and social issues. The environmental manager reported to the Research, Innovation, and Development Department and actively supported branches in deploying the green products and social performance reporting.

The Green Performance Agenda has not fundamentally changed the organizational structure. The research, innovation, and development manager led the agenda while the environmental manager trained the loan officers and field staff on technical issues.

6.2.5 Partnerships and Special Programs

The main partnerships were with ADA and MicroEnergy International. Other key partners in the MFI's Green Performance Agenda were the equipment suppliers, who were selected on the basis of product quality, reliability, production and management capabilities, and after-sale services. After intensive testing of various solar water heaters under extreme conditions, Fondesurco selected a vacuum tube technology imported from China. These heaters can resist temperatures as low as -20°C, which makes them suitable for the weather in the targeted locations. A local supplier placed orders with the Chinese manufacturer and was responsible for the installation and post-sale service. Fondesecuro arranged for testing of alternative technologies for solar water heaters by the Centro Experimental Tecnológico.[62] After the testing period, Fondesurco signed an agreement with two local manufacturers that will serve as preferred suppliers.

6.2.6 Lessons Learned

The main challenge was changing the mentality of the loan officers, who had to adapt to selling renewable energy equipment on credit, instead of providing conventional loans. This was still a work in progress because some loan officers had difficulty understanding the products and Fondesurco was the first FI to offer this service. Marketing of loans for energy technologies presented a number of challenges for Fondesurco and the suppliers. Both had to adapt work methods to establish an efficient supply chain that included creating demand for the loans; acquisition of the technology; and transportation, installation, and maintenance of the equipment.

These efforts were beginning to bear fruit as approximately 200 energy systems had been placed in households and micro and small businesses. An evaluation of the first phase of the project reaffirmed the potential of these types of energy programs and customer satisfaction with green energy technology. About 85 percent of the clients rated the quality of the equipment as good or very good and 100 percent would recommend the technology to relatives and acquaintances.

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[62] Experimental Center Technology (CET) was implemented through the international financial and technical support of the Swiss Government Technical Cooperation (COTESU) and the efforts made by teachers of the National University of Callao, Peru, accessed November 2013, http://www.unac.edu.pe/index.php?id=CentroExperimental

The FI planned to expand the scale of marketing energy efficient products on credit by offering FondeENERGÍA loans in more locations, increasing challenges for the supply chains. Since strengthening its suppliers was a key element of success for the continued growth of the CE program, Fondesurco signed an agreement with Hivos, an NGO based in the Netherlands, to train its staff and improve managerial skills. In April of 2013, Fondesecuro was the only MFI in Peru offering CE loans.

The main lessons learned from this experience were that the importance of

- Market assessments to identify the specific energy needs of target clients and offer technology solutions that are financially viable,
- Training and buy-in of the loan officers,
- Careful supplier selection and development of the supply chain, and
- Post-sale service and monitoring and evaluation help to keep the products relevant.

6.3 ROMANIAN BANKS (ROMANIA)

The European Bank for Reconstruction and Development (EBRD) launched a Sustainable Energy Initiative in 2006 to facilitate the financing of CE investments in Eastern Europe and the former Soviet Union. The purpose was to help countries become more competitive by reducing energy consumption and its associated costs. The program built on earlier financing of CE in the region.

The EBRD initiative has implemented over 20 Sustainable Energy Finance Facilities (SEFFs) and was still expanding as of 2013. Each facility included a credit line for one or more local Partner Financial Institutions (PFIs), for on-lending to their clients. There were some differences across countries and banks in the scope, size, and market segments of lending, but usually both renewable energy and energy efficiency investments were targeted, either within one SEFF or separate SEFFs in each country.[63] The discussion below pertains to the program in Romania. Table 6.4 provides an overview of the type of energy lending offered by the Romanian banks that participated in the program.

Table 6.4: Types of Energy Lending Offered by Romanian Banks Under the EBRD Program

	Consumer Loans	Enterprise Loans	Project Finance	ESCO Finance
EE buildings	X	X		X
EE Transport		X		
EE Industry		X	X	X
Solar PV	X	X	X	
Biogas	X	X	X	
Biomass (incl. clean cookstoves)	X	X	X	
Wind power		X		
Hydropower		X		

[63] For more information, see http://www.ebrd.com/pages/sector/energyefficiency/sei/financing.shtml

The participating Romanian banks offered financing for CE products in the following amounts:

- For "small and simple" investments, loans up to USD 335,000 for equipment from the EBRD's List of Eligible Measures and Equipment.
- For "large and complex" investments, loans up to USD 1.34 million to improve the energy efficiency of commercial buildings or production processes or technologies using renewable energy.
- Loans were available in Romanian Leu or Euros for up to 10 years. The project end date is May 30, 2015.

Some of the strong selling points of the CE loan products include the ability to finance up to 100 percent of the cost and eligibility for an EU grant of up to 15 percent of the project's value. In addition, borrowers have access to free technical assistance and financial consulting from EBRD consultants with specialized experience in evaluating, verifying, and financing energy projects. The local banks' relationship managers are also available for advice and support in structuring projects and assembling required documentation. The banks track their CE portfolio and report to the EBRD quarterly.

6.3.1 First Steps in CE Financing

Banks began to join the first CE Facility offered by the EBRD in 2008. In that year, the participating banks borrowed over USD 107 million cumulatively from the EBRD Energy Efficiency Finance Facility (EEFF). In 2011, the EBRD launched a new program with the equivalent of over USD 80 million in financing for CE lending for SMEs in Romania. The Romania SME Energy Finance Facility (ROSEFF) was launched to offer CE solutions for small and medium-sized enterprises.

6.3.2 CE Finance Products

In 2013, the participating banks involved were financing the following types of CE projects:

- Commercial equipment, systems, and processes to reduce consumption of electricity or fuel,
- Purchase and installation of equipment, systems, and processes for small-scale renewable energy,
- Energy efficiency for building renovations, and
- Business development funding for companies providing CE.

The banks financed CE projects for property owners, retailers, and manufacturers in a wide range of sectors, including manufacture of cables, forging, extrusion, furniture making, poultry production, textiles, metalworking, food production, paper manufacture, dairy, and plastics. The banks have provided loans for

- Technological process improvements to reduction energy costs,
- Building insulation of walls, roofs, terraces, doors, and windows,
- Electrical equipment: electrical motors, variable speed drives, and energy management systems that are compatible with CE sources,
- Machinery, such as compressors, tractors, agricultural equipment,
- "A" rated lighting systems (i.e., highly energy efficient according to European standards), LED lighting systems, and light pipes,
- Solar hot water systems, biomass systems, biogas systems, hydropower,
- Heat pumps for buildings,

- Boilers, burners or heaters, infra-red gas heaters for buildings, and
- Cogeneration[64] or tri-generation[65] (mostly for office buildings, hospitals).

The advantages of bank-financing of ESCO's CE operations include

- Reduced energy consumption and energy price risks for ESCO's customers by allowing them to benefit from improved technologies, without increasing their debt load;
- Better efficiency and effectiveness of energy investments due to the ESCO's expertise and access to volume discounts or wholesale pricing;
- Improved reliability of electricity and heating and cooling for the ESCO customers; Lower risk of CE lending for the financial institution and transaction costs than with retail loans due to the expertise, experience, and volume of investments of the ESCO;
- A viable business model for the ESCO with revenues and profits for an extended period of time; and
- Environmental benefits from carbon dioxide emission reductions.

The only disadvantage for the client business or financial institution is the additional cost of the profit margin and overhead of the ESCO, but this is likely to be outweighed by the above advantages.

6.3.3 CE Marketing

As a result of initial market research funded by the EBRD, the Romanian banks saw CE financing as an opportunity to increase market share by attracting new clients and providing additional services to existing clients. The banks promoted the products through a marketing campaign that included client events and specialized promotional materials.

EU grants supported the capacity development and marketing. About 60% of the grant funds were used for staff motivation, training, and incentives and 40% for marketing events organized by individual

Example of an ESCO Loan in Romania

A large bread company in Romania built a new factory at a different location An ESCO company helped to reduce the energy costs of the bakery by financing a 1 MW tri-generation system to provide all of the electricity requirements of the bakery and heating and cooling. The system recovered heat from the engine and two chillers. One of the chillers was operated with recovered combustion gases and the other with natural gas.

One of the banks participating in the RoSEFF program financed USD 1.34 million of the investment costs of the ESCO that financed and owned the energy system of the bakery. The ESCO is selling energy to the bakery under a contract that is long enough to allow the ESCO to fully recover its investment costs and earn an acceptable rate of return. After the contract period ends, the ESCO will transfer the system to the bread factory to operate and maintain on its own.

[64] Cogeneration through combined heat and power is the simultaneous production of electricity with the recovery and utilization heat, accessed November 2013 http://www.clarke-energy.com/chp-cogeneration/

[65] Trigeneration is a process for combined heat, power and cooling in which some of the heat produced by a cogeneration plant is used to generate chilled water for air conditioning or refrigeration, accessed November 2013 http://www.clarke-energy.com/gas-engines/trigeneration/

banks and participation in broader CE exhibitions and conferences. The banks also cooperated with vendors promoting equipment and products.

6.3.4 Internal Organization and Staffing

The sales divisions of the participating banks are responsible for the promotion of the CE loan products. The banks generally do not have a separate division that handles CE finance. Instead of recruiting specialized staff for the CE portfolio, they trained their existing staff. In the first year, two banks trained more than 350 of their total sales staff of 480 on CE lending by holding over 40 training sessions. The trained staff were eligible for a special incentive plan with prizes.

The participating banks carried out the following activities for new business development:

- Developed a pipeline from their internal customer database and a list of prospects;
- Partnered with vendors of financed equipment (such as boilers and air conditioners) to generate deal flow;
- Promoted the loan products through governmental agencies, associations, and ESCOs; and
- Organized events for existing and new clients.

One of the participating banks established partnerships with 5 ESCOs and was developing a vendor partnership to be launched in 2013 to generate referrals from suppliers, dealers, and vendors of CE technology.

6.3.5 Lessons Learned and Key Issues

The participating banks have faced some challenges in finding eligible CE projects that met the EBRD's criteria for direct lending and competing with other CE lending programs in Romania. This competition included the

- European Investment Bank's similar financing facility, which served another set of financial institutions;
- European Union funds for similar financing facilities;
- JEREMIE (Joint European Resources for Micro to Medium Enterprises);
- FREE (Romanian Energy Efficiency Fund); and
- Romanian Government incentives for renewable power production (Green Certificates).

There is also a risk of duplicative financing inter-bank conflicts, and over-subsidizing projects with grants if borrowers have access to multiple CE lending programs. The banks' marketing strategies and staff training can reduce the overlap. In addition, FIs have to conduct due diligence to help ensure that clients do not take on excessive debts and have unencumbered collateral and clearly defined uses of the loans.

Some specific challenges encountered in financing ESCOs include the following:

- Some businesses are reluctant to seek financing through an ESCO because they are still relatively new and unfamiliar in Romania.
- The credit risk of lending to ESCOs mainly depends on the energy service company rather than its clients. Nevertheless, many FIs still want to analyze the creditworthiness of the ESCO clients

because an ESCO may have trouble making its loan repayments if the client businesses shut down or do not fulfill their energy purchase contracts. As a result, the participating banks have rejected many ESCO projects.

Additional marketing and advertising activities might help educate companies about the advantages of working with ESCOs.

For more information on these banks as well as others participating in the program, see the RoSEFF website at https://www.seff.ro/

6.4 SASFIN (SOUTH AFRICA)

Sasfin Bank is a small South African bank that provides a wide range of financial and non-financial services to SME clients --equipment and trade financing, wealth management, private equity and entrepreneurial support, import financing, and assistance in accessing tax credits and government grants.

In 2012, Sasfin began offering turnkey CE financing for SMEs, the first in South Africa. Although four commercial banks were serving the SME sector, none have shown much interest in offering CE financing for this market due to the high transaction costs and specialized nature of these loans.

Sasfin positioned itself as "a one-stop energy shop," where clients could receive assistance in the entire process of developing and implementing a CE project. The bank helped SMEs identify energy efficiency measures, access government incentives, obtain financing and implementation, and monitor projects. Clients can make use of the full range of services or select a smaller number of services.

Table 6.5: Sasfin's CE Lending

Number of approved applications as of 2013	35 finance applications 3 project implementations
Year when CE financing began	2012
Overview of CE finance offering	CE equipment finance

6.4.1 First Steps in CE Financing

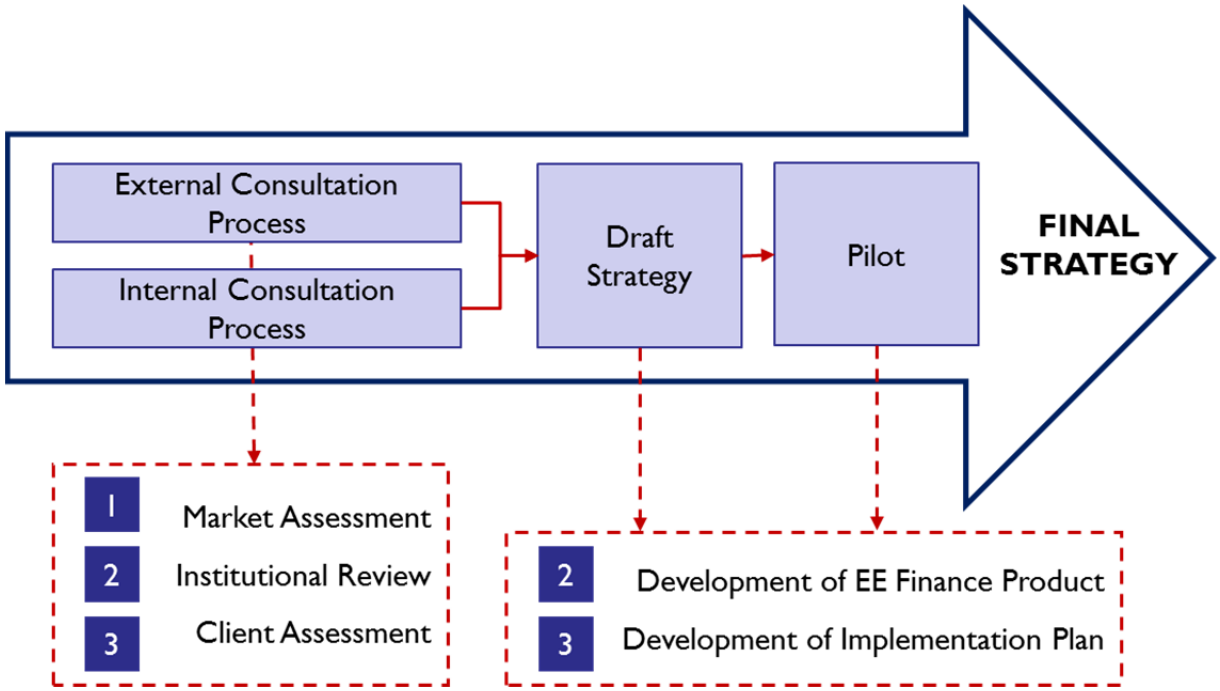
In 2010, Sasfin decided to develop a CE finance offering after policy and market changes resulted in a favorable environment for adoption of these technologies in South Africa. These policy and market changes included large increases in electricity prices, attractive incentives from the national utility covering 70-100 percent of project implementation costs, and CE tax rebates.

Although SMEs were increasingly interested in adopting technologies to reduce their energy costs, many found CE projects too complicated to take on by themselves. Available incentives were not easy to access, and implementation involved multiple parties (ESCOs, financial institutions, the national utility, and government agencies). As a relationship bank, Sasfin saw an opportunity to make the process easier and more attractive for its clients. Since Sasfin already had a specialization in equipment finance, CE equipment financing seemed a good fit and offered an opportunity to expand its services to existing clients, who are generally less risky than new clients.

In late 2010, Sasfin received a USD 10 million line of credit from the International Finance Corporation (IFC) to expand its energy efficiency lending. To help it use this credit line effectively, Sasfin received technical assistance from USAID to develop a CE strategy. This technical assistance was provided under USAID's Financial Sector Program in South Africa (2008-2013).

The development of Sasfin's CE strategy began with 2.5 months of internal discussions and consultations with major market players in the country. The internal stakeholder consultation process was used to obtain a better understanding of the operations of the bank. It helped determine how clean lending could be best integrated into the bank's current operations. The external stakeholder consultation process identified key market opportunities, potential partnerships, and pipeline opportunities.

Figure 6.1: Strategy Development Process



In September 2012, Sasfin completed the draft strategy outlining its strategic positioning and three EE lending products that represented start-to-finish solutions. It then began pilot testing the new loan products with a small number of existing and new clients. Based on client feedback, Sasfin revised its energy efficiency lending strategy. The IFC then supported Sasfin with a long-term expert to assist in implementation. This consultant worked with Sasfin from October 2012 to April 2013.

6.4.2 CE Finance Products

Table 6.6: Types of CE Lending Offered by Sasfin

Type of Energy	Consumer Loans	Enterprise Loans	Project Finance	ESCO Finance
EE buildings		X		
EE transport		X		
EE industry		X		
Solar PV		X		

Biogas		X		
Biomass (including clean cookstoves)		X		
Wind power		X		
Hydropower		X		

Sasfin targeted commercial property owners, manufacturers, and retailers with revenues and asset base below USD 15 million, fewer than 500 staff, and proposed projects that can reduce energy costs at least 20 percent. Loan sizes ranged from USD 100,000 to 2,000,000 for investments in PV and thermal solar solutions, lighting, heating, ventilation and cooling equipment, IT equipment, water heating, manufacturing equipment, and materials handling equipment.

Sasfin's EE lending policy was to

- Work though approved suppliers,
- Base loan amounts and terms on client and project cash flows,
- Serve clients that meet its normal lending criteria,
- Finance against a client's balance sheet, not the ESCO's, and
- Use loan terms up to 60 months, possibly longer for solar PV in the future.

The client's capacity to pay and risk were taken into account in pricing the loans. To increase awareness of its energy lending services, Sasfin publicized them on its website and at conferences and other events. It also used direct mail marketing to existing clients. By June 2013, Sasfin had approved the first three loan applications for CE finance projects and was reviewing an additional 35 deals. The bank expects to fund over US $20 million in energy loans by the end of 2014.

6.4.3 Internal Organization and Partnerships

Sasfin's commercial solutions unit handled incentive applications. Energy audits and implementation of energy projects were handled by Sasfin's "in-house ESCO." Sasfin's Equipment Finance Division handled loan applications. Except for the temporary expert provided by IFC, Sasfin had not created any new positions for its energy offerings. In 2010, Sasfin hired the international consulting firm Iquad to provide services to its clients applying for government-funded CE incentives. Iquad served as Sasfin's commercial solutions unit and created new deal flow by referring clients with financing requirements to the lending department. Sasfin increased its deal flow by working closely with an ESCO, Terra Firma. Sasfin obtained a 20 percent equity share in this company in 2012. Sasfin also plans to develop partnerships with other ESCOs to bring in new clients, develop projects, and provide some of the energy services financed by the bank.

6.4.4 Lessons Learned and Key Issues

Sasfin faced the following challenges in developing an energy offering in the current South African market:

- **Past experience of potential clients:** Some SMEs had bad prior experiences with "fly-by-night" operations that did not deliver promised services.
- **Perceived profitability and payback period:** Some potential SME clients perceived CE investments to only be attractive for large companies with a long time horizon. Many SMEs

thought the payback period would be too long. In fact, grid parity requirements and electricity supply shortages, and availability of appropriate loan products can make CE projects sufficiently profitable over an acceptable time period for SMEs.

Limited number of reputable ESCOs: The South African market was dominated by a few large ESCOs. Although there were also many small ESCOs, they had not established a sufficient track record and some were not considered to be reputable. There was no process of ESCO accreditation.