



FINANCE & INSURANCE TOOLKIT For the Renewable Energy Sector in Barbados

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ACRI+’s objective is to enhance local climate and disaster risk practices, therewith integrating residual risk into the disaster risk management cycle of prevention, preparation, response, and recover practices. ACRI+ operates in three countries with varying climate risks. In Barbados, ACRI+ supports local authorities with their envisioned renewable energy transition and aims to improve the resilience of existing and future renewable energy generation, transmission and distribution infrastructure towards extreme weather events. The Barbados Renewable Energy Association (BREA) is the local focal point and project partner.

For more information on ACRI+ visit the following webpage:

<http://www.climate-insurance.org/projects/advancing-climate-risk-insurance-acri/>



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CONTENTS

Acknowledgements 03

Contents 04

Acronyms 06

MODULE 1: GENERAL GUIDE 07

- 1.0 WHAT IS RENEWABLE ENERGY AND WHY IS IT IMPORTANT FOR BARBADOS? 08
- 1.1 PURPOSE AND COMPONENTS OF THE RENEWABLE ENERGY LENDING AND INSURANCE TOOLKIT 09

MODULE 2: RENEWABLE ENERGY ENVIRONMENT IN BARBADOS 11

- 2.0 PURPOSE 12
- 2.1 HOW TO USE THIS MODULE 12
- 2.2 OVERVIEW OF RENEWABLE ENERGY SECTOR IN BARBADOS 12
- 2.3 TECHNOLOGY OPTIONS IN BARBADOS 12
- 2.4 KEY GOVERNMENT POLICIES AND TARGETS 13
- 2.5 RENEWABLE ENERGY LEGISLATION & REGULATIONS 14
- 2.6 RENEWABLE ENERGY TARIFFS 14
- 2.7 LICENSING AND APPROVAL PROCESS 16
- 2.8 OVERVIEW OF FINANCIAL SERVICES INDUSTRY IN BARBADOS 16
 - 2.8.1 CURRENT LOAN MARKET SITUATION 17
 - 2.8.2 CURRENT INSURANCE MARKET SITUATION 18

MODULE 3: LOAN PRODUCTS FOR RENEWABLE ENERGY and ENERGY EFFICIENCY INVESTMENTS IN BARBADOS 19

- 3.0 PURPOSE 20
- 3.1 HOW TO USE THIS MODULE 20
- 3.2 OPPORTUNITIES FOR RE AND EE LENDING IN BARBADOS 20
- 3.3 RETAIL FINANCE FOR RE/EE IN BARBADOS 21
- 3.4 EXISTING RETAIL PRODUCTS FOR RE IN BARBADOS 21
- 3.5 EXTENSION OF LOAN MATURITIES 23
- 3.6 REDUCTION OF INTEREST RATES 26
- 3.7 SUMMARY 26

MODULE 4: INSURANCE PRODUCTS FOR RENEWABLE ENERGY INVESTMENTS IN BARBADOS 27

- 4.0 PURPOSE 28
- 4.1 HOW TO USE THIS MODULE 28
- 4.2 RE AND THE INSURANCE MARKET IN BARBADOS 28
- 4.3 REQUIRED RE INSURANCE PRODUCTS 31
- 4.4 OPPORTUNITIES FOR INDUSTRY GROWTH 32

MODULE 5: INSURANCE UNDERWRITING GUIDELINES & POLICY	33
5.0	PURPOSE 34
5.1	HOW TO USE THIS MODULE 34
5.2	BASIC UNDERWRITING PRINCIPLES 34
5.3	UNDERWRITING DATA REQUIREMENTS FOR RISK ASSESSMENT / RISK RATING 36
5.4	BASIC INSURANCE PRODUCT OFFERINGS FOR RET 37
5.5	BASIC UNDERWRITING PROCESSES AND GUIDELINES 44
5.6	RISKS AND BARRIERS IN RET UNDERWRITING 46
5.7	RISK ANALYSIS FOR SPECIFIC TECHNOLOGIES. 47
5.8	SPECIFIC CONSIDERATIONS FOR SOLAR 52
5.9	SPECIFIC CONSIDERATIONS FOR BIOMASS 53
MODULE 6: RECOMMENDATIONS AND ROADMAP	57
APPENDIX: Appendix 1	59
Appendix 2	68
Appendix 3	72

TABLES & FIGURES

TABLE 1:	Target Energy Mix in Barbados 2017 13
TABLE 2:	Summary of Renewable Energy Targets 13
TABLE 3:	Summary of Suggested First Price Points For All Technologies Considered For Possible FIT Rates for Barbados 15
TABLE 4:	Assets of Financial Institutions In Barbados (MLs of Barbados Dollars) 16
TABLE 5:	Commercial Banks and Finance Companies in Barbados and Type of Services Offered 17
TABLE 6:	Insurance Companies in Barbados and Type of Services Offered 18
TABLE 7:	RE Financial Products by Market Segment 20
TABLE 8:	Basic RE Loan Terms In Barbados 21
TABLE 9:	Base Case Assumptions For RE Loan Terms in Barbados 22
TABLE 10:	Annual Cash Flows For Solar PV Loan In Barbados With Varying Loan Maturities 24
TABLE 11:	Impact of Extending Loan Maturities to 10 or 12 years 25
TABLE 12:	Insurance Companies in Barbados and Type of Services Offered 29
TABLE 13:	General Gap Analysis for Barbados 29
TABLE 14:	Financial Risk Management Instruments for Renewable Energy Projects 30
FIGURE 1:	Assets of Financial Institutions in Barbados (MLs of Barbados Dollars) 16

ACRONYMS

AC	Air Conditioning
BREA	Barbados Renewable Energy Association
CO2	Carbon Dioxide
RE	Renewable Energy
EE	Energy Efficiency
ESCO	Energy Services Company
FCA	Fuel Clause Adjustment
FI	Financial Institution
GIAB	General Insurance Association of Barbados
GHG	Greenhouse Gas
IRR	Internal Rate of Return
MCII	Munich Climate Insurance Initiative
NPL	Non-Performing Loan
O&M	Operations and Maintenance
OMR	Operating, Maintenance and Replacement
PPA	Power Purchase Agreement
PV	Photovoltaic
RAROC	Risk-Adjusted Income/Return on Capital
RE	Renewable Energy
RES	Renewable Energy System
SEFI	Sustainable Energy Finance Initiative
SPBP	Simple Payback Period
SME	Small and Medium Size Enterprise
SWH	Solar Water Heater
USAID	United States Agency For International Development
UNEP	United Nations Environment Program
WTE	Waste to Energy

MODULE 1

GENERAL GUIDE



1.0 WHAT IS RENEWABLE ENERGY AND WHY IS IT IMPORTANT FOR BARBADOS?

Renewable energy (RE) 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. RE as used here comprises both renewable energy and energy efficiency and renewable energy as both can serve to reduce the use of non-renewable energy which will minimize environmental pollution and GHG emissions.

Barbados has experienced a number of challenges that can be linked to climate change. This includes the rise in the country's sea level, extensive beach erosion and the intensified storm surges when hurricanes affect the Caribbean region. In 2010 hurricane Tomas impacted Barbados, in 2014 hurricane Matthew also impacted and as recently as November 2016, a tropical depression led to major flooding across the island. Extreme weather events such as hurricanes, floods, landslides, storm surges and droughts all pose a direct threat to the island's population, infrastructure and economy.

In addition, Barbados currently spends approximately BDS\$ 1 billion annually for the importation and distribution of fossil fuels, which is one of the major uses of Barbados' scarce foreign exchange. The increased use of RE in Barbados will reduce economic vulnerability by allowing the nation to save significantly on foreign exchange which is one of the major economic constraints in Barbados.

Barbados is beginning the transition of its energy system by integrating more renewable energy sources. It is therefore critically important to ensure that the existing and future energy generation and transmission / distribution infrastructure is climate resilient. The design of appropriate financial and insurance related products is essential to achieving this goal and to aim at achieving a better uptake of RE technology across all relevant levels.

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

- **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
- **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.
- **Waste to Energy:** is the process of generating energy in the form of electricity and/or heat from the primary treatment of waste, or the processing of waste into a fuel source.

The above-mentioned forms of renewable energy may be implemented as stand-alone systems or grid-connected systems. Stand-alone systems allow energy to be utilized at a particular location immediately or after being stored in a battery. Stand-alone systems are not connected to a public or national grid. In the case of Grid-connected systems, electricity produced from renewable sources at a particular location can be distributed to users at other locations through a public or national grid.

There may also be Micro-grids, which are not connected to a national system but serve a local area. An example of a micro-grid system would be solar PV or wind power for a particular parish in Barbados.

1.1 PURPOSE AND COMPONENTS OF THE RENEWABLE ENERGY LENDING AND INSURANCE TOOLKIT

Barbados is blessed to have a relatively well-developed financial services industry. The financial services industry has also had experience with lending for Energy Efficiency (EE) projects in the form of Solar Water Heaters which enjoy a penetration rate of almost 50 percent in Barbados. However, the financial services industry has had limited experience in financing RE projects and EE projects outside of Solar Water Heaters. This is especially true in the area of insurance. In Barbados, perceptions of the technological and financial viability of RE and EE investments have lagged behind the current reality.

The technological issues are a function of lack of information, while a long period of policy uncertainty has created significant doubts around financial viability. As is the case in a number of developing countries, FIs in Barbados often lack the Insurance/loan products, systems and market knowledge to serve the RE lending market effectively and efficiently. As a result loan terms are often unsuitable or financing is simply unavailable. In particular, the cash flows embedded in loan terms are not optimally matched to the cash flows from energy savings or earning from RE investments, and insurance products may simply be unavailable.

The consequence has been that RE and EE projects have only achieved a limited penetration rate in Barbados. If the knowledge gaps can be bridged and FIs can improve their skills and systems for RE lending, then Barbados can achieve a quantum leap in its RE penetration. RE and EE lending/Insurance can also be a new profitable growth area for the financial services industry with an expected expenditure of approximately US1 billion over the next decade. The aim of this toolkit is to help bridge the knowledge gap by providing FIs and other interested parties with relevant information.

This toolkit is designed to help to assist FIs in lending for RE projects and insuring RE projects by providing them with the relevant background information and analytical tools to make informed judgements on a variety of RE projects and users. The users range from households (consumers), small and medium sized businesses (SMEs), large businesses, state institutions and non-governmental organizations. The technologies covered in the toolkit include Solar PV, Wind Turbines, biogas and biomass. GIZ provided assistance in the development of this toolkit.

The toolkit first provides a background on the various RE technologies that have been shown to be technically and financially feasible in Barbados. The toolkit then describes the regulatory environment for RE in Barbados. It outlines the key government policies and targets, regulatory framework, subsidies, renewable energy tariffs and other issues that may be relevant to a potential lender or insurer. The toolkit then provides an overview of the financial services sector in Barbados and current approaches to financing and insuring RE projects in Barbados. After setting this background the tool kit then provides analytical tools to guides FIs through the process of financing and insuring RE projects in a manner that facilitates rapid growth of the RE sector in Barbados while meeting the risk / return targets of FIs.

The toolkit is structured as follows:

- **MODULE 1. GENERAL GUIDE:**
Toolkit overview and content summary
- **MODULE 2. RE ENVIRONMENT IN BARBADOS:**
What are relevant technologies and key policies and regulations?
- **MODULE 3. LOAN PRODUCT DEVELOPMENT:**
What loan products should be developed and tools for guiding the development of such products?
- **MODULE 4. INSURANCE PRODUCT DEVELOPMENT:**
What insurance products should be developed and tools for guiding the development of such products?
- **MODULE 5. General Recommendations on RE Financing and Insurance In Barbados.**

MODULE 2

RENEWABLE ENERGY
ENVIRONMENT
IN BARBADOS



2.0 PURPOSE

This module helps in clarifying the key technology and regulatory issues surrounding RE in Barbados, as well as providing background information on the financial services industry.

2.1 HOW TO USE THIS MODULE

This module is to be used as a guide to obtaining a clear understanding of the policy, legislative and regulatory process being developed to transition the island's generation of electricity from fossil fuels towards RE as the primary source.

2.2 OVERVIEW OF RENEWABLE ENERGY SECTOR IN BARBADOS

Barbados has historically exploited its RE resources through the use of wind mills in the colonial sugar industry up until 1950 and solar water heaters (SWH) throughout households and businesses from the 1970's onwards. Over the past 10 years, there has been a move towards using RE for electricity generation under the Renewable Energy Rider (RER) program. The RER program was introduced by the Barbados Light & Power Company Limited (BL&PCL) with regulatory approval from the Fair Trading Commission (FTC) on a two year pilot basis in June 2010 to June 2012.

The programme was open on a first come first serve basis for 200 customers to install a maximum capacity of 1.6 MW of small scale photovoltaic and wind turbine systems onto the national grid. The RER constituted a credit to be paid to all classes of customers who already utilised or were thinking of investing in renewable energy generating systems for the generation of electricity for their own use, or to sell their excess energy to the national grid. Under the RER pilot programme all kWh sold to the grid by customers who sign up to the RER were compensated via a credit at the greater of 1.8 times the Fuel Clause Adjustment or 31.5 cents/kWh.

The Fuel Clause Adjustment is a pass through of the cost of the fuel used by the BL&P on a monthly basis to generate electricity. Of significance, the RER credit was not designed for participants in the programme to be compensated for their investment.

Initial customer uptake and participation in the program was slow during the two year pilot period but rapidly increased once the program was made permanent on the 9th August 2013. In spite of receiving regulatory permanence in August 2013, it was not until the passage of the Electric Light & Power Act (ELPA) in December 2013, that the third party generation and sale of electricity to the national grid became legal.

The passage of the ELPA was essential to the commercialization of RE electricity generation as the ELPA Regulations introduced on the 6th May 2015 provided the licensing framework for residential and Independent Power Producers (IPP's) to legally sell power back to the grid.

2.3 TECHNOLOGY OPTIONS IN BARBADOS

The establishment of a National Energy Policy Task Force in October 2015 commenced with a comprehensive review of the economic and commercial viability of the several renewable energy technology options available for exploitation in Barbados. Arising out of this review was the task of identifying the mix of technologies RE and cleaner fossil fuels such as biogas (inclusive of natural gas) which would inform the best energy policy options. The energy mix target contained in the 2017 Barbados National Energy Policy (BNEP) consisted of renewable energy, variable and intermittent technologies, as well as cleaner fossil fuel such as natural gas. The target proposed in BNEP requires 75 % reduction in total heavy fossil fuel (heavy fuel oil, diesel, gasoline, kerosene and LPG) consumption and replaced accordingly with the following (these percentages refer to energy and NOT installed capacity):

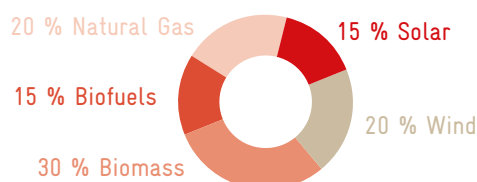


TABLE 1: Target Energy Mix in Barbados 2017

EnergySource	Energy (GWh)	Installed Capacity (MW)	Physical Units
Solar	320	195	
Wind	411	127	
Biomass (Including WTE)	643	79	
Natural Gas (Also Includes Biogas)	152	49	21,974,523 cm ³
Biofuel			141, 500 (BBL)

It should be noted that this suggested mixed is based only on current prices and predicted availability, and may change as further developments in renewable resources and technology as well as exploration of natural gas occur over the next five to ten years.

We recommend that Biogas be included in the mix, and that solar be split into Solar PV and Solar thermal. We also recommend that the policy include a focus on solar cooling.

2.4 KEY GOVERNMENT POLICIES AND TARGETS

Since 2007, when the first RE policy was introduced Barbados has set a number of National Renewable Energy Targets. The attainment of these targets over the past decade have been stymied by significant changes in technology prices, a lack of a coherent policy, legislative and regulatory framework and the absence of a comprehensive private sector support environment. Over past three years several of these hurdles have been overcome through the passage of the Electric Light and Power Act (ELPA) and its regulations as well as the

establishment of the National Energy Policy Task Force, which was instrumental in completing the 2017 Barbados Energy Policy 2017–2030. The targets set by this task force are set out in Table 2.

Following the most recent general election held on the 24th May 2018, a new government came into power and has set a new target of achieving 100 % Renewable Energy Generation and Clean Fuel production by 2030. The current government is less than 4 weeks old but already there has been significant engagement with key stakeholders as it relates to outlining a specific roadmap to achieve this target. As a consequence some revision to the foregoing technology options for the island is possible.

The new policy pronouncement will have significant implications for the financial and insurance industries as a major paradigm shift in the scope and type of products being offered to the RE sector will now be required to meet this ambitious target. As such, a more dynamic and proactive approach towards RE project financing, implementation and facilitation will be required as means of progressively increasing annual uptake over the next decade. Additionally, a host of new insurance risk transfer products will be required to mitigate the various mechanical, climatic and business risks being presented by the large scale deployment of the various RE technologies.

TABLE 2: Summary of Renewable Energy Targets

Year	Penetration Targets
2007	10 % Renewable Energy Generation by 2010
2010	29 % Renewable Energy Generation and a 22 % Energy Efficiency reduction by 2029
2017	75 % Renewable Energy Generation by 2037
2018	100 % Renewable Energy Generation target by 2030

2.5 RENEWABLE ENERGY LEGISLATION & REGULATIONS

The RE sector currently receives dual regulatory oversight from the Fair Trading Commission (FTC) and the Minister with responsibility for Energy acting on the advice of the ELPA Advisory Committee. The FTC assumes responsibility for all issues pertaining to the pricing of RE generated electricity being sold back to the grid and draws its regulatory authority from the Fair Trading Act Cap and the Utilities Regulatory Act CAP.

The Minister with responsibility for Energy and the ELPA Advisory Committee provides for the licensing of all RE generators under the ELPA. The Minister with responsibility for Energy has the authority to set capacity limits for RE generated electricity being placed onto the national grid and is also responsible for the issuance of licenses to Independent Power Producers (IPP's) which allows the sale of power to the national grid.

2.6 RENEWABLE ENERGY TARIFFS

The temporary Renewable Energy Rider (RER) tariff of \$ 0.416 cents for solar and \$ 0.315 for wind installations < 500kw is currently the only tariff mechanism in place for the residential or commercial investment in RE. This tariff came into effect through the July 12, 2016 decision of the FTC in response to a joint policy directive being issued by the Minister with responsibility for Commerce on the 2nd March 2016. The decision was instrumental as it represented the first tariff since the introduction of the RER

Coincident to the establishment of the National task Force on Energy, in 2016 the Division of Energy also commissioned a study to be prepared by German Professor Olav Hohmeyer for the development of market analysis and tariff pricing mechanism for the island's RE sector. In October 2017 the government was presented with the interim draft final report of the study entitled an "Economic Analysis to Facilitate the Establishment of a Stable Price for Electricity from Renewable Sources," a full copy of which can be found on the Division of Energy's website at "energy.gov.bb." The major recommendation emerging from the study was the need for a fixed term Feed-In-Tariff (FIT) framework for the various RE technology options governed by a standardized 20 year Power Purchase Agreement. The adoption of this recommendation would greatly reduce some of the uncertainty and credit risk concerns facing financial institutions with respect to providing financing for RE investments in Barbados.

See Table 3 for a summary of suggested first price points for all technologies considered for possible FIT rates for Barbados.

TABLE 3: Summary of Suggested First Price Points For All Technologies Considered For Possible FIT Rates for Barbados

	Size range in kW	FIT rates				Guarantee period in years	Suggested annual reduction in %	
		Average FIT rate in BBD/kWh	Phase I		Phase II			
			Rate in BBD/kWh	Duration in years	Rate in BBD/kWh			Duration in years
PV roof	1-100	0.607	0.748	10	0.471	10	20	2.4 %
	10-100	0.584	0.673	10	0.424	10	20	2.4 %
	100-1,000	0.408	0.501	10	0.264	10	20	2.4 %
	>1,000	0.341	0.419	10	0.264	10	20	2.4 %
PV ground mounted		0.341	0.419	10	0.264	10	20	2.4 %
Wind	Investor owned	0.247	0.318	10	0.175	10	20	1 %
	Community owned	0.266	.343	10	0.188	10	20	1 %
	Investor owned plus 10 % ownership for proximity	0.263	0.340	10	0.187	10	20	1 %
Biogas from manure	0-200	0.229	0.263	10	0.195	0	20	1 %
	210-750	0.223	0.253	10	0.193	0	20	1 %
	> 751	0.203	0.221	10	0.184	0	20	1 %
Biomass gasification	0-750	0.471	0.552	10	0.320	0	20	1 %
	> 751	0.381	0.441	10	0.320	0	20	1 %
Solid biomass combustion (bagasse)		0.315	0.315	25	0.315	0	20	0 %
Solid waste combustion		0.270	0.270	20	0.270	0	20	1 %

2.7 LICENSING AND APPROVAL PROCESS

The licensing process for RE investments in Barbados is currently a twofold one, involving either firstly obtaining planning approval from the Chief Town Planner or the approval of an RE generator licence from the Minister with responsibility for energy under the ELPA. Depending on the type of RE technology and the size of the investment being pursued approval from the Chief Town Planner may be required. Rooftop solar p.v. investments have received an exemption from Town planning approval as at October 2015 once they meet certain height stipulations. Planning permission is required for all other RE technology investments such as car port and ground mounted solar installations, biomass facilities, residential and commercial wind systems and waste to energy plants. In each instance where RE generated power is to be sold back to the national grid, a licence from the Minister of Energy acting on the advice of the ELPA Advisory Committee will be required.

The process for obtaining a generator licence under the ELPA is dependent on whether you are a domestic or commercial customer. Domestic or residential customers

with installations < 5kw in capacity and small corporate customers with installations < 25kw are exempted from requiring a licence and need only to register their system with the ELPA Advisory Committee in writing. All other systems, including domestic residential systems with installations > 5kw and all other installations > 25kw require a licence from the Minister with responsibility for Energy in accordance with the provisions of the ELPA.

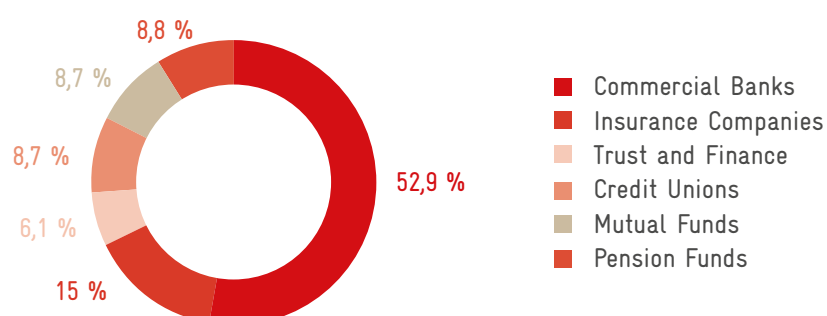
2.8 OVERVIEW OF FINANCIAL SERVICES INDUSTRY IN BARBADOS

Barbados has a relatively large and well developed financial services industry. Commercial banks dominate the financial system representing 53 percent of total financial assets in 2017, which was marginally lower than their share in 2016 (see Table 4 and Figure 1). The insurance industry accounts for 15 percent, while the credit unions, finance and trusts companies, mutual funds and private pension schemes each hold under 10 percent of the system's assets.

TABLE 4: Assets of Financial Institutions In Barbados (MLs of Barbados Dollars)

Entities	2017	2016	2015	2014	2013
Commercial Banks	\$ 13,479	\$ 13,302	\$ 12,829	\$ 12,312	\$ 12,480
Insurance Companies	\$ 3,820	\$ 3,635	\$ 3,243	\$ 3,025	\$ 3,011
Trust and Finance	\$ 1,544	\$ 1,507	\$ 1,646	\$ 1,563	\$ 1,519
Credit Unions	\$ 2,212	\$ 2,035	\$ 1,850	\$ 1,728	\$ 1,683
Mutual Funds	\$ 2,210	\$ 2,073	\$ 1,860	\$ 1,849	\$ 1,836
Pension Funds	NA	\$ 2,231	\$ 2,102	\$ 2,066	\$ 1,985

FIGURE 1: Assets of Financial Institutions in Barbados 2017 (MLs of Barbados Dollars)



2.8.1 CURRENT LOAN MARKET SITUATION

At present there are five commercial banks on the island of Barbados providing a comprehensive range of banking services. These entities are, Bank of Nova Scotia, First Citizens Bank, First Caribbean International Bank, Royal Bank of Canada and Republic Bank Barbados. The commercial bank market in Barbados can be described as mature, with well over 95 % of the population utilizing commercial banking services.

The market is currently extensively served by well-established and entrenched service providers, while the newest entrant, First Citizens is a large, well-capitalized and diversified entity. As such, the market is a mature and highly competitive one.

In addition to the commercial banks, the market is also served by three relatively well established finance houses, Consolidated Finance, Globe Finance and Signia Financial. These entities provide a variety of loans services to customers in Barbados and can play a vital role in developing loan products for RE. The various players are summarized in Table 5.

TABLE 5: Commercial Banks and Finance Companies in Barbados and Type of Services Offered

Name of facility	Type of services offered
Bank of Nova Scotia	Full Service International Commercial Bank with seven (7) retail branches.
First Caribbean International Bank	Full Service Regional Bank with nine (9) retail branches.
First Citizens Bank	Full Service Regional Bank with one (3) retail branches.
Republic Bank Barbados	Full Service Regional Bank with nine (9) retail branches.
Royal Bank of Canada	Full Service International Commercial Bank with eight (8) retail branches.
Consolidated Finance Co. Ltd	Finance Company with one (1) branch.
Globe Finance Inc	Finance Company with one (1) branch.
Signia Financial Group Inc.	Finance Company with one (1) branch.
Capita Finance	Finance Company with one (1) branch.

In addition to the commercial banks and Finance companies, Credit unions have become an important part of the financial landscape of Barbados. Credit unions are membership-owned institutions that focus on the provision of affordable personal loans and savings products to their members. Currently, there are 35 credit unions under the Barbados Credit Union League, with the four largest institutions accounting for over 85 % of the industry’s assets and membership.

As the major indigenous players in the financial services sector (also owning Finance Company and General Insurance Company) Credit Unions may take a special interest in a national initiative such as RE financing. As such, Credit Unions may have a greater role to play in RE financing and insurance than their sheer size would suggest, and it is recommended that BREA and GIZ undertake a special outreach to this sector in terms of loan and insurance products for RE

As shown in table 1 and figure 1 credit unions continue to increase their asset base and they have become an important source of retail finance for lower and middle income segments of the society, as well as Small and Medium-Size enterprises.

2.8.2 CURRENT INSURANCE MARKET SITUATION

Insurance companies are the second largest players in the financial system in Barbados. There are a large number of entities offering insurance services in Barbados (see table 6). However, the life insurance sector accounts for 71 percent of total industry assets, with General Insurers accounting for 29 percent of total industry assets. The insurance industry in Barbados is highly skewed with the top three life insurers holding 96 percent of life insurance assets and the top three general insurers represented 65 percent of the general insurance industry. The key players are presented in table 6.

The Insurance industry can play a major role in the financing of RE in Barbados. If restrictions are removed Life Insurance companies in particular can provide direct financing for RE projects, while the ability to insure RE investments will be key to banks, finance houses and credit unions being willing to finance RE projects on a large scale. The development of insurance products for RE investments is a critical cog in the wheel for RE financing in Barbados.

TABLE 6: Insurance Companies in Barbados and Type of Services Offered

Insurance Company	Type of services offered
Sagicor	General and Life Insurance
Insurance Corporation of Barbados	General and Life Insurance
United Insurance	General and Life Insurance
Consumers Guarantee	General Insurance
Cooperators General	General and Life Insurance
Brydens Insurance	General and Life Insurance
SunGeneral	General and Life Insurance
Newco	General and Life Insurance
Massy Insurance	General and Life Insurance
Trident Insurance	General and Life Insurance
Equity Insurance	General and Life Insurance
Guardian Insurance	General and Life Insurance
Harmony General	General Insurance Broker
CGM Gallagher	General Insurance Broker
Beacon Insurance	General and Life Insurance

MODULE 3

LOAN PRODUCTS FOR
RENEWABLE ENERGY
and ENERGY EFFICIENCY
INVESTMENTS
IN BARBADOS



3.0 PURPOSE

The purpose of this module is to provide FIs in Barbados with an overview of the lending opportunities in the area of RE/EE and provide tools that assist in creating lending products for the RE/EE sector. Some well-established RE and EE technologies are already financed through credit products that are not energy specific. In Barbados, hybrid, electric, and natural gas vehicles are financed by the same loan and lease mechanisms as gasoline or diesel-powered vehicles. Similarly, commercial buildings designed to meet higher efficiency standards (such as LEED) are usually financed with regular construction loans, while solar water heaters are financed as part of home construction loans. However, challenges arise with the financing of less familiar RE and EE investments such as the installation of PV, Wind, BioGas and BioMass electricity generation systems. These investments are less familiar and do not fit optimally into existing loan products due to their longer-term nature, uncertainty about the risks and potential returns, challenges with insurance and difficulty in obtaining conventional collateral. The toolkit therefore focuses on the issues surrounding the financing of the latter types of investments.

3.1 HOW TO USE THIS MODULE

This module is to be used as a guide to the lending opportunities in RE/EE and to assist in developing loan products that are suited to the risk/return profile of RE investments, while meeting the objectives of the FI.

3.2 OPPORTUNITIES FOR RE AND EE LENDING IN BARBADOS

It is useful to think of a RE/EE supply chain which involves a wide range of activities and participants, all which require financing and can provide new lending opportunities for FIs. The RE/EE supply chain includes RE technology manufacturing, sales, installation, post-sales servicing and end users, and ESCOs. The needs of players at different stages in the supply often require different loan products and the market for RE/EE lending can be divided into three segments, Retail Finance, ESCO Finance and Project Finance. Table 7 provides an outline of the types of loan products typically provided in the Retail Finance, ESCO Finance and Project Finance segments.

TABLE 7: RE 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 Contracting heat, cooling and power.	RE Generation (small or large scale)

3.3 RETAIL FINANCE FOR RE / EE IN BARBADOS

As outlined in Module 2, the financial system in Barbados is dominated by commercial banks, finance and credit unions which have high levels of experience and expertise in retail lending. Therefore, consumer loans structured along the lines of existing housing finance, consumer asset finance, or general consumer credit products are ideal entry points into RE and EE financing for FIs in Barbados. The FIs already have the expertise, hence there is little need for additional staff training and FIs can move into RE/EE lending by targeting existing clients, who are generally less risky than new clients without a track record.

Trade loans represent another opportunity to provide financing for RE/EE manufacturers, distributors, and installers. This is a diverse group, and different players may have very different financing needs. RE/EE manufacturers may need relatively large amounts of financing with long terms for major capital investments in plant and equipment and/or short-term loans for working capital for production and marketing. On the other hand installers and distributors may require financing for acquiring inventory or to provide financing to their customers. In Barbados, manufacturers and suppliers while likely need Letters of Credit to facilitate import transactions and other foreign exchange services.

3.4 EXISTING RETAIL PRODUCTS FOR RE IN BARBADOS

In Barbados, retail financing for electric cars and small scale Solar PV Electrical Generation systems, have been the dominant form of RE/EE financing. The electric cars have been financed along the lines of typical vehicle loans hence the toolkit will not focus on those loans. In general, somewhat surprisingly, the loans for PV Electrical Generation systems have been structured along the lines of typical consumer loans. The typical loan terms are captured in Table 8.

TABLE 8: Basic RE Loan Terms In Barbados

Loan to Value	80 %
Loan Maturity	7 Years
Interest Rate	7 %

The fact that the majority of retail loan products are structured along these lines means that, given the current renewable energy tariff in Barbados, investors in Solar PV electricity generation system will likely have negative cash flows over the life of the loan even if one excludes operating costs (see Table 9).

TABLE 9: Base Case Assumptions For RE Loan Terms in Barbados

Initial Investment in Solar System	\$ 55,000
Equity Required (20 %)	\$ 11,000
Loan Proceeds	\$ 44,000
Loan Maturity	12
Interest Rate	7 %
Energy Produced Annually	18,250
Renewable Energy Tariff	\$ 0.42
Annual Revenue From Tariff	\$ 7,584.70
Un-Levered Internal Rate Of Return	12.5 %
Levered Internal Rate Of Return	18.5 %
Net Cash Flow Per Solar System Over Life Of Loan	\$ (45.53)

Year	Un-Levered Cash Flows	7 Year Loan Cash Flows
0	\$ (55,000)	\$ (11,000)
1	\$ 7,584	\$ (45)
2	\$ 7,584	\$ (45)
3	\$ 7,584	\$ (45)
4	\$ 7,584	\$ (45)
5	\$ 7,584	\$ (45)
6	\$ 7,584	\$ (45)
7	\$ 7,584	\$ (45)
8	\$ 7,584	\$ 7,584
9	\$ 7,584	\$ 7,584
10	\$ 7,584	\$ 7,584
11	\$ 7,584	\$ 7,584
12	\$ 7,584	\$ 7,584
13	\$ 7,584	\$ 7,584
14	\$ 7,584	\$ 7,584
15	\$ 7,584	\$ 7,584
16	\$ 7,584	\$ 7,584
17	\$ 7,584	\$ 7,584
18	\$ 7,584	\$ 7,584
19	\$ 7,584	\$ 7,584
20	\$ 7,584	\$ 7,584

Thus while the investment in a PV electricity generation system will yield a 18.5 % return over the 20 year life of the system (as shown in table 9) , the investor has to contend with negative cash flows over the 7 year life of the loan.

The essential challenge is that using the current retail loan structures, there is a mismatch between the cash flows from the asset and the debt service flows. The outcome is that using the current financial products available in Barbados, RE and EE investment are only attractive to and feasible for those willing able to manage negative cash flows over the life of the loan.

The implication is that retail loan structures in Barbados will have to be modified if there is to be large scale take up of RE/EE investments across the society. The loan structures can be modified so as to more closely match the cash flows from RE/EE investments and make the loans more attractive to a broader range of investors. The available evidence shows that the investments in RE generate high rates of return in Barbados as shown in table, the immediate challenge is to address the problem of negative cash flows to the investor over the life of the loan.

The challenge of negative cash flows to the investor over the life of the loan can be addressed by:

1. Extension of Loan Maturities;
2. Reduction of Interest Rates;
3. Reduction of initial equity required;
4. A combination of reduced interest rates, extended maturities and reduced initial equity requirement.

3.5 EXTENSION OF LOAN MATURITIES

The challenge of negative cash flows to the investor over the life of the loan can be addressed by extending loan maturities from the customary seven (7) years to ten (10) years or longer. The impact of extending loan maturity with all other terms and conditions unchanged is illustrated in table 10.

TABLE 10: Annual Cash Flows For Solar PV Loan In Barbados With Varying Loan Maturities

Initial Investment in Solar System	\$ 55,000				
Equity Required (20 %)	\$ 11,000				
Loan Proceeds	\$ 44,000				
Loan Maturity	12				
Interest Rate	7 %				
Energy Produced Annually	18,250				
Renewable Energy Tariff	\$ 0.42				
Annual Revenue From Tariff	\$ 7,584.70				
	7 Year Loan Maturity Cash Flows	10 Year Loan Maturity Cash Flows	12 Year Loan Maturity Cash Flows	15 Year Loan Maturity Cash Flows	20 Year Loan Maturity Cash Flows
0	\$ (11,000)	\$ (11,000)	\$ (11,000)	\$ (11,000)	\$ (11,000)
1	\$ (45)	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
2	\$ (45)	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
3	\$ (45)	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
4	\$ (45)	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
5	\$ (45)	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
6	\$ (45)	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
7	\$ (45)	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
8	\$ 7,584	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
9	\$ 7,584	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
10	\$ 7,584	\$ 1,729	\$ 2,407	\$ 3,069	\$ 3,703
11	\$ 7,584	\$ 7,584	\$ 2,407	\$ 3,069	\$ 3,703
12	\$ 7,584	\$ 7,584	\$ 2,407	\$ 3,069	\$ 3,703
13	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,069	\$ 3,703
14	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,069	\$ 3,703
15	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,069	\$ 3,703
16	\$ 7,584	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,703
17	\$ 7,584	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,703
18	\$ 7,584	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,703
19	\$ 7,584	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,703
20	\$ 7,584	\$ 7,584	\$ 7,584	\$ 7,584	\$ 3,703

As can be seen in table 10 extending loan maturities to 10 years from 7 years will allow investors to be “cash flow positive” from the start of the loan (excluding operating costs). In the case of Barbados, a case can be made for an extension of loan maturities to 10-12 years instead of the customary seven (7) year maturity. The case can be made that:

- a. The typical solar PV or wind system has a useful life of at least 20 years. Therefore, having the loan mature at the end of ten to twelve years exposes the lender to relatively little risk in terms of the obsolescence or performance of the asset;
- b. The introduction of a fixed feed-in tariff provides a relatively stable revenue stream over the life of the asset and justifies a longer term maturity on the loan.

Table 11 summarizes the impact of FIs extending the loan maturity for seven to ten or twelve years with all other conditions unchanged.

TABLE 11: Impact of Extending Loan Maturities to 10 or 12 years

	Currently & Year Loan Maturity	Proposed 10 Year Loan Maturity	Proposal 12 Year Loan Maturity
Equity Required	20 %	20 %	20 %
Maturity	7 Years	10 Years	12 Years
Interest rate	7 %	7 %	7 %
Net Cash Flow Per Solar System Over Life Of Loan	\$ (45.53)	\$ 1,729	\$ 2,407
Return To Investor	18.5 %	21.8 %	24.43 %
Annual Debt Service	(\$ 7,630.23)	(\$ 5,854.78)	(\$ 5,177.28)
Annual Income	\$ 7,584.70	\$ 7,584.70	\$ 7,584.70
Internal Rate of Return	18.5 %	21.8 %	24.43 %

3.6 REDUCTION OF INTEREST RATES

The interest rate charged on a loan represents a rate that provides the lender with an appropriate risk-adjusted rate of return. Therefore, in order for the interest rates on RE/EE loans to be reduced, there would have to risk mitigation and/or return enhancing mechanisms to ensure lenders are in fact earning appropriate risk-adjusted rates of return. The expected losses on a loan portfolio are typically a function of:

- a The Expected Default Frequency;
- b The Expected Loss on Default;

FIs in Barbados can use at least three risk mitigation mechanisms to reduce the “Expected Default Frequency” and “Expected Loss On default.” interest rates on RE/EE loans to businesses and individuals without reducing their Risk Adjusted Rates of Return. Firstly, FIs can reduce Expected Default Frequency by requiring that the revenues earned by the borrower under the RER be paid directly to the FI by the Barbados Light and Power Company. Secondly, the “Loss on Default” can be reduced by ensuring assets are properly insured, and thirdly by utilising the Industrial Credit Fund Facility provided by the Central Bank of Barbados (see Appendix). In particular, the following changes were made to the ICF for the specific purpose of supporting private sector lending to energy projects:

1. The interest rate for loans under the Industrial Credit Fund has been set at 2.00 %, one percentage point below the normal ICF rate.
2. The maximum guarantee cover has been set at 100 % for the factoring of receivables for energy projects under the Trade Receivables Liquidity Facility.
3. Loans to individuals for goods and services in respect of energy projects are eligible for guarantee coverage under the Guarantee Scheme for Businesses.

Details on the Industrial Credit Fund can be found on the Central Bank of Barbados website:

<http://www.centralbank.org.bb/financing-schemes/financing-schemes/credit-guarantee-scheme-for-businesses>.

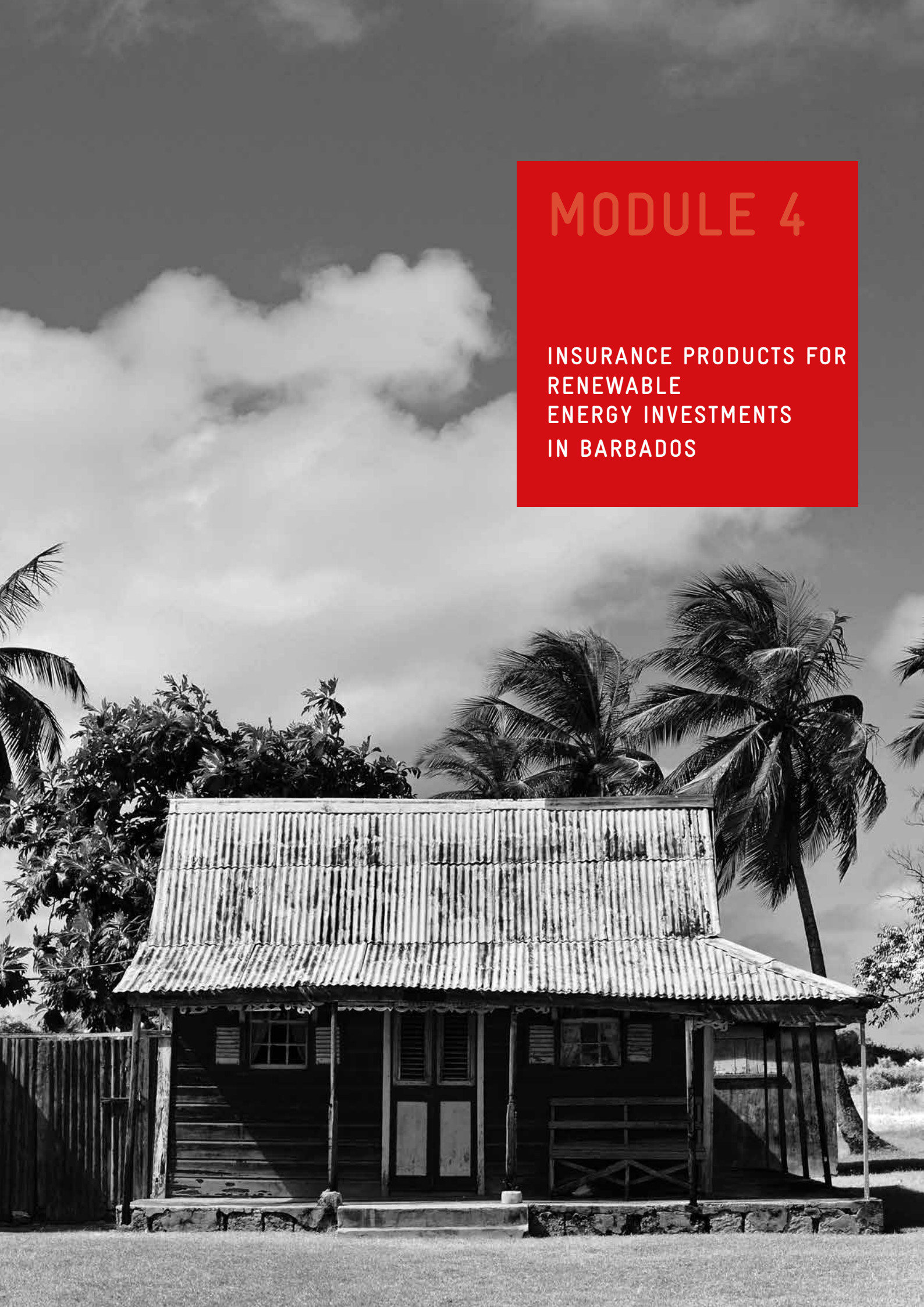
The combination of the reduction in “Default Frequency” by requiring that revenues be assigned directly to the FI and the reduction in the “Loss on Default” provided by the provide by the Industrial Credit Fund Facility and adequate insurance products, provide a strong case for the reduction in the loan spread on RE/EE loans in Barbados. If interest rates on RE/EE were to be reduced that would also contribute to addressing the problem of negative cash flow over the life of current loans.

3.7 SUMMARY

This module suggests that the majority of loan products for RE/EE in Barbados are only attractive to investors who are able to forego any positive cash flows from investments in RE/EE for the life of the loan. The module shows how extending loan maturities can address this problem. The module also provides readily accessible risk mitigation mechanisms that would allow the spread on RE/EE loans to be reduced to make such loans even more attractive to investors, while providing FIs with appropriate risk-adjusted rates of return. A number of tools that can assist FIs in loan product developments can be found at the BREA website.

MODULE 4

INSURANCE PRODUCTS FOR
RENEWABLE
ENERGY INVESTMENTS
IN BARBADOS



4.0 PURPOSE

The purpose of this module is to underscore the importance of insurance products to the development of the RE industry in Barbados, provide insurance providers in Barbados with an overview of the business opportunities in the area of RE/EE, outline the types of products required by the sector, identify gaps in RE insurance and make recommendations for promoting greater RE take up.

4.1 HOW TO USE THIS MODULE

This module is to be used as a guide to the opportunities for insurers in RE/EE and to assist in developing insurance products that are suited to the risk/return profile of RE investments, while meeting the objectives of the insurer.

4.2 RE AND THE INSURANCE MARKET IN BARBADOS

The development of adequate and affordable insurance products is absolutely essential to the development of RE in Barbados. During the interviews and workshops conducted with banks, credit unions and finance companies in Barbados for the preparation of this toolkit, these players made it clear that they would be challenged to expand the provision of loan financing for RE projects if “the insurance issues were not sorted out.” In particular they stated “assets such as solar panels, windmill, Biomass generators and so on would need to be insured against damage or loss if they were to serve as collateral for the loans.” In addition they also stated “insurance against loss of income during periods of damage would make RE loans more “bankable.”

Therefore, business interruption insurance and insurance products that protect against damage to or loss of the physical assets used in RE generation are absolutely essential if the RE industry is to attract the required levels of loan financing. In addition, these types of insurance products would reduce the risk of RE investments and make more players willing to invest in RE.

In the design of these products it is essential that they at least provide the degree of coverage and pricing that are currently provided on investments in real estate and vehicles. These are the major investments made by local entrepreneurs and loans made by local financial institutions. Investors and lenders and investors need to be provided the same levels of insurance protection at similar pricing or investment and capital will not flow to the RE sector

The insurance industry in Barbados is largely characterized by homeowner, motor and commercial business insurance. An important question that arises is whether or not solar panels or other renewable energy systems installed on a property become an integrated part of the building and as such are already insured. It may be feasible that an additional premium is attached to the homeowner insurance for such facilities. There are a total of 16 Life and General Insurance companies / Brokers. Table 12 below sets out a list of these companies and the specific services they provide. A series of surveys were conducted with these entities during the months of March and July of 2018. The responses to the survey disclosed that the current range of insurance products being offered to predominantly residential and commercial business customers, relates to a combination of Home and Content, All Risks, Business Interruption and Commercial Property.

TABLE 12: Insurance Companies in Barbados and Type of Services Offered

Name of facility	Type of services offered
Sagicor	General and Life Insurance.
Insurance Corporation of Barbados	General and Life Insurance
Massy United Insurance	General Insurance
Consumers Guarantee	General Insurance
Cooperative General	General Insurance
Brydens Insurance	General Insurance
SunGeneral	General Insurance
Island Heritage Barbados	General Insurance
BCIC	General Insurance
Trident Insurance	General Insurance
Equity Insurance	General Insurance
Guardian Insurance	General and Life Insurance
Harmony General	General Insurance
CGM Gallagher	General Insurance
Beacon Insurance	General Insurance
Resolution Life Insurance	Life Insurance

Interviews with the General Insurance Association of Barbados and other representatives from the individual insurance companies revealed that there is an absence of standard insurance products for RE investments being offered. In these interviews, senior insurance executives revealed that specific coverage for RE investments is currently being addressed on a case by case basis. The current practice is that when specific requests have been made for particular types of risk protection for RE investments, such enquiries have been referred back to their reinsurers for guidance. In general the comments from insurers were along the line:

“We have not given much thought to RE insurance.”
 “We do not get much demand for these products.” “We are not clear on the laws and regulations for these types of products.” “We are not sure our regulator will approve these products.” “We have done it or something like it for a customer in the past, but it something we have in our brochures.” “Our underwriters and marketing personnel lack knowledge of and expertise in RE insurance.” “We would love some more training to build awareness of RE products so we can approach Reinsures and develop products for the Barbados market.”

The picture that emerges in Barbados is one where insurers will respond to insurance demands from a large or long-time customer, but RE insurance has not been occupying the attention of regulators or insurance companies. There is a general lack of awareness of RE insurance needs and products in the insurance sector, hence there are no RE insurance products that are available and being promoted in Barbados. Potential customers who need RE insurance are required to raise the issue with an insurer and the insurer will typically seek to determine if the risks being discussed fit into an existing insurance product. The insurer will likely try to cover the RE investment using an existing product if the customer is large or a preferred customer.

A comparison with Jamaica and Trinidad and Tobago indicates that these markets are essentially at the same stage. This is not surprising given that the vast majority of insurance companies offer their services on a Caribbean wide basis. The Caribbean is almost virgin territory for RE insurance. Table 13 provides a summary “Gap Analysis” of RE insurance products in Barbados, while Appendix 1 provides company specific “Gap Analyses.”

There is also a scarcity of insurance products being offered specifically as it relates to climate resilience. This fact is significant given the specific risk extreme climate events can and has presented to RE investments. As such, at the regional level there has also a gap in specific insurance products being offered to provide coverage against the various risks being presented to RE investments. In fact specialized coverage has only been introduced within the last decade to cover against climatic catastrophe risks with the establishment of the Caribbean Catastrophe Risk Insurance Facility (CCRIF). The CCRIF was established to:

- cover the post-disaster liquidity gap faced by governments between immediate emergency aid and long-term redevelopment assistance
- enable governments to receive money quickly, with the amount calculated completely objectively

- minimise the burden on governments to provide exposure information prior to coverage being initiated and loss information after a disaster

However, it should be noted that there is no insured interest in the coverage of CCRIF.

It is critical that RE insurance products are developed and promoted as loan providers have noted these high profile examples and are cautious of lending in the absence of insurance. Policymakers and development agencies will need to undertake a special outreach to build awareness of RE insurance products for regulators and insurance companies. The removal of any regulatory hurdles or the presence of necessary legislation along with an intensive awareness campaign will encourage and enable insurance companies to approach reinsurers in order to develop and market RE insurance products.

TABLE 13: General Gap Analysis for Barbados

Type of Insurance Product	Availability and Accessibility in Barbados (see key below table)	Usage in Barbados	Potential for Increased Usage	Recommendations
Business Interruption Insurance	B	Limited	Significant	Enhanced promotion and improved pricing
Construction All Risks (CAR)	B	Wide	Modest	Improved pricing;
Contractors Overall Risk	C	Average	High	Improved pricing; Training for underwriters and capacity building;
Delay in Start up (DSU)/ Advance Loss of Profit	E	Non-existent	High	A need to build basic awareness.
Defective part/ Technology Risk	E	Selective	High	A need to build basic awareness.
General / Third Party Liabilities	A	Wide	Low	
Machinery Break Down	D	Limited	High	A need to build basic awareness.
Operating All Risks/ Physical Damage	C	Limited	High	A need to build basic awareness.
Property Damage	B	Wide	Low	

Source: Adapted from UNEP SEFI

- A. Increasingly Comprehensive and Competitive Cover – rates going down, cover being extended
- B. Broad Cover – Leading markets available, standard rating available, possible high premiums/ deductibles.
- C. Partial Cover- Growing market interest, some gaps in cover, limited capacity, high premiums/ deductibles.
- D. Very Limited Cover- Few markets, restrictive terms and conditions, many exclusions
- E. No cover available from local providers.

It should be noted that most of the major constraints apply to utility scale projects.

4.3 REQUIRED RE INSURANCE PRODUCTS

To adequately provide risk coverage and resilience for the island’s emerging RE sector over the next decade the following insurance products for RE investments will be required:

- Construction All Risks (CAR) / Erection All Risks
- Delay in Start Up (DSU) / Advance Loss of Profit (ALOP)
- Operating All Risks/ Physical Damage
- Machinery Breakdown (MB)
- Business Interruption
- General / Third-Party Liability
- Warranty Insurance

The above-mentioned insurance products are necessary to mitigate a range of risks which can emerge throughout the development and operational life cycles of the various RE technologies. Table 14 below summarizes several of the risks presented by the primary RE technologies available for exploitation in Barbados and identified in the various energy policies.

TABLE 14: Financial Risk Management Instruments for Renewable Energy Projects

RE Technology	Risks
Large PV	<ul style="list-style-type: none"> – Component breakdowns (e.g. short circuits) – Weather damage – Theft / vandalism
Wind Power	<ul style="list-style-type: none"> – Long lead times and up-front costs (e.g. planning permission and construction costs) – Critical component failures (e.g. gear train / box, bearings, blades etc) – Wind resource variability – Offshore cable laying
Biomass / WTE	<ul style="list-style-type: none"> – Fuel supply availability / variability – Resource price variability – Environmental liabilities associated with fuel handling and storage
Biogas	<ul style="list-style-type: none"> – Resource risk (e.g. reduction of gas quantity and quality due to changes in organic feedstock) – Planning opposition associated with odour Problems

Source: UNEP SEFI

Critical to successfully introducing the range of RE insurance products into Barbados' insurance industry, would be the early and comprehensive engagement with the various reinsurers. This step is necessary in ensuring that there is sufficient transfer of the various risks not only presented by the development and operational life cycles of RE technologies, but also in providing protection against climatic events. Commencement of a formal engagement process between the local insurance companies and their reinsurers is urgently required within the next six months to ensure that the industry is in tune with the expected rapid deployment of various RE technologies.

4.4 OPPORTUNITIES FOR INDUSTRY GROWTH

To achieve the governments' ambitious 100 % RE target by 2030, the domestic insurance industry will need to respond with alacrity to capitalize on the estimated US\$ 1.5 billion of capital investment expected over the next decade. The identified RE technologies of Solar, Wind, Waste to Energy, Biomass and Biogas will require range insurance products specifically tailored to address the potential risks facing their operation. At present, there are no insurance products being offered for these proposed investments domestically, particularly at utility scale. To date, most RE investments have been incorporated into existing home or commercial property insurance policies. These policies have largely been to cover domestic and commercial solar p.v investment ranging in value from US \$ 10,000.00 to US \$ 250,000.00. This has resulted in a total of 17 MW of distributed solar systems < 150 kw of installed capacity and one solar utility scale solar farm of 10 MW as at July 2018.

With respect to solar, industry experts have the proposed 195 MW of capacity has will be confined to three distinct capacity thresholds,1) residential systems < 10kw totaling at least 30 MW of installed capacity; 2) small commercial systems < 1 MW totaling at least 80 MW; 3) utility scale systems < 10 MW totaling at least 85 MW of installed capacity.

Investment in wind will largely take place at utility scale and plans are currently in place for the establishment of a national utility scale wind project. It is expected that this project will have total installed capacity of 80 MW to 100 MW of approximately 80 turbines at multiple locations across the island.

The Waste to Energy Facility is expected to be based on more conventional incineration technology and should possess and installed capacity of at least 17 MW to 20 MW. The Biomass facility will comprise of a combination of Bagasse from sugar cane and pelletized King Grass. These facilities are expected be of installed capacities of 500 KW to 2 MW and should total at least 50 MW. In addition to these facilities, there is also significant interest in Bio-methane production at Bio-digester facilities. These facilities are expected to range in size from 250 KW to 1 MW.

A comprehensive set of insurance underwriting guidelines prepared by Mr. Dirk Kohler from MCII is now presented in module 5.

MODULE 5

INSURANCE
UNDERWRITING
GUIDELINES & POLICY



5.0 PURPOSE

The Purpose of this module is to provide potential insurers with a clear set of underwriting guidelines for covering a range of renewable energy investments.

5.1 HOW TO USE THIS MODULE

Insurance for Renewable Energy Technologies (RET) follows the same structure and processes as traditional insurance for energy power plants and machinery. Generally, the same underwriting principles and guidelines apply. A clear underwriting philosophy, reliable pricing mechanisms and stable underwriting guidelines are required elements to successfully insure RET.

RET insurance products cover the main lines of insurance such as property, engineering, marine, energy and liability. Additional special types of insurance can be made available; such as credit, political and weather risks, Errors & Omission (E&O), and Directors & Officers (D&O) are underwritten.

For RET, there are no new underwriting processes and guidelines necessary but comprehensive insurance regulations can be missing. The basic information required for diligent underwriting of RET is mainly the same as for traditional businesses such as machinery or energy installations.

RET poses some specific risks and barriers. Technologies applied are relatively new and the available expertise and actuarial data is still low. There are few standard products and underwriting is primarily done on a case-by-case basis. Some specific underwriting considerations for wind, solar and biomass apply. The remainder of the module walks through these specific requirements and introduces standard insurance application forms for these four RET.

Basic Underwriting Principles

This section provides an overview of the main ingredients of successful underwriting, understanding the market mechanisms, applying sensible pricing and reliable underwriting guidelines. This also fully applies for RET.

Basic Insurance Product Offers for RET

This section covers the available basic insurance offerings for RET. Products offered are property, marine, engineering, energy and liability. Also special lines such as crime, E&O, D&O and credit, political, weather risks are considered in the context of RET offerings.

Basic Underwriting Process and Guidelines

This section provides an overview of the basic underwriting process and guidelines and gives a short introduction into the main standard information elements required for underwriting as well as the basic guidelines and clauses that normally are applied in insurance underwriting.

Risks and Barriers in RET Underwriting

This section lists the main risk and barriers for RET underwriting. Key barriers for RET underwriting include the missing expertise and lack of actuarial loss data.

Specific Considerations for Different Technologies

This section introduces the specific underwriting requirements for Wind, Solar and Biomass.

5.2 BASIC UNDERWRITING PRINCIPLES

Insurance is used to hedge against the risk of a contingent loss triggered by a physical, human or natural peril. The insured transfers a defined risk of a loss in exchange for a premium, which is an insurance rate used to determine the amount to be charged for a certain amount of insurance coverage. An insured is thus said to be „indemnified“ against the loss events covered in the policy.

Insurers underwrite risks within clear constraints. Their available equity or surplus is limited and thus the risk-taking capacity cannot exceed a certain amount. Also, certain regulatory and legal limitations apply, especially in emerging and developing countries. Risks that qualify for underwriting must be diligently assessed, rated and priced.

Any insurance company relies on an underwriting philosophy, and is confronted with specific market conditions. The market conditions are defined by the insurance cycle. The degree of understanding of the insurance cycle will influence the risk appetite of the insurer and insured.

Risk Philosophy

The risk philosophy describes the balance between risk taking, risk tolerance, risk management and risk ownership.

Insurance Cycle

Non-life insurance business is characterized by the insurance cycle. The insurance cycle refers to the periodic oscillation of the market between “soft” and “hard” phases. The soft market is characterized by decreasing premiums, less capital and less competition. The hard market exhibits growing premiums, new capital influx and more stringent underwriting guidelines. A hard market can be triggered by a large loss event such as natural catastrophes. A soft market follows the hard market once the insurance market is saturated, that competition has taken off and premiums has started to decline.

Taking risks is the core of the insurance business. The key challenge for the insurers is to balance the risk appetite and the risk tolerance in a sustainable way:

- The risk appetite is the additional marginal amount of risk a company is willing to accept in order to gain a business benefit.
- The risk tolerance is the setting of a maximum exposure level an insurance company is willing to accept in order to be able to meet all of its obligations. Normally this is the surplus capital or the available risk capital.
- Risk management is the process of defining the project’s objectives, assessing, reporting, deciding on, treating and monitoring the risk.

- Risk ownership refers to the ultimate owners of the risk. In an insurance company these are the shareholder representatives in the Board of Directors and their delegates in the Executive Team. In a project these are the project sponsors.

The cycle Management is the active management of the insurance cycle. Depending on the state of the market (soft or hard) different underwriting policies will apply. Usually, in a soft market, the following guidelines are suggested:

- Set premiums in a prudent and risk-based way;
- Install state-of-the-art risk management tools;
- De-link underwriting from available surplus or high investment returns;
- Redeploy capital to sustainable insurance lines and implement smart incentives.

Depending on the frequency and severity of the losses, different insurance mechanisms will apply. For low-severity and low-frequency events, self-insurance or risk retention is used. National insurance markets are strongly positioned for high-frequency and low-to mid-severity events. Higher severity risks are covered by international insurance and reinsurance groups. The highest severity risks might be securitized on the global capital markets or covered by public risk finance tools such as credit delivery guarantees. Insurance companies must be able to price their products in an economically sustainable way. The price depends mainly on the expected loss.

Pricing mechanisms

Price = Expected Claims + Admin Costs + Risk Premium.

- Expected Claims Payment are the payments the insurer must potentially make to the insured party under the contract.
- Administrative Costs cover all the administrative, distribution and other costs the insurer bears in order to provide the policy protection.
- Risk Premium covers the capital and interest costs.

Underwriting guidelines and policies define the underlying operational execution principles for risk underwriting:

- Underwriting guidelines include the following elements:
- Underwriting Data Requirements for Risk Assessment / Risk Rating.
- Interests Insured and Insurance Options.
- Coverage (Limits, Deductibles), Terms & Conditions, Exclusions.
- Capacity, Pricing, Processes and Acceptance.
- Accumulation Controls, Natural Catastrophe (Nat Cat) Exposure.

5.3 UNDERWRITING DATA REQUIREMENTS FOR RISK ASSESSMENT / RISK RATING

Standard insurance forms are used to collect information from project developers which will help assess the risk exposure of the project. The different risk appraisal steps are:

1. **Risk engineering:**
Understanding the mechanics of the risk to be insured. This is normally done by experts and relies on available exposure and loss information.
2. **Risk assessment:**
Identifying, describing, estimating and evaluating the various risk factors that are relevant in the context of the technology, environment and other risk factors.
3. **Risk rating:**
Based on the risk assessment, a rating provides a rough guideline of how good or bad a risk is. The three generic ratings for RET are “prototype,” “unproven,” and “proven” technology. Different ratings might imply underwriting decisions. It can be difficult to find insurance for technologies that are rated as potential “prototype” (e.g. fuel cell technologies).

Interests Insured and Insurance Offering

The insured has an interest in a property that is subject to insurance. Damage, destruction, or value reduction of that property would cause the insured to incur financial loss. This must be demonstrated when a policy is issued and must always exist at the time of loss (with the exception of life insurance).

For RET the most common interests insured are property values (such as machinery, turbines, platforms, installations, warehouses, and buildings), the business value generated from the property (revenue, rent, profit), liability values (third-party) and specific interests (construction phase).

Insurance offerings consist of the products that indemnify, or hedge, the risks identified with regards to the insured objects. In today’s markets for most common risks, standardized insurance products are offered. For complex and new risks, new technologies, lack of expertise and loss experience, or large capacities, customized policies are issued. This applies for RET projects in many cases. Customized policies are normally more expensive than standard products.

Coverage (Limits, Deductibles), Terms & Conditions, Exclusions

Once the risk has been assessed, reported and decided upon then the appropriate coverage, the terms and conditions that apply as well as the exclusions in the coverage can be developed.

Coverage includes setting the limits and deductibles in order to come up with an attractive insurance offering. For RET, most terms and conditions are derived from the ones used in property, engineering and energy insurance policies. Exclusions are a critical factor to be considered in the contract stage. Some standard exclusions apply for risks such as war, terrorism, natural catastrophe (Nat Cat), etc. Also some specific exclusions are applied case by case.

Capacity, Pricing, Processes and Acceptance

Once the details of coverage, terms and conditions have been agreed upon, an insurance capacity is suggested, and the premium (pricing) as well as the acceptance are set.

Accumulation Controls, Nat Cat Exposure

In parallel to the pricing and capacity setting, accumulation control of a risk in an existing pool of risks must be strictly governed. Also specific risk exposure information must be analyzed with regards to Nat Cat events and the exposure to these perils.

5.4 BASIC INSURANCE PRODUCT OFFERINGS FOR RET

Traditional and already available classes of insurance are relevant in conjunction with RET projects and operations. As of today, RET coverage is a combination of traditional insurance products. However, insurance companies that are active in the renewable energy arena have set up specific underwriting teams for renewable energy or alternative energy.

Type of Insurance

Scope Relevance for RET

Property

Property insurance covers the damage and loss to property. Physical Damage/Operating All Risks applies to losses from all accidental and unforeseen causes with the exception of perils that are specifically excluded from the policy. Physical Damage/Operating All Risks for a company's property value, including properties where RETs are installed.

Engineering

Engineering insurance is specifically used to protect construction works, as well as erection and operation of machinery. Non-renewable coverage is used for projects under construction and/or erection. Renewable coverage is used for installations, equipment and machinery once they are ready for commercial operations. Non-renewable and renewable coverage for RET installations (construction and operations phase).

Marine

Marine insurance provides coverage for hull and cargo. Hull covers all types of vessels that float. Cargo provides coverage for anything that is loaded in any type of vehicle or vessel for the purpose of being transported. Marine coverage for transport to and from RET sites.

Energy

Energy insurance is traditionally for oil platforms. It provides coverage for platforms and equipment in offshore oil operations and exploration as well as for all supply vessels serving the offshore oil fields and offshore pipelines.

Nuclear coverage

is often considered as a separate class of insurance due to its very specific risk characteristics. RET might establish a new class of insurance in energy underwriting.

Liability: General/Third Party

General Liability offers personal and commercial coverage for the financial Liability coverage in conjunction with construction and operation of RET

Consequences of damages claimed by third parties that are not included in property, employers, motor and marine liability. Third Party Liability (TPL) considers the impact of construction and operation work on third parties (visitors, neighbors) or employees that incur bodily or physical property damage.

Crime, Fidelity, E&O, D&O

Crime, Fidelity, Errors & Omissions (E&O) as well as Directors & Officers (D&O) covers are additional special lines of insurance considered to be relevant for some RET projects, especially when there are many project stakeholders, complex ownership (owners, employers, developers) and new emerging technologies involved. These covers are relevant for specific issues with regards to project ownership (D&O) and emerging technologies (E&O).

Credit Risks Credit Insurance

and Credit Delivery Guarantees offer protection for the payment risk resulting from the delivery of goods or services. This is caused by the counterparty being unable to pay as a result of protracted default, insolvency or bankruptcy. Credit coverage in conjunction with counter-party exposure in RET projects.

Political Risks Political Risk insurance

offers protection against political conditions that result in a loss. These can be political violence, governmental actions (expropriation, confiscation, repudiation of assets) or other issues such as currency inconvertibility or inability to repatriate funds. Political risk coverage in conjunction with political exposure in RET projects.

Weather Risks

Weather derivatives are instruments used to hedge against the risk of weather-related losses. The underlying assets are measurable weather events and patterns such as rain, temperature or snow. To hedge dependency on weather patterns for wind and solar installations, as well as other RETs.

With regards to constructing, erecting and operating an RET installation, the main insurance offerings are property and engineering products:

Physical Damage/Operating All Risks

Renewable policy to protect against losses/damage to property that has been erected and is operational.

Construction All Risks (CAR)

Non-renewable coverage to protect against losses in the construction phase.

Erection All Risks (EAR)

Non-renewable coverage to protect against losses in the erection phase.

Advance Loss of Profit (ALOP)/Delay in Start-Up (DSU)

Non-renewable coverage in conjunction with CAR and / or EAR.

To protect against loss of income or profit during the construction or erection phase.

Contractors Plant and Equipment (CPE)

Renewable policy to protect against losses on a plant and equipment independent of the location or project.

Machinery Breakdown (MB)

Renewable policy to protect against losses to machinery that has been erected and is operational.

Business Interruption (BI)

Renewable policy to protect against loss of income or profit if operations are interrupted because of loss.

Physical Damage / Operating All Risks

Definition

Physical Damage/Operating All Risks covers all physical damages to tangible property and plant assets that have been erected and are operational. Coverage Sudden and unforeseen physical loss or physical damage to the plant/assets during the operational phase of a project subject to exclusions.

Insured Parties

Owner of the plant.

Sum Insured

New replacement value of the insured plant assets that can be defined as the cost of replacing by a new one of the same capacity. This includes transport and erection costs, as well as taxes and customs. If total loss occurs the indemnification might be restricted to the actual cash value.

Main Hazards

Fire and explosion, theft, burglary, collapse, earthquake, seaquake, landslides, storms and flood. Perils might vary from location to location.

Exclusions

Standard exclusions are war, other political perils, seepage and pollution, contamination, nuclear energy risks. Further exclusions apply case-by-case.

CAR – Construction All Risks

Definition

CAR insurance covers all types of building and civil engineering construction and offers protection against hazards that may threaten the work under construction.

Coverage

All Risks basis for physical loss damage to the insured property subject to the damage being unforeseen and accidental, and subject to exclusions to the policy.

Insured Parties

Insured parties are project owners, principals and contractors.

Sum Insured

Total contract value e.g. the anticipated value of the completed works including materials, salaries, transport, custom duties, taxes and the value of any material or labor supplied by the principal.

Main Hazards

Fire and explosion, theft, burglary, collapse, earthquake, seaquake, landslides, storms and flood. Perils may vary from location to location.

Exclusions

General exclusions are liquidated damages or penalties for delay or detention, or in connection with guarantees of performance and efficiency, willful acts or omissions or gross negligence of any director, manager or responsible party on site, nuclear risks and political risks. Further exclusions apply to normal upkeep, consequential loss of any kind, or loss of use, wear and tear, corrosion, erosion, or deterioration due to lack of use and other reasons.

EAR – Erection All Risks

Definition

EAR insurance covers the erection of individual machines such as lifts or complete systems such as power stations.

Coverage

All risks basis including coverage for testing and commissioning of erected machines, subject to the damage being unforeseen and accidental, and subject to exclusions to the policy.

Insured Parties

Same as CAR. In addition the machinery manufacturer might be included as an insured party if performing a function on the erection site.

Sum Insured

Anticipated value of the completed works. Might be adjusted during the course of erection. Final total investment is declared upon completion of the project.

Main Hazards

Main hazard is fire and explosion, and machinery breakdown during testing and commissioning. Further hazards depend on the type of works and location – for instance if indoors, forces of nature are less relevant than in CAR.

Exclusions

Exclusions are the same as for CAR.

ALOP/DSU – Advance Loss of Profit/Delay in Start-Up

Definition

Business income protection to cover for losses of the gross profit resulting from a delay in completion of a construction and/or erection work. Underlying CAR and / or EAR must be in force.

Coverage

Actual loss of gross profit sustained from a delay in the completion of the project. Loss must be covered in the respective CAR and / or EAR.

Insured Parties

Principal or owner of project to be constructed or erected as defined in the underlying CAR and / or EAR.

Sum Insured

Expected annual gross profit, revenue, rent, or fixed costs – to be defined case by case.

Main Hazards

Loss events as defined for CAR/EAR.

Exclusions

General exclusions are the same as for CAR/EAR.

Further exclusions apply to restrictions imposed by public authorities, alterations to the insured works after the occurrence of the material damage accident, and delays caused by further reasons– also some specific nat cat perils such as earthquake, volcanic eruption, tsunami and hurricane if not agreed to in writing.

CPE – Contractors Plant and Equipment

DEFINITION

Renewable cover for plant and equipment used by contractors at different locations.

Coverage

All risks basis for unforeseen and accidental physical loss or damage due to external causes.

Insured Parties

Owner of the insured plant and equipment.

Sum Insured

New replacement value of all plant and equipment insured under the policy including freight costs, customs and erection costs.

Main Hazards

Working accidents, fire, burglary, theft, faulty operation, natural perils such as earthquake, storm and flood, collision and overturning.

Exclusions

Excludes mechanical and electrical breakdown. Normal wear and tear, lack of oil or coolant, deposits of rusts, exchangeable tools and parts and further reasons are excluded.

MB – Machinery Breakdown

Definition

Renewable coverage which offers protection against sudden and unforeseen physical loss or damage to machinery that has been erected and is operational or at rest.

Coverage

Policy pays for all repair costs, or in case of total loss or repair costs exceeding the actual value of the machinery, the actual value is indemnified.

Insured Parties

Owner of the machinery.

Sum Insured

New replacement value of the insured machinery that can be defined as the cost of replacing by a new one of the same capacity includes transport and erection costs, taxes and customs.

Main Hazards

Working accidents, centrifugal force tearing a machine apart, short circuits, defects or faults in design, material or manufacturing, incorrect operation.

Exclusions

Corrosion, erosion, wear and tear, overloading, and further specific exclusions might apply.

BI – Business Interruption

Definition

Business income protection to cover losses of the gross profit resulting from a disruption in the operational performance of a company because of property loss.

Coverage

Policy pays for actual loss of gross profit sustained resulting from a disruption in operational performance. The insurance protects during the time period it takes to achieve commercial operational readiness again. An indemnity period (mostly with maximum of 12 months) and a time deductible are agreed.

Insured Parties

Owner of the operations/company.

Sum Insured

Expected annual gross profit, revenue rent or fixed costs – to be defined case by case.

Main Hazards

Loss events as defined for Physical Damage/Operating All Risks.

Exclusions

General exclusions are war, other political perils, seepage and pollution, contamination, nuclear energy risks. Further exclusions apply case-by-case.

5.5 BASIC UNDERWRITING PROCESSES AND GUIDELINES

The following underwriting guidelines are valid for all underwriting affairs and cover the setup of a standard underwriting form and standard underwriting clauses. A standard underwriting form for RET business (generic form) consists of following information:

Elements Description

- Contracting Parties Name and address of carrier and insured.
Full legal names of the carrier and insured corporate entity with complete address.
- Also name of broker if applicable.
- Occupancy or Project Occupancy must be listed. In case of coverage limited to part of the corporate activity this must also be specified.
- Scope of Coverage / Coverage
- General description of the scope of coverage such as CAR/EAR, Operating All Risks, etc.
- Geographical Scope Description of the geographical scope if not worldwide.
- Either use name of existing states, territories with settled political boundaries, or regions (not for Political Risk policies).
- Period Renewable Covers: Inception and Expiration date for coverage.
- Non-renewable covers: Inception date. Structure of Contract → Total Insured Value (TIV).
→ Limits and Capacity provided by insurer or reinsurer [based on limit, ALP (anticipated loss potential), MPL (maximum possible loss) or other base] plus deductibles. → Premium (100 %) and Deductions.
- Exposure and Risk Quality
- Location set inclusive top location.
- MPL per location.
- Exposure risk quality/Rating if applicable.
- Exclusions Specifically excluded perils.
- Specific Perils Sub-limits and deductibles per specifically included perils.
- Nat Cat Sub-limits and deductibles per natural catastrophe peril if applicable.
- Loss History Add loss history information if applicable (Year, Loss Description, Total loss).
- Choice of Law Applicable law must be agreed upon before coverage commences.
Law must be acceptable pursuant to the contract preferences of parties involved.
Must refer to the substantive law of a particular state or country.
- Claims provisions Specific claims-related provisions related to the claims settlement process must be listed. Claims control clauses as applicable.

Standard underwriting guidelines set up the clauses which cover a list of required elements in order to issue an insurance contract. Here is a list of typical principles:

Guideline Description

Basic requirements Insurance follows the principle of indemnity.

Indemnity or Insuring Clause

Policy should make clear what the scope of the coverage is, for example, for which liability, loss, damage, injury or expense the policy will pay or indemnify. Terms like “permanent damage,” “accidental,” “sudden,” and “unforeseeable” should be clearly defined with regards to what is excluded.

Disclaimers of legal duty for disclosure

Contractual waivers of insurer’s rights and remedies at law arising from pre-contractual non-disclosure or misrepresentation of material facts are subject to approval in each situation. Insurers prefer to retain all rights and remedies available at law. Accumulation control Systematic tracking of the accumulated risk exposures regarding capacity controls, natural catastrophe scenario exposures, terrorism covers and Contingent Business Interruption (CBI) covers. Nat Cat clause Nat cat perils have to be specifically enumerated. Capacities are locally allocated.

Contingent Business Interruption

There are specific considerations for Contingent Business Interruption coverage for unnamed suppliers and customers. Insurers might set a maximum limit of liability for this kind of BI coverage (as a percent of sum insured, as loss limit, and as absolute amount). Similar limits apply in case of public utilities and denial of access where an additional time deductible might apply.

Reinsurance Proceeds Clauses

In cases of reinsurance, a list of specific clauses is explicitly considered such as cut-through clauses, loss-payee clauses, and arrangements. Typically they are avoided or restrictively handled.

Definition Occurrence/Events

Definition of property occurrence must aggregate all loss or losses arising from one common cause, event, or catastrophe during the period of insurance. If an “hour’s clause” is applicable, the covered time period is limited to a certain length, typically 72 hours.

Definition Values Reported

Value basis (Real or Actual Cash value, BI values, etc.) must be defined and reviewed.

Fronting arrangements

Fronting arrangements are granted in specific constellations.

Multiyear Coverage

Renewable covers normally are based on one-year coverage. In some cases, multiyear covers are also granted. Non-renewable covers for engineering projects might easily achieve multiyear status.

Claims considerations

Claims cooperation clauses cover the duties of the insured to provide to the insurer all information relevant to a covered loss. Claims notification clauses describe the specified time and further considerations such as “prompt”, “immediate,” or “as soon as reasonably practicable.”

Extensions

Extensions of coverage vary depending on the type of insurance and coverage. They typically cover extra costs and expenses borne from the loss, debris removal, expediting costs, and extensions with regards to liability and manufacturer’s risk.

Exclusions

Exclusion clauses typically consider following risks:

- Excluded Countries – Insurers maintain lists of excluded countries where they do not write any business. This includes relationships with public or private clients, acceptances and risks located in these countries.
- Political Risks typically are not written by property, energy or engineering insurers. They are covered by credit insurers.
- Reputational risks are considered in case of publicly-controversial environmental, social, ethical and political issues. Insurers do adhere to strong internal compliance rules with regards to ethical principles in writing sensitive business risks.
- Terrorism clauses might be added for very large and exposed risks.
- War and civil war clauses typically are not written by property, energy or engineering insurers.

5.6 RISKS AND BARRIERS IN RET UNDERWRITING

Frequencies and severities of losses associated with renewable energy projects are not fully known. Technology innovation happens quickly. RETs evolve quickly which often lead to a general lack of underwriting experience due to lack of data and expertise on the new technologies.

Risks and Barriers Description

Technology efficacy

For insurance companies, a new RET product is a significant bet on technology with regards to reliability, quality and costs. Efficacy of the technology is still in doubt with regards to operational reliability. Technologies that are considered to be at an early stage such as certain RET do lack the operating history and provide a limited amount of loss information for loss projections and pricing. Underwriting multiple insured using the same, yet not fully proven, technology might generate many losses.

Technology risk profile diversification

The risk profile of existing mature technology is different from new technologies. A portfolio of risks in a new technology can be strongly non-diversified.

Technical perils

Certain RETs present concerns during construction, testing and commission phases. Often high risk and complex engineering processes, procedures and contracts/equipment are involved. Which create perils with regards to handling, erecting, testing and commissioning a new installation.

Technology replacement cycle

Technology innovation might lead to the replacement of a relatively new technology by an even newer technology. This is true for areas where new designs are introduced in short cycles and no single design becomes dominant.

Local economic conditions

The same technologies are deployed in different localities and countries. Mere knowledge about the failure behavior of a new technology is not sufficient. Environmental factors such as local maintenance practices, supply channels, and operating conditions might also have a severe impact on the loss exposure.

Regulatory environment

Government actions, regulations, and taxes typically favor some specific RETs. In some emerging markets and developing countries, restrictions towards market access of foreign players are in place which means that a certain proportion of the risk is reinsured by local insurers.

Natural catastrophe hazards

Impact of natural hazards on engineering insurance is partially understood. Increasing frequencies in extreme atmospheric events such as floods, storms and heat waves have been observed. This leads to an acceleration of secondary effects (losses). Currently, the percentage of losses in engineering insurance triggered by natural events is between 10% (Europe) and 75% (Taiwan) and is expected a high risk in Barbados due to heavy rain events in the hurricane season.

Accumulation control and vulnerabilities

Individual structures and systems on a property may have very different vulnerabilities with regards to Nat Cat events. Some mobile machinery and equipment have variable exposure during events depending on their exact location at the time of the event. Problems with business interruption coverage often arise due to the inability to account for the whereabouts of mobile plants and equipment. EAR/CAR coverage is faced with changing values during the erection period. At the end of the erection period, the value at risk (VAR) is typically at its maximum and poses a much higher vulnerability. A loss caused by natural hazards can result in ALOP or DSU coverage at any time during construction.

Credit and counterparty risks

For each RET project, an actual or perceived credit risk posed by the project's host country or developer exists. The smaller and less experienced the suppliers and consumer groups are, the more difficult it becomes to overcome the perceived credit risk. Credit enhancements provided by public funds are considered a very effective tool in order to support private financing of RET projects.

Market conditions

Generally for RET and other new technology risks, a small group of insurers and reinsurers are positioned as leaders. They have a reputation for technical expertise and can dictate the terms and conditions of the policy. They will be supported by a group of companies who are prepared to "follow" the leaders' terms and conditions. Over time, more leaders are established and businesses will be underwritten jointly with different terms and conditions.

Availability of data

An extensive and long-term database of empirical claims, losses, damages occurrence rates etc, is one of the most useful tools for underwriting. Improved actuarial data is a key facilitator for product development and underwriting in RETs.

Availability of experts

If historical loss and exposure data is not available, experts must be able to identify the risk exposure profile of a new technology. This includes educated predictions of potential failures, and the possible frequencies and severities of losses.

Infrastructure and local markets

Adequate financial, legal and service infrastructure is a key enabler for RET in developing countries.

Local insurance markets

In some emerging and developing economies, national insurance regulations tend to protect insurers or reinsurers by restricting access to local markets.

A comprehensive risk analysis is a key step to completely understand the challenges, pitfalls and necessary insurance needs of a RET project. Below is an example of considerations commonly applied in the insurance process for a large-scale wind project following the typical project stages of project development, construction, testing and commissioning, and operating.

5.7 RISK ANALYSIS FOR SPECIFIC TECHNOLOGIES

Risk analysis example for a large-scale wind project

Risk Project Stage Details and estimated Risk Ranking for Barbados:

- Permitting/Project Risk of delay due to inability to obtain building permit Medium
- Planning Delays Development planning or other regulatory consent. *High*
- Contract bankability *Medium*
- Project Development *Medium*
- Risk of being unable to secure bankable offtaker/fuel supply contract. *Medium*
- Contractor nonperformance *Medium*
- Construction, Testing and Commissioning *High*
- Risk of EPC (Engineering, Procurement, Construction) and turnkey contractors being unable to deliver to specification and to budget on time. *Medium*
- Engineering risk Construction, Testing and Commissioning *Medium*
- Risk of physical loss or damage to property caused by technical/engineering hazards (e.g. defective design, faulty parts and/or workmanship). *Low*
- Physical hazard (caused by man or nature) *Medium*
- Construction, Testing and Commissioning *Medium*
- Risk of physical loss or damage to property caused by human and/or natural hazards/catastrophes (e.g. fire, lightning, explosion, earthquake, flood, windstorm). *Medium*
- Offtaker contract failure *Low*
- Risk that power offtakers withdraw from contract subsequent to financial closure.
- Catastrophic design failure *Low*
- Risk of complete mechanical or control failure during testing and commissioning due to defective design. *Low*
- Process Interruption *Medium*
- Operating Risk of complete plant shut down (total process interruption) at any time due to unscheduled maintenance. *Medium*
- Natural hazards Operating Risk of physical loss and/or damage to the plant and/or machinery breakdown caused by natural hazards/catastrophes (e.g. fire, lightning, explosion, windstorm, flooding). *High*
- Design/Engineering Risk *Low*
- Operating Risk of physical loss and/or damage to the plant and/or machinery breakdown caused by design/engineering perils (e.g. defective design, faulty parts and workmanship, all occurring outside the scope of any warranty protection). *Medium*

- Physical hazard (caused by third party) *Low*
- Operating Risk of physical loss and /or damage to the plant caused by human hazards external to the project (e.g. strikes, riots, civil commotion, war). *Low*
- Wind volatility Operating Risk that average wind speeds falls below required thresholds to generate economically efficient power outputs / electricity. *High*
- Offtaker default Operating Risk of the electricity offtaker defaulting on contractual obligations under PPA (Power Purchase Agreement). *Low*
- Warranty nonperformance *Medium*
- Operating Risk of the warranty provider failing to meet contractual obligations. *Medium*
- Legal liability Operating Risk of the legal liability caused by bodily injury or property damage to third parties. *Low*

Specific Considerations for Wind

Characteristics Description

Overall attractiveness

Significant growth potential.

Current situation

Trend to off-shore wind farms.

Ideal operating conditions

Specific window of wind speed (between 10 and 25 m/s) required.

Insurance maturity and loss experience

Early phase of large underwriting losses. With latest increase of projects there is more underwriting and loss experience available.

Major known loss factors

Design and material, lightning, storm, short circuit, fire.

Insurance offerings

Used to be part of main property insurance package. With growing project sizes and numbers, specific policies are becoming available. Insured limits of up to USD 500 million have been placed.

Construction phase:

CAR, DSU, TPL available.

Operational phase:

Operating All Risks, MB, BI

Key Risks Risk Management Drivers / Measures and expected Risk Ranking for Barbados

- Long lead times and up-front costs. *Medium*
- Critical component failures. *Medium*
- Wind resource variability. *High*
- Offshore cable laying. *Medium*
- Make and model of turbines. *Low*
- Manufacturing warranties. *Low*
- Loss control. *Low*

Best practice procedures

Traditionally, commercial wind energy projects have been owned and developed by large power companies. Insurance has been provided under the main property package covering all parent power assets worldwide. However this unspecialized policy did not provide adequate coverage to the unique risks profile of the wind sector – especially in case of off-shore wind projects.

Wind underwriting has gone through an early phase of losses but has achieved a good level of maturity. In comparison to other RET covers, there is already a competitive insurance marketplace for on-shore wind energy projects. Premium rates for physical damage coverage are in the range of 0.3 to 0.4 % of total insured property values. Off-shore projects have a more risky profile and underwriting experience is not as advanced. Insured limits placed on the market have been up to USD 500 million. It is expected that more capacity will be made available with growing expertise, more projects and operating hours, more policies placed, and more loss data available.

Delays or damages during fabrication, transport, installation, or testing and commissioning are key concerns during the construction process. Risks in the off-shore area are significantly larger than with on-shore projects. Off-shore DSU and ALOP policies are more expensive and have more restrictions and deductibles than on-shore policies. DSU premiums for off-shore projects are in the range of 2 – 3 % of annual gross revenue to be expected. Future growth of DSU coverage is limited by the availability of marine infrastructure (vessels) to service sites and repair or replace damaged items.

Once operating, Operating All Risks policies are available. Insurers might want to verify the loss control measures against perils such as high wind, freak wave conditions, fire and lightning and vessel collision.

With regards to design and technology risks, some restrictions also apply. Insurers do not provide a broad design coverage for new and prototypical turbines. Clauses regarding component replacement (after 5 years or 40'000 operating hours) also apply. Project owners and developers might have to rely solely on warranties provided by the turbine manufacturers. This again creates credit risks with regards to the manufacturer's creditworthiness.

Today's new projects emerge with new, larger turbines (5 MW and more). Appropriate insurance for defective parts and consequential losses (BI) is very difficult to attain. Therefore so-called Contractual Service Agreements (CSA) are directly offered by large turbine manufacturers which guarantee the technical operation of the system over the term of the financing agreement.

Generally, business interruption coverage is a major concern. Loss of a single turbine does not affect substantially large scale wind projects' operations; however the loss of export cables or transformer should lead to the interruption of the overall electricity output. For off-shore wind, a BI cover is very much dependent on the design and location of the project.

Insurance Characteristics for Wind

Characteristics Description

Main challenges Construction phase:

- The construction phase is a key area of concern for the investor and subject to many issues regarding to new technology and prototypes.
- Delay in Start Up coverage is limited by issues regarding the availability of marine infrastructure to quickly service sites in order to repair and replace damaged items.

Operational phase:

- Offshore technology is still not yet fully proven in challenges such as cabling, weather, and repair lead times.
- Space and landscape requirements challenge on-shore parks.
- Power distribution and volatility of power generation requires back-up power installations.
- Business Interruption is difficult to obtain because of the potential for cable or transformer loss in offshore wind parks.

Main exclusions or restrictions

Offshore construction projects present higher risk, therefore higher premiums (2 % of project cost) and higher deductibles apply. Design and technology risks associated with wind turbines result in no coverage for design of new and prototypical turbines.

Loss control measures required

Control measures should be in place to protect against high winds, freak waves, fire and lightning and vessel collision. Mitigation of design risk with a Contractual Service Agreement (CSA) provided by wind turbine manufacturer, covering maintenance and repair costs, can provide greater confidence to the underwriter.

Exemplified Insurance Application Form for Wind Power Installations

(This application form is shortened and exemplified)

The Insured has the obligation to respond to the hereafter indicated questions as accurately and truly as possible. If the reply does not correspond to the real installed equipment and installations the Insurer could, possibly, invoke cancellation of the policy after a one month period. In case of intentional omission of material information and/or gross negligence, the Insurer could cancel "ab initio". The Insurer's withdrawal of the right of coverage is normally excluded, except in case of intentional omission of material information, even if the noted omission would have resulted in the Insurer taking on the risk with different terms and conditions.

Insured:

Country:

County/Province:

Location:

Zip Code:

Machinery Breakdown Insurance

Insured value machinery, new values basis*, including freight, civil works and peripheral equipment such as transformer, yard switchgear in \$/EUR:

New value basis: indicate in – or excluding VAT

Manufacturer: Type:

Year of construction: Name plate capacity:

KW:

Height of nacelle (in m): Tower construction: steel tube- / mast tower

Cable length (in m): Propeller manufacturer:

Rotor diameter (in m):

Gearbox manufacturer: Type/construction: Serial number:

Switchyard installed (Yes / No): To be insured (Yes / No):

Manufacturer Capacity: MVA (Market Value Added) Value (in \$/EUR):

Hoist installation costs of 5,000 Euro are insured on first loss basis.

Increase of first loss basis to (maximal 20,000 Euro)

Deductible (in \$/Euro):

Machinery Breakdown Business Interruption

Calculate KWh:

Plate capacity (KW) x peak load operating hours p.a.

(please provide wind study pattern) Calculate Value in EUR:

KWh (projected annual energy production) x production delivery price according the Power Purchase Agreement (provide copy) in EUR/KWh

This insured Business Insured value (in \$/EUR):

Delivery period(s) (in days/weeks)

Gearbox: Generator: Propeller:.....

Period of Indemnity: 6 months Deductible:.....

Risk description

Is the insured owner of the installation (Yes / No)

If no who is Owner:

Are all components tested and serial produced, i.e., there are no prototype or "one of a kind" installation (Yes / No)

Has a commissioning test run been adequately executed with reaching name plate capacity (Yes / No) (add copy test acceptance protocol)

Has a manufacturer's maintenance programme been contracted (Yes / No) (add copy)

Does a manufacturer's warranty contract exist (Yes / No) (add copy)

Does a service contract incl. a manufacturer's availability guaranty for the installation exist (Yes / No) (add copy)

Has the Wind Energy Installation been fitted with a Condition Monitoring System (CMS) (Yes / No)

If Yes, manufacturer: Type:

Has the CMS been certified by an acknowledged testing organisation (Yes / No)

If yes by whom: (add copy manufacturer's declaration, that certified criteria have been complied with)

Has the Wind Energy Installation been fitted with a "State of the Art" lightning protection system (Yes / No)

Has the Wind Energy Installation been fitted with a fire detection system and/or automatic fire suppression extinguishing system (Yes / No)

If yes, indicate manufacturer:

After the occurrence of a loss can restrictive measures be expected from local authorities (Yes / No)

If yes, indicate which ones are likely:

Special Agreements

Existing coverage

Does there exist insurance coverage (Yes/No)

What type of cover does exist:

Who is the insurer:

Coverage cancelled by insured/Insurer:

Loss History

Signatures

The undersigned parties warrant that the information supplied in this questionnaire is truthful and applies correctly to the installed Wind Energy Installation(s). Non-intentional omission of information will not jeopardise insurance coverage; however gross negligence in omitting material risk information, which unduly and unknowingly increases the risk for the underwriter, may trigger nullity of the contractual insurance terms "ab initio".

5.8 SPECIFIC CONSIDERATIONS FOR SOLAR

Characteristics Description

Overall attractiveness

Off-grid systems are small-scale consumer products with low attraction for commercial insurance. Grid-connected projects for solar photovoltaic are starting to gain momentum. Some large scale projects exist or are underway.

Current situation

Grid-connected projects are increasing in size and value. Significant subsidies in some countries.

Ideal operating conditions

High local sun irradiance with high amount of W per m².

Insurance maturity and loss experience

Close to mature.
Low loss experience.

Major known loss factors

Faulty material, theft (offsite), fire exposure, technology parts (circuits, converters), weather (hail, lightning), leakage (thermal).

Insurance offerings

Very few as of today.

Key Risks - Photovoltaic Power

Risk Management Drivers/Measures

- Component breakdowns (e.g. short-circuits).
- Weather damage.
- Theft/vandalism. Performance guarantee available (e.g. up to 25 years). Standard components, with easy substitution. Maintenance need to be enhanced.

Key Risks - Solar thermal

Risk Management Drivers/Measures

- Prototypical/technology risks as project size increases and
- Other RET risk such as those associate with the erection solar towers. Good operating history and loss record. Maintenance need to be enhanced.

Generating energy with solar photovoltaic (PV) technology is in many cases a small-scale, consumer process, and is not attractive for commercial insurers. For larger installations, commercial protection is available. Underwriters focus on regular maintenance procedures due to frequent breakdowns and attrition losses due to wear and tear.

Currently the size and value of commercial installations are increasing. Large projects have been developed in Australia, the United States (Nevada, Arizona, California), Spain and Germany with capacities above 10 MW. Construction and operation insurance is already available. However, the applications are very remote. The availability of service industries to repair, replace and maintain these facilities is a concern for machinery breakdown and business interruption underwriting. Key underwriting considerations for Solar PV are:

- Main risk exposures are workmanship and faulty material as well as theft and equipment handling.
- With regards to the technology, short circuits and converters are critical elements.
- Vulnerability to weather events such as hail and lightning.
- Third party liability (TPL).
- Additional operational risks.

Like solar PV, solar thermal projects are increasing in size and value. The risks for solar thermal installations are the same as for solar PV. For Solar Thermal, the following additional risks apply:

- Leakage.
- Similar risk factors as applicable for steam turbine power plants.

Overall, the growth rates for solar technologies are expected to be larger than for any other group of RET. Generally the loss and actuarial experience for solar PV and solar thermal is significantly lower than for other RETs such as wind or hydropower.

Insurance Characteristics for Solar

Characteristics Description

Main Challenges

- Remoteness of solar installations with reduced availability of services to repair, replace and maintain the facilities.
- Low loss experience with large-scale solar installations.
- Availability of polysilicon feedstock is a critical issue for the growing PV industry.
- Main exclusions or restrictions
- Design and technology risks associated with new solar installations. No coverage or higher deductibles for new and prototypical emerging solar PV.
- Loss control measures required
- Control measures should be in place to ensure offsite monitoring and spare parts supply, as well as fire, hail and lightning prevention, and a detailed maintenance plan.

5.9 SPECIFIC CONSIDERATIONS FOR BIOMASS

Characteristics Description

Overall attractiveness

Biomass technologies are mature however still relatively costly especially in the case of organic ranking. Securing a stable fuel/biomass supply is challenging.

In some countries, the production of biofuels using sugar cane and other agricultural waste has already gained significant share of overall fuel production.

Current situation

Biomass generally get less support and subsidies than wind and solar. Mature technologies can be employed at large scale (10 to 100 MW). Biofuels are currently under debate with regards to ethics and crop substitution (crops for food vs. crops for fuel).

Operating conditions

Key criteria are the long-term continuous supply of fuel (biomass, crop).
For biogas strict safety conditions apply.

Insurance maturity and loss experience

Despite mature technologies, insurance offerings are still lacking. Relatively low loss experience.

Major known loss factors

Faulty material, fire exposure, TPL due to emissions and pollution, prototypical technology, operational lack of experience.

Insurance Offerings

Very few as of today.
For biogas: MB, BI.

Key Risks - Biomass/

Biofuels Risk Management Drivers/Measures

- Fuel supply and availability.
- Resource price variability.
- Environmental liabilities associated with fuel handling and storage.
- Long-term contracts can solve the resource problems.
- Fuel handling costs.
- Emission controls.

Key Risks - Biogas Risk

Management Drivers/Measures

- Fire/Explosion risks. Resource risks (e.g. reduction of gas quantity and quality due to changes in organic feedstock).
- Planning opposition associated with odour and potential health problems.
- Strict safety procedures are needed as are loss controls such as fire fighting equipment and services.
- High rate of wear and tear.

Biomass and biogas projects encounter significant challenges with regards to resource supply risks. Security of fuel supply and fuel-price volatility is a major concern for the risk and finance management of these projects. In the case of energy crops, crop yield insurance might be a solution but it is difficult to attain. Other financial instruments that secure long-term fuel supply are not yet available. Business Interruption insurance is difficult to purchase because of the length of the reinstatement period for biomass facilities that are dependent upon the continuity of fuel supply.

For biogas installations with tried and tested machinery, MB and BI covers are widely available. Also for waste-to-energy generators, the technology risk is not critical due to its maturity. Manufacturers' warranties are still prerequisites. Biogas facilities that use fermentation processes are still a major concern, due to the health risks posed by the noxious gases. Underwriters require strict safety procedures and operational experience.

Key underwriting considerations for biomass installations are:

- Workmanship and faulty material, which often constitute the main risk exposures.
- Fire exposure.
- TPL for emissions and pollution.
- Technology design risks due to prototypical nature.
- General lack of experience in operations.
- Similar risks as for steam turbine power plants.
- Availability and security of supply fuel.

Insurance Characteristics for Biomass

Characteristics Description

Main challenges

Small scale projects are risky. Resource supply is risky due to insecurity of fuel supply and volatility of fuel prices. Biogas installations (with fermentation process) pose health risks due to noxious gases.

Main exclusions or restrictions

Biomass installations have higher deductibles for Business Interruption coverage risk because of insecurity in fuel supply. Biogas installations encounter restricted liability coverage due to the potential negative health and pollution risks.

Loss control measures required

Biomass (waste-to-energy) installations still need comprehensive manufacturing warranties prerequisite to insurance. Biogas (fermentation) installations require strict safety procedures and operational experience.

Exemplified Insurance Application Form for Biomass Power Installations

(This application form is shortened and exemplified)

The Insured has the obligation to respond to the hereafter indicated questions as accurately and truly as possible. If the reply does not correspond to the real installed equipment and installations the Insurer could, possibly, invoke cancellation of the policy after a one month period. In case of intentional omission of material information and/or gross negligence the Insurer could cancel "ab initio". The Insurer's withdrawal of the right of coverage is normally excluded, except in case of intentional omission of material information, even if the noted omission would have resulted in the Insurer taking on the risk with different terms and conditions.

Machinery Breakdown Insurance

Type of installation:.....

Installation with indemnity according Power Purchase Agreement:.....

Power with heat recovery installation:

Installation fired with crop refuse:

Power with heat recovery installation using crop refuse:

Installation company/Designer:

Installation components New values (without rebates)

Components for gas production, gas preparation, mixing tank, Fermentor, refuse holding tank, gas storage, gas drying) (in \$/EUR):

Installation designer:

Skid mounted boiler plant unit(s) including automatic steering (in \$/EUR)

Number: Power:

KWel:
 Year of construction :
 Motor design Manufacturer:
 Type: Year of construction:
 Operating hours:
 1-Insured:
 2-Country: County/Province:
 Location: Zip Code:
 Storage volume (in m³): Gas consumption (in m³):
 Transformer including net supply switchgear
 Capacity: Power:
 KWel: Year of construction:
 Manufacturer: Type:
 Enclosure/building (in \$/EUR)
 Total sums insured (include VAT: YES/NO) (in \$/EUR)
 Projected annual capacity:
 From which material is the Fermentor made:
 Surface protection:
 Is fire damage to be covered (YES/NO)
 Machinery Breakdown Business Interruption
 Calculate KWh:
 Engine/turbine capacity in KW x projected operating hours p.a.
 Calculate Value:
 KWh x price power purchase contract (provide copy) (in \$/EUR/KWh)
 Result:
 Sum Insured
 Replacement time (in days/weeks):
 Engine/Turbine: Transformer: Switchgear:
 Period of Indemnity (3 / 6 months): Deductible:
 Damage as a result of Fire, Lightning or Explosion:
 Period of Indemnity 12 months
 5 Risk description
 Is the insured owner of the insured premises? (Yes / No)
 If not, please indicate owner:
 Are the premises also used by others (Yes / No)
 If yes, by whom:
 Is the insured owner of the " to be insured " installations? (Yes / No)
 If no, please indicate owner of the installations :
 Is the installation in an existing integrated process? (Yes / No)
 If yes, what type of building:
 Does an increased Fire-or Explosion hazard due to contents,
 operation or environment in a 30 m radius exist? (Yes / No)
 Are all components of know & proven technology and no prototype
 equipment and not one of a kind installation? (Yes / No)
 Has a commissioning test run of 4 weeks been adequately executed
 with reaching name plate capacity (Yes / No)
 (If so add copy test acceptance protocol)
 Has a manufacturer's maintenance programme been contracted? (Yes / No)
 (If so add copy)
 Does a manufacturer's warranty contract exist? (Yes / No)
 (If so add copy)
 Is the installation build according plans of designer, installer or components supplier? (Yes / No)

If not please add description of deviation.

Is a state of the art gas cleaning installation foreseen, sulphur filter and silica filter? (Yes / No)

If Yes , what system-type

Are the employed engines/Turbines for the Bio-gas firing in conjunction with the installed gas cleaning installation approved by the designer/ manufacturer? (Yes / No)

If Yes, does a corresponding legal guarantee exist? (Yes / No)

Is a flue gas temperature control, an engine / Turbine revolution measurement, a methane sulphur and silica Bio-gas content measurement, an ambient room air-gas measurement been installed and an does automatic security trip ensues of accepted base values are exceeded? (Yes / No)

If Yes, is data stored for review? (Yes / No)

Are prescribed lubrication oil quality analysis carried out, oil changes executed according manufacturers maintenance prescription, and lubrication quality data adhered to? (Yes / No)

(If Yes add last test protocol)

Has the Installation been fitted with a "State of the Art" lighting protection system, (i.e. DIN VDE 0100 part 540/737) or similar acceptable equipment? (Yes / No)

If Yes, has it been tested? (Yes / No)

Have technical installation measures (i.e. Carbon absorption filter, gas dryer, gas pipe insulation) been taken to avoid gas being cooled below gas dew point? (Yes / No)

Have all technical & safety standards, regulatory norms, prescriptions, licenses been obtained for the operation of this installation? (Yes / No)

What type of fire detection & protection installation has been installed?

Have the insured still recommendations to comply with? (Yes / No)

If Yes, which one and when to be complied with?

Are authoritative regulations and/or constraints expected in case of a replacement after a loss? (Yes/No)

Is sales of heat foreseen? (Yes / No)

If Yes, what is the projected annual sales

Any special conditions?

Special Agreements

Existing coverage

Does there exist insurance coverage (Yes / No)

Who is the insurer?:

Place:

Insured:

Coverage cancelled by insured/Insurer:

Loss History

Review of claims history precondition of coverage

Cancelled by whom? :

Insurer? :

Insured? :

Last 5 years claims history?

No (claims for which not yet insurance existed are to be indicated)

Yes (Nature, number, date and indemnity are to be indicated)

Signatures

The undersigned parties warrant that the information supplied in this questionnaire is truthful and applies correctly to the installed Wind Energy Installation(s). Non-intentional omission of information will not jeopardise insurance coverage; however gross negligence in omitting material risk information, which unduly and unknowingly increases the risk for the underwriter, may trigger nullity of the contractual insurance terms "ab initio".

MODULE 6

RECOMMENDATIONS
AND ROADMAP



This section will summarize the key recommendations arising from the issues unearthed in this toolkit and a road map for increasing the use of RE in Barbados given the significant need for climate change mitigation and earn foreign exchange savings from fossil fuel replacement with RE

SPECIFIC RECOMMENDATIONS:

- An urgent and intensive RE insurance awareness drive targeted at regulators, insurance companies and RE investors.
- Introduction of specific insurance products providing cover against the specific presented to Solar and Wind RE installations by extreme climate events.
- Creation of an internet based online matching platform that links producers, installers, service and maintenance providers, insurers, financing organizations and the government. BREa can source the financing as the concept and blueprint are already available.
- Establishment of an insured risk assessment quality assurance and installation inspection checklist for systems in Barbados. This checklist will be completed by independent installers/ inspectors in the Renewable Energy industry and will assist in assuring insurers and financial institutions that the assets and investments will be insuring and financing are comprised of the appropriate quality and installed to the requisite technical standards to provide the stated returns and durability.
- Introduction of a RE insured Risk training program for underwriters to assist with them with the upsurge in RE insurance business over the next decade.
- Introduction of a RE financing training programme for financial institutions to capitalize on the increase in Reinvestments over the next decade.
- Creation of a claims data database for all losses.
- Creation of guidelines in conjunction with the GIAB and FSC for the mandatory cover of insured risk coverage for grid interconnected RE generating systems. This recommendation is essential as in a new liberalized market with distributed generation and independent power producers now all forming part of the island's energy network, as opposed to a single entity in the form of a utility company. There is now increased risk of disruption to the entire due to the diversity of the power generation suppliers.
- Examination of the linkages between the suggested industry products in the toolkit and the existing Integrated Disaster Risk Management Framework of prevention, preparation, response and recovery.
- Creation of a new financing instruments ideally suited from a credit risk perspective for the small to medium sized Renewable Energy Investments of less than 500kw of installed capacity and less than BDS\$ 2,000,000.00 in value. This will require the extension of loan maturities to at least 10 years, as well as the possible reduction in interest rates

ROAD MAP RECOMMENDATIONS:

1. Creation of a Technical Working Group on RE Financing and Insurance. The working group should include senior officials from the Ministry of Energy, Fair Trading Commission, Insurance Industry, Banking and Credit Union Industry, GIZ and BREa;
2. Provision of a full underwriting and policy tool for RET;
3. Staging of a one day workshop to create awareness of RE insurance products and international best practices among local insurance providers and RE investors;
4. Staging of a one day workshop with policymakers and regulators on regulatory matters related to RE insurance;
5. Development of training materials for RE risk underwriting.

APPENDIX



Appendix 1

Gap Analysis For RE Insurance Products Currently Used in Barbados

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Sagicor	Business Interruption	Selective	Modest	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	High	Significant
	Property Damage	Widely	Low	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Insurance Corporation of Barbados	Business Interruption	Selective	Modest	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	High	Significant
	Property Damage	Widely	Low	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Massy United Insurance	Business Interruption	Selective	Modest	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Consumers Guarantee	Business Interruption	Selective	Modest	Significant
	Construction All Risk	Selective	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Non-existent	Zero	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Cooperative General	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Low	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Non-existent	Zero	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Non-existent	Zero	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Brydens Insurance	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Low	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
SunGeneral	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Low	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Island Heritage Barbados	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Low	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Zero	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
BCIC	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Low	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Trident Insurance	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Low	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Equity Insurance	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Low	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Zero	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Guardian Insurance	Business Interruption	Selective	Modest	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Harmony General	Business Interruption	Selective	Modest	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
CGM Gallaghe	Business Interruption	Selective	Modest	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Insurance Company/ Broker	Type of Insurance Product	Availability and Accessibility in Barbados	Usage in Barbados	Potential for Increased Usage
Beacon Insurance	Business Interruption	Selective	Low	Significant
	Construction All Risk	Widely	High	Modest
	Contractors Overall Risk	Selective	Modest	Significant
	Delay In Start-Up	Non-existent	Zero	Significant
	Defective Technology	Selective	Low	Significant
	General Third Party Liabilities	Widely	High	Low
	Machinery Break-down	Selective	Low	Significant
	Operating All Risk	Selective	Low	Significant
	Property Damage	Widely	High	Low

Appendix 2

Gap Analysis For RE Insurance Products Not Yet Used In Barbados

Insurance Company/ Broker	Type of Insurance Product	Gaps and Barriers	Actors	Recommendations
Sagicor	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness.
Insurance Corporation of Barbados	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness.
Massy Insurance	Delay In Start-up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness.
Consumers Guarantee	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness.
	Inadequate Capital	Finance	Improved access to capital and/or Reinsurance	
	Defective Technology	Same as above	Same as above	Same as above
	Machinery Break-down	Same as above	Same as above	Same as above
Operating All Risk	Same as above	Same as above	Same as above	

Insurance Company/ Broker	Type of Insurance Product	Gaps and Barriers	Actors and timelines	Recommendations
Cooperators General	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Improved access to capital and/or Reinsurance
		Inadequate Capital	Finance	Marketing campaigns to build potential customer knowledge and awareness
	Defective Technology	Same as above	Same as above	Same as above
	Machinery Break-down	Same as above	Same as above	Same as above
	Operating All Risk	Same as above	Same as above	Same as above
Brydens Insurance	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness
	Defective Technology	Same as above	Same as above	Same as above
SunGeneral	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness

Insurance Company/ Broker	Type of Insurance Product	Gaps and Barriers	Actors and timelines	Recommendations
Island Heritage Barbados	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness
BCIC	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness
Trident Insurance	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness
Equity Insurance	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness

Insurance Company/ Broker	Type of Insurance Product	Gaps and Barriers	Actors and timelines	Recommendations
Guardian Insurance	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness
Harmony General	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
	Property	Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness
CGM Gallagher	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness
Beacon Insurance	Delay In Start-Up	High perceived risk	Risk underwriters	Education for risk underwriters as delay in start up insurance is not a priority
		Low demand	Marketing	Marketing campaigns to build potential customer knowledge and awareness

Appendix 3

LIST OF INTERVIEWS WITH BARBADIAN STAKEHOLDERS AND INSTITUTIONS

- Barbados Credit Union League
- Bank of Nova Scotia
- BCIC Insurance
- Capita Finance
- Citibank
- Cooperators General Insurance
- Consolidated Finance
- Globe Finance
- Equity Insurance Limited
- First Citizens Bank
- First Caribbean International Bank
- Insurance Corporation of Barbados
- Royal Bank of Canada
- Republic Bank
- Sagicor
- Sun General Insurance
- Resolution Life Assurance

LIST OF INTERVIEWS WITH STAKEHOLDERS OUTSIDE BARBADOS

- Bank of St. Vincent & The Grenadines
- Capita Finance (St. Lucia)
- Citibank (Trinidad and Tobago)
- First Citizens Bank (Trinidad and Tobago)
- First Caribbean International Bank (Jamaica)
- Guardian Insurance (Trinidad & Tobago)
- Kingstown Credit Union (St. Vincent & The Grenadines)
- Republic Bank (Grenada and Trinidad & Tobago)
- Sagicor (Jamaica)

TOOLS, REPORTS, FRAMEWORKS USED

- Barbados Financial Stability Report 2017
- Barbados National Energy Policy 2017-2030
- UNEP and SEFI's Financial Risk Management Instruments For Renewable Energy
- Economic Analysis to Facilitate the Establishment of a Stable Price for Electricity from Renewable Sources: Professor Olav Hohmeyer
- USAID/AILEG Clean Energy Lending Toolkit

About ACRI+

ACRI+ is implemented by MCII and GIZ and financed by BMU and is part of the Promoting Integrated Mechanisms for Climate Risk Management and Transfer programme (ICRM), implemented by GIZ.

For more information, please visit:

<http://www.climate-insurance.org/projects/advancing-climate-risk-insurance-acri/>

About GIZ

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About MCII

The Munich Climate Insurance Initiative (MCII) was launched in April 2005 in response to the growing realization that insurance-related solutions can play a role in adaptation to climate change, as advocated in the Framework Convention and the Kyoto Protocol. This initiative brings together insurers, experts on climate change and adaptation, NGOs and policy researchers who intend on finding solutions to the risks posed by climate change. MCII provides a forum and gathering point for insurance-related expertise on climate change impact issues. MCII is hosted at UNU-EHS in Bonn, Germany.

For more information, please visit: www.climate-insurance.org/

About BREA

The Barbados Renewable Energy Association (BREA) is a Non-Governmental Organization (NGO) focused on Renewable Energy and Energy Efficiency at the residential, commercial, industrial and national levels. The Association's Vision Statement is "to create a business environment in renewable energy conservation and energy efficiency initiatives in Barbados conducive to ensuring a sustainable present and future". BREA was formerly established in 2011.

For more information, please visit: www.brea.bb

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