

BACKGROUND STUDY

UNEP/GEF PROJECT

**ASSESSMENT OF FINANCIAL RISK
MANAGEMENT INSTRUMENTS FOR RE
PROJECTS IN DEVELOPING COUNTRIES**

**UNITED NATIONS ENVIRONMENT
PROGRAMME**

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This report was prepared for the United Nations Environment Programme (UNEP) under the UNEP/GEF project “Assessment of Financial Risk Management Instruments for Renewable Energy Projects” to provide a background information for the subsequent research activities of the project.

The assignment consists of three tasks I) Identification of risks that can be effectively managed by financial instruments, II) Availability survey of financial risk management instruments in developing countries, and III) Possible scope of introducing financial risk management instruments in developing countries. The tasks I and III were conducted by IT Power India Pvt. Ltd whereas Task II was undertaken by Mirador Consulting Ltd (Country Survey) and Marsh Ltd (Global Insurance Survey). More information about the project and its research reports can be found at unep.fr/energy/finance/risk.

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ABBREVIATIONS

ALOP	Advanced Loss of Profit
BI	Business Interruption
CAR	Construction All Risks
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CUP	Cooperative Underwriting Program
DSU	Delay in start up
EAR	Erection All Risks
ECA	Export Credit Agency
EMCD	Emerging Market Credit Derivatives
FRM	Financial Risk Management
GEF	Global Environment Facility
MBI	Machinery breakdown Insurance
MFI	Multilateral Financial Institute
MIGA	Multilateral Investment Guarantee Agency
O&M	Operations and Maintenance
OBI	Official Bilateral Institutes
OE	Operating Entity
OECD	Organization for Economic Co-operation and Development
OEE	Operators Extra Expenses
OPIC	Overseas Private Investment Corporation
PCG	Partial Credit Guarantee
PDD	Project Development Document
PDI	Physical Damage Insurance
PIN	Project Initiation Note
PPA	Power Purchase Agreement
PRG	Political Risk Guarantee
RET	Renewable Energy Technology
SEFI	Sustainable Energy Finance Initiative
VAT	Value Added Tax
WPI	Wind Power Indices

1. EXECUTIVE SUMMARY

Background of this study

In 2004, UNEP sponsored a study that provided an overview of the risks and barriers affecting investments in RE projects, and investigated the financial risk management (FRM) instruments that could be used to mitigate these risks. The scoping study highlighted that application of FRM instruments for RE projects in developing countries was limited. UNEP/GEF has therefore sponsored a project “Assessment of Financial Risk Management Instruments for Renewable Energy Projects” to evaluate appropriate interventions that will spur the acceptance and application of FRM instruments in developing countries.

This background study provides a reference for the subsequent research activities of the project – working group research, feasibility studies, and identification of effective interventions by the donor community. This report has been prepared for UNEP by IT Power India Ltd., Marsh Ltd., and Mirador Consulting.

The objective of this study was to suggest the scope for introducing potential FRM instruments focusing on the context of developing countries, which will be examined further by the working groups. The study was carried out in three stages –

- ❑ **Stage I** - A taxonomy of risks associated with RE projects in developing countries was prepared, and risks that could be effectively managed by FRM instruments were identified. This was done through a detailed literature review followed by validation by experts.
- ❑ **Stage II** - A survey of FRM instruments, both insurance and non-insurance, was carried out to understand the instruments currently available especially in developing countries, and study their impact on RE financing. The availability surveys in selected countries were conducted through interviews. In addition, a web-based survey on insurance instruments was conducted to investigate the market capacity and appetite for RE projects in the global context.
- ❑ **Stage III** – A demand/supply framework was developed to identify potential FRM instruments for introduction in developing countries. The demand for FRM instruments was determined by considering the probability of occurrence of a risk as well as the extent of its impact. The ability of a market to absorb an instrument or class of instruments was evaluated by comparing the status of the market in developing countries, as defined by select market characteristics, with that required for introduction of the instrument or class of instruments.

The study was technology neutral but implicitly considered only those projects that were based on RE technologies which had reached the commercialisation stage. The risks and associated FRM instruments were identified as per project scale – large, medium and small – in view of the fact that the characteristics and financing needs of these projects are significantly different. A further generalization that has been made in relation to grid connected projects as well as isolated grid projects that are typically medium or large scale and are funded through the corporate financing or project financing route, whereas non-grid or standalone projects are typically small scale and are funded by local financial institutions with support from donor agencies or microfinance institutions.

The availability survey was restricted to nine GEF eligible developing countries in 3 regions/continents– India, China, Vietnam, Brazil, Mexico, Chile, South Africa, Morocco and Senegal. The countries chosen represent differing stages of development in terms of commercial, financial and renewable energy market, but are generally considered to have high potential to absorb and capitalize on the introduction of financial risk management instruments. The global survey on insurance products was also conducted to estimate the baseline coverage and the market capacity for RE projects.

Main findings

The following table provides an overview of the major risks that can be managed by financial instruments with corresponding classes of instruments as per different project types.

Risk	Nature of Risk	FRM Instruments
<i>Risks associated with Large Scale Projects</i>		
Project Development/ Pre-construction Phase		
Concept to implementation	<ul style="list-style-type: none"> ➤ Feasibility analysis indicates project not feasible/viable ➤ Regulatory clearances delayed/denied ➤ Financial closure not achieved 	<ul style="list-style-type: none"> ➤ Grants, Contingent Grants (GEF)
Construction Phase		
Construction/ Completion Risk	<ul style="list-style-type: none"> ➤ Time overrun ➤ Cost overrun ➤ Project does not meet technical specifications ➤ Changes to project assumptions make the project unviable 	<ul style="list-style-type: none"> ➤ Insurance – Construction All Risks (CAR/EAR)
Counterparty Risk	<ul style="list-style-type: none"> ➤ Risk that the Construction Contractor does not perform as per contract 	<ul style="list-style-type: none"> ➤ Surety bonds - Performance guarantees ➤ Liquidation damages
Operating Phase		
Performance Risk	<ul style="list-style-type: none"> ➤ Technical performance ➤ Managing the facility ➤ Physical damage to the facility 	<ul style="list-style-type: none"> ➤ Insurance
Counterparty Risk	<ul style="list-style-type: none"> ➤ Risk that the O & M Contractor does not perform as per contract 	<ul style="list-style-type: none"> ➤ Surety bonds - Performance guarantees ➤ Liquidation damages
Fuel Supply Risk	<ul style="list-style-type: none"> ➤ Intermittent/Irregular fuel supply 	<ul style="list-style-type: none"> ➤ Weather Insurance/ Derivatives
Credit Risk	<ul style="list-style-type: none"> ➤ Related to default by off taker i.e. inability of the off-taker/ utility running to meet their payment obligations. 	<ul style="list-style-type: none"> ➤ Guarantees ➤ Credit derivatives
Generic – All Phases		
Financial Risk	<ul style="list-style-type: none"> ➤ Fluctuations in interest rate, currency exchange rate, etc 	<ul style="list-style-type: none"> ➤ Standard derivative products
Political Risk	<ul style="list-style-type: none"> ➤ Currency inconvertibility ➤ Expropriation ➤ Political violence ➤ Breach of contract 	<ul style="list-style-type: none"> ➤ Political Risk Insurance ➤ MFI Guarantees ➤ Export Credit guarantees

<i>Force Majeure</i> Risk	➤ Natural Catastrophe ➤ Man-made interruptions – war, strike, etc	➤ Insurance ➤ Catastrophe bonds
<i>Risks associated with small scale projects</i>		
Project Developer		
Development (Credit) Risk	➤ Lack of start- up capital ➤ Project sponsors with limited track records, poor credit history	➤ Guarantee Funds
End User		
Risks of physical damage including theft	➤ Theft/damage to the facility	➤ Micro-insurance
Credit Risk	➤ Poor financial credibility of end users	➤ Guarantees ➤ Credit lines
<i>Risks associated with Carbon Financed projects</i>		
Market Risk	➤ Demand Risk – uncertainty on evolution of CER markets post 2012 ➤ Price risk – linked to demand risk	➤ Standard derivative products to hedge against price
CER delivery Risk	➤ Project fails to generate projected CERs. This is linked to the intermittent nature of resource supply	➤ Insurance – carbon delivery guarantee, permit delivery guarantee

Availability survey

- Secure contracts (such as PPA, EPC contract, O&M agreement and Fuel supply agreement), equipment warranties, insurance products and various national government guarantees are the most utilized risk management instruments to facilitate the construction and operation of renewable energy projects in the focus countries. Naturally, the underlying business case for generating renewable energy (tariff structures, and privatization etc) will determine RE investments in the first case.
- Non-insurance financial instruments (with the exception of weather and credit derivatives) are generally used only to hedge the financial market risk (currency and interest rate) component of large-scale RE project finance deals once terms are in place. However, most of the difficulties in RE finance arrive at the front end of a deal when there is the greatest amount of uncertainty.
- The risk management products available from the multilaterals (such as Partial Credit Guarantees) are better understood by market participants. However, there appears to be little enthusiasm amongst project financiers interviewed for working alongside multilaterals unless there is a guiding strategic motive or large profit incentive.
- Local developing country insurers have generally limited expertise to write renewable energy business. However, where foreign insurers have access to developing country markets most traditional products relevant to RE projects – Property, Construction/Erection all risks; Business interruption, Machinery Breakdown etc- are available for mature RET projects. However, foreign insurer's access to local insurance market is restricted by local insurance regulations.
- With over **USD2 billion** of combined capacity of about 20 insurance companies participating in this survey, in theory sufficient capacity is available to meet the insurance

requirements of the renewable energy industry. However in reality there are still a number of technical underwriting concerns and barriers associated with for example technology performance risks and the harsh offshore locations, which can restrict / limit participation.

- The ability to deploy insurance capacity in developing countries is also hampered by local insurance regulations which restrict foreign market access. Insurance availability in developing countries is restricted by a lack of adequate financial, legal and service infrastructure as well as lack of credit worthy local insurers, restrictive local insurance regulations and limited distribution channels.
- As most renewable technologies (with the exception of onshore wind) are perceived to be prototypical in nature the limited data on commercial operating history presents a huge challenge to the insurance industry who are unable to accurately model future loss projections and price risk in an economic and sustainable manner. Further practical evaluation of the scope for improving actuarial data and technical risk information flow and studies into new risk based pricing methodologies would serve as useful interventions in catalyzing new thinking for RE projects in insurance market.

Instruments recommended for further research

- Introducing standard insurance covers to mitigate the risks during construction and operations phase for *large-scale on-grid RE projects* seems to have a high potential impact on facilitating RE investment. Political Risk Insurance (PRI) and Partial Risk Guarantees and Partial Credit Guarantees offered by multilaterals can also play an important role for RE investments in developing countries. Innovative application of those instruments for RE projects such as PRI insured bonds as well as credit derivatives to enhance investment grades may be considered in some developing countries. Surety bonds can also be recommended for further examination as alternative to bank guarantee to safeguard risks arising during the construction and operation phase.
- Risk management instruments for *Geothermal projects and Carbon financed projects* were analysed separately as they carry unique sets of specific risks in addition to those associated with general large scale RE projects.
Risks related to *geothermal technologies*- those associated with exploration, drilling and resource development- can be addressed through contingent grants and partial risk guarantees as shown in the pioneering examples of GEF projects. Possible risk sharing with private insurers should be investigated as alternative approach for the future projects. Although primary risk allocation systems remain the pricing of carbon credit in Emission Reduction Purchase Agreement and institutional risk sharing, emerging insurance products for *carbon financed projects*, such as carbon delivery guarantee and permit delivery guarantee may be considered for further study to mitigate the risks of non-delivery of carbon credits.
- Guarantee funds and partial credit guarantees to manage credit risks of both project developers and end-users of *Small-scale stand alone RE systems* have proved to be effective credit enhancement mechanisms. Appropriate risk sharing structure among parties involved is the key to the successful design of these instruments. Application of micro-insurance may also be recommended for further study.

2. OVERVIEW OF THIS STUDY

2.1. Background

The total primary energy supply across the world in 2003 was 10,579Mtoe¹, and it is estimated to increase to 16,500Mtoe by 2030. 74% of this increase in energy supply is expected to come from non-OECD countries. 87.7% of this energy supply today comes from using conventional fossil fuels. Even among the balance 13%, a large proportion is contributed by burning of biomass in developing countries and from large hydro². However, the fossil fuel reserves across the world have been considerably exploited and there have been no significant new reserves found. Moreover, recent concerns pertaining to the environmental impact of burning fossil fuels imply that there is an urgent and imperative need to identify alternate, clean sources of energy. Several RE technologies have shown potential, but have failed to live up to that potential to date. But even where technologies have moved to the stage of commercialization, there are several barriers and risks associated with RE projects that hinder the financing for such projects.

In order to identify approaches to address these barriers and risks, UNEP, under its Sustainable Energy Finance Initiative (SEFI), sponsored a scoping study³ in 2004. The study primarily covered OECD countries, and provided an overview of the risks and barriers affecting investments in RE projects and financial risk management instruments, both existing as well as potential, that could be used to mitigate these risks and facilitate financing of these projects. Undertaken by Marsh in association with Ted Olivier, Andlug Consulting and Rodl & Partner, the study's key findings were –

- ❑ Information sought by lenders and underwriters in assessing a project's viability is often unavailable or in the wrong format in the case of RE projects.
- ❑ Key risks and barriers that inhibit financing of RE projects relate to the small scale of the projects, lack of technology efficacy, operational risks and regulatory uncertainty.
- ❑ The risks associated with RE projects, irrespective of size, can be classified as follows --
 - Regulatory and policy issues that favour conventional energy sources or hamper RET: insecure legislation with respect to take off contracts/ feed-in laws
 - Energy market distortions: subsidized prices for hydrocarbons fuels and the consumption and import duties & Value Added Tax (Vat) on RE components
 - Deficiencies in framework: the financial, legal and institutional structures supporting RE
 - Credit issues, loan tenors, and lack of bankable structures
- ❑ There exists a financing continuum for renewable energy projects depending upon the scale of the project and the stakeholders involved -
 - Project finance for large RE projects
 - Corporate finance for small on-grid RE projects and new technologies
 - Consumer and microfinance for off-grid RE projects

¹ Key world Energy Statistics, International Energy Agency, 2005

² Renewables in Global Energy Supply, an International Energy Agency fact sheet, 2005

³ "Scoping Study on Financial Risk Management Instruments for Renewable Energy Projects", *UNEP Reference Document*, Marsh, 2004.

- ❑ While existing insurance products are being customized to address certain risks in the RE sector, institutional inertia is preventing any significant progress with regards to product development. Given that RE projects are of a smaller scale and therefore have a higher opportunity cost, innovative insurance solutions are likely to be provided by small to medium-sized specialist risk transfer / finance operation with dedicated capital and low overheads.
- ❑ There are several new risk management instruments and approaches – alternative risk transfer products, specialist underwriting vehicles, credit derivatives, political risk insurance, etc – which can be adapted to address the needs of the RE sector.

The scoping study identified several products, both insurance as well as non-insurance that have been customized from existing risk management products or have been exclusively developed to mitigate various risks associated with RE projects in OECD countries. However, their application in developing countries has been limited to date on account of lack of awareness, capacity, infrastructure and/or institutional framework.

UNEP/GEF has therefore sponsored a project that builds on the scoping study and identifies effective and replicable interventions that can be supported by GEF and other donor countries to spur the development of innovative risk management approaches for RE projects in developing countries. The project was structured in the following sequence–

- ❑ Preparation of a **background report** that identifies risks associated with RE projects and which can be effectively managed by financial risk management instruments or structures, and that evaluates the scope for introducing these instruments in developing countries.
- ❑ Based on the background report, **Working Group research consultations** identify specific instruments that have the potential for being introduced in developing countries.
- ❑ **Feasibility studies** evaluate the market potential of instruments identified as promising by the Working Groups.
- ❑ Consolidation of the results of the feasibility studies and arrival at **specific recommendations** as well as follow up actions for appropriate GEF and other donors' interventions.
- ❑ Information dissemination activities of the project, including an international workshop.

This report forms the first deliverable of the project i.e. the background report, which will be the reference document for the subsequent activities of the project, especially the research to be carried out by the working groups. This report has been prepared for UNEP by IT Power India Ltd., Marsh Ltd., and Mirador Consulting.

2.2. Objectives

The overall objective of this project is to identify effective and replicable interventions that can be supported by GEF and other donors to spur the development of new and innovative risk management instruments and approaches to mitigate risks associated with RE projects and thereby accelerate the uptake of RE projects in developing countries.

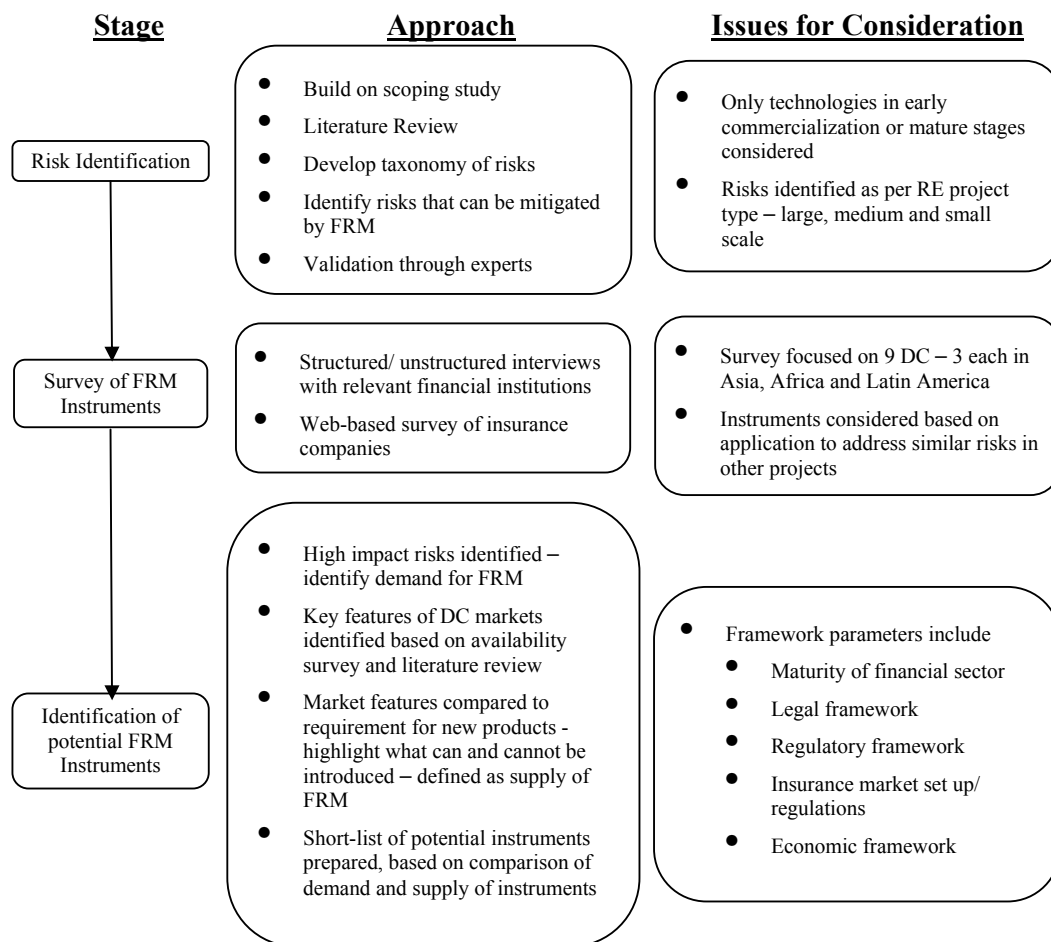
The specific objectives of this study are:

- ❑ To identify risks that can be effectively managed by financial risk management instruments/structures by analyzing the sources and nature of risks associated with RE projects
- ❑ To review existing financial instruments/structures available to mitigate risks associated with RE projects and evaluate the extent of the impact on RE financing
- ❑ To examine the scope for developing new financial risk management (FRM) instruments/structures for RE projects.

2.3. Approach

The assignment was undertaken in three stages – i) Risk Identification, ii) Survey of FRM instruments, and iii) Identification of potential FRM instruments. Given below is a detailed description of activities within each stage. Figure 1 provides a snapshot of the same. The activities under Stages I & III were undertaken by ITPI whereas those under Stage II were undertaken by Mirador Consulting and Marsh Ltd. There was frequent interaction between the various consultants to ensure that all three tasks were carried out in coordination.

Figure 1: Stage-wise Activities and Assumptions in the Study



Stage I – Risk Identification

The objective of this stage was to identify the risks that can be effectively managed by FRM instruments. The risks associated with RE projects in developing countries, as identified in the scoping study, were used as the starting point. A literature review was carried out to understand how risks associated with RE projects in developing countries are unique to them, or how the risks differed from those identified in developed countries. A taxonomy of risks associated with RE projects in developing countries was developed on the basis of the literature review, and risks that could be mitigated through FRM instruments were pointed out. This output was validated by experts who were part of the consultant team.

When identifying the risks, the following assumptions were made –

- ❑ While the study is technology neutral, RE projects based on technologies that are either mature or are in the early stages of commercialization have been considered, because they are likely to be financed easily and can avail of market-based solutions to mitigate associated risks.
- ❑ The risks were identified for different project scales i.e. large, medium and small, since the characteristics of the project and its financing needs as well as the risks perceived by financiers differ as per project scale.
- ❑ Grid connected projects as well as isolated grid projects will typically be medium to large scale and can be funded either through corporate financing, where the project sponsor assumes a majority of the risk, or project financing, where there is limited recourse to other non-project related assets and cash flows of the project sponsor. Non-grid or standalone projects are likely to be of small scale, and financed through microfinance agencies.
- ❑ The risks associated with medium scale isolated mini-grids are significantly different from those associated with large scale RE projects but the risks that can be mitigated through FRM instruments are similar.

Stage II – Availability Survey of FRM Instruments

The objective of this stage was to survey the availability of FRM instruments and evaluate the extent of impact on RE financing. This was achieved through structured interviews, unstructured discussions, both face-to-face as well as over the telephone, and a web-based survey (primarily addressed towards insurance companies) covering numerous financial institutions, insurance companies, and experts.

When conducting the survey, the following constraints/assumptions were made –

- ❑ The survey, especially in the case of non-insurance FRM instruments, was restricted to nine developing countries (India, China, Vietnam, Senegal, South Africa, Morocco, Brazil, Mexico and Chile) that were identified based on the following considerations
 - Countries were GEF eligible countries in different regions/continents – Asia, Africa, and Latin America
 - The countries chosen represent differing stages of development in terms of commercial, financial and renewable energy market, but are generally considered to have high potential to absorb and capitalize on the introduction of financial risk management instruments

- ❑ The insurance survey was conducted online by Marsh Ltd. Around 20 RE active insurance companies responded in the survey representing a combination of local insurers, specialist Lloyds markets, company markets and international (re) insurers from a wide geographical spread and with differing focuses on local / regional and international business.
- ❑ There are limited examples of application of FRM instruments to RE projects. The instruments covered are therefore included for their application to address similar risks in conventional energy / infrastructure projects.
- ❑ While every effort has been taken to cover all relevant instruments, the survey may not be exhaustive.

Stage III – Identification of Potential FRM Instruments

The objective of this stage was to identify FRM instruments with potential for introduction in developing countries.

When identifying the risks in Stage I, the probability of occurrence and extent of impact was also estimated. Based on this, it was possible to arrive at a priority of demand for FRM instruments in developing countries i.e. higher impact risks are likely to be of greater concern to financiers and therefore the demand for FRM instruments addressing these risks is likely to be higher. However, some of these instruments are complex and cannot be considered for introduction in developing countries that do not have the necessary capacity or infrastructure to absorb these products. A framework was developed to evaluate the ability of developing countries to support such FRM products. The demand for FRM instruments was matched with the ability of developing countries to absorb these products to arrive at a short-list of potential instruments for introduction in these regions.

The parameters to be considered while evaluating the ability of developing countries to absorb FRM instruments are –

- ❑ Maturity of the financial sector
- ❑ Legal framework
- ❑ Regulatory framework
- ❑ Insurance market set-up/regulations
- ❑ Economic framework

2.4. Structure of this Report

The following sections present the results of this study. Section 3 details the risks associated with RE projects in developing countries and identifies risks that can be mitigated through financial instruments. Section 4 provides an introduction to these financial instruments available to mitigate risks. Section 5 identifies and prioritises some of these instruments that can be introduced or replicated in developing countries, especially the nine GEF eligible countries listed above. Section 6 concludes with a set of recommendations and issues to be addressed by the working groups. The results of the availability surveys conducted for the insurance and non-insurance instruments are provided in Annexure 1 and Annexure 2.

3. RISKS ASSOCIATED WITH RE PROJECTS IN DEVELOPING COUNTRIES

While this study is technology neutral, various RE technologies are in different stages of development. The implicit focus here, when identifying risks, is on technologies which are in their early stages of commercialization or market-driven stage. This is because technologies in the R&D and demonstration stages require government support, while projects based on technologies that have moved beyond these stages, seek commercial financing options and hence require market-based solutions to mitigate risks associated with them. Table 1 presents the stages of development of various RE technologies, classified as per scale of project. It is observed that the technologies that have moved beyond R&D and demonstration stages are: on-shore wind, biomass, hydro, geothermal, SPV, and solar thermal.

Table 1: Stages of Development of RE Technologies

Technology	Stage of Development			
	R & D	Demonstration	Early Commercialization	Market Driven
Large Scale Grid Connected RE Systems				
Wind On-shore				X
Wind Off-shore		X		
Biomass ⁴			X	
Small Hydro				X
Solar PV			X	
Solar Thermal (CLFR)	X			
Geothermal			X	
Wave/ Tidal		X		
Off-grid Standalone RE Systems				
Small Wind Turbines			X	
Mini/Micro/Pico Hydro			X	
Solar PV			X	
Biomass			X	
Fuel Cells	X			
Hybrid Systems		X		
Standalone Household RE Systems				
Solar PV Lighting			X	
Solar PV Pumping			X	
Solar Thermal Water Heaters				X
Solar Thermal Dryers		X		
Solar Thermal Cookers			X	

⁴ Biomass covers incineration, gasification (including waste to energy) and bio fuels.

3.1. Large Scale RE Projects

Large scale RE projects are typically grid connected or isolated grid projects, and are often (but not always) financed on a non-recourse basis. Potential financiers are likely to apply the same rules as those for conventional energy projects, when evaluating such project proposals. Table 2 provides a summary of the risks associated with large scale RE projects as well as approaches to mitigate these risks. The risks have been classified according to the phase of the project where they occur – project development phase, construction phase, performance phase, and generic i.e. all phases of the project.

3.1.1. Risks during the Project Development Phase

Between the project concept and its implementation stage there are several steps that require significant time and resource input. There is, however, the possibility that the project concept will never reach the implementation stage on account of the project being considered infeasible or economically unviable. Hence the project does not receive the necessary regulatory approvals or the project fails to achieve financial closure i.e. raise the required funds to implement the project. However, the probability of delays in receiving the regulatory approvals and achieving financial closure is relatively high. While project sponsors may have sufficient resources to fund the activities during this phase, there are also grants or contingent grants available from various public sector/multilateral financial institutions, including GEF.

3.1.2. Risks during the Construction Phase

- ❑ **Completion Risk** – The nature of risk factors associated with completion is similar to that in the case of other infrastructure projects with there being a possibility of time overrun, cost overrun or completed project not being up to the required technical specifications. The probability of time and cost overruns is pretty high and the extent of impact on account of these is also relatively high. There are standard insurance covers available to mitigate such risks such as Construction/Erection All Risks (CAR/EAR). Project sponsors also transfer this risk by outsourcing construction to a contractor through a turnkey contract.
- ❑ **Counterparty Risk** - When construction is undertaken by a construction contractor, there is a risk that the contractor does not perform as per contract, which results in time and cost overruns. Construction contractors are required to provide surety bonds/performance guarantees and also pay liquidation damages on non-performance.

3.1.3. Risks during the Operation Phase

- ❑ **Performance Risk** - The nature of risks associated with performance is similar to that in the case of other infrastructure projects with there being a possibility of equipment not performing as per required standards. This is usually covered through product/equipment warranties. There is a possibility of equipment theft or damage due to accidents, fires, etc. There are standard insurance covers available to mitigate such risks. Lastly, there can also be issues with respect to management of the facility, which is addressed by outsourcing operations to an O & M contractor.
- ❑ **Counterparty Risk** – When the operations are performed and managed by an O & M contractor, there is a risk that the contractor does not perform as per contract, which may result in sub-standard performance. As in the case of construction, O & M contractors are required to provide surety bonds/performance guarantees and also pay liquidation damages on non-performance.

- ❑ **Fuel Supply/ Resource Risk** – The input fuel to RE projects is natural resources, the availability of which is typically unknown but may be predictable. In developing countries, where meteorological data is not very accurate and historical data is not available, predicting weather conditions is a great challenge. Thus, as compared to conventional projects, where fuel supply can be ensured through a fuel supply agreement, RE projects suffer from instability of cash flows due to unpredictability of resource availability and therefore the energy generated from the project. Further, given this unpredictability, most RE projects are paid a single-part tariff linked to energy generation as opposed to a two-part tariff as in the case of conventional projects. The fixed component of the two-part tariff ensures a certain minimum cash flow to the project irrespective of actual energy generation. Innovative insurance products and weather derivatives, however, have the potential to address this risk.
- ❑ **Market Risk** – Market risk comprises both demand risk as well as price risk. Demand risk mainly arises from uncompetitive pricing policy of RE compared with conventional energy. However, in most developing countries where there is a severe energy as well as peak demand shortage, the relevance of this risk may not be very high. Most countries have recognized the importance of RE projects and provide some form of incentive tariff that is determined on a cost plus basis. The risk associated with changes in price is addressed by entering into a power purchase agreement (PPA) with the off-taker/utility for a specified duration. There is an associated risk of changes in tariff/reopening or renegotiating of PPAs, which is discussed under regulatory risk.
- ❑ **Credit Risk** – The nature of risk associated with credit is similar to that of conventional power projects, where there is a probability that the utility may be unable to meet its payment obligations. The possibility of this occurrence is high since utilities are typically often managed by the public sector and operate on non-commercial principles. Partial credit guarantee products are available from multilateral agencies to address such a risk. Financial institutions that hold a portfolio of such projects can transfer this risk through credit derivatives.

3.1.4. Generic risks – All Phases

- ❑ **Financial Risk** – Fluctuations in interest rate, currency exchange rate, and inflation can affect a project's economics. The probability of fluctuation of these factors is high and the extent of impact is linked to the extent of fluctuation. Protection against such fluctuations is possible through standard derivative products available in the market.
- ❑ **Legal Risk** – There are often problems with respect to contract enforcement as well as contract re-negotiations in developing countries on account of a poor legal infrastructure. The probability of contractual default is high and the extent of impact is also relatively high. The only way of mitigating this risk is by obtaining some form of a sovereign guarantee from the host government. Multilateral agency involvement can also act as a deterrent.
- ❑ **Regulatory Risk** – As discussed under market risk, the incentive tariff for specific RE projects/technologies is determined by regulators. However, with the electricity sectors becoming subject to greater competition in most developing countries, the approach to determining tariff for RE projects is not very clear. Even where the price is locked in through a PPA, there is a risk that the regulators may mandate a revised price leading to a renegotiation of the PPA. The only way to mitigate this risk is by getting some form of a regulatory assurance in the long-term approach to RE projects. There is also a need for

capacity building of regulators with reference to those RE projects involving a competitive market scenario.

- ❑ **Political Risk** – Restrictions on currency convertibility may restrict the repatriation of profits. Political violence may restrict operations and result in damage of equipment as well. The host government may also expropriate the assets of a project under certain circumstances. The probability of occurrence of these events is relatively low but the extent of impact is very high. Political risk insurance is available from multilateral agencies, export credit agencies (ECA), and private insurers.
- ❑ **Force Majeure Risk** – Natural catastrophes such as floods, earthquakes, etc., as well as man-made events such as a war, strike, etc., could hamper or stop activities both during the construction as well as operations phase. The probability of occurrence is low but the extent of impact is very high. Insurance products are available to mitigate against these risks. Insurance and re-insurance companies can also transfer this risk to the market through catastrophe bonds.

Table 2: Risks Associated With Large Scale RE Projects in Developing Countries

Risk	Nature of Risk	Probability of Occurrence (H/M/L*)	Extent of Impact (H/M/L)	Risk Mitigation Approach	
				FRM Instruments	Other
Project Development/ Pre-construction Phase					
Concept to implementation	<ul style="list-style-type: none"> ➤ Feasibility analysis indicates project not feasible/viable ➤ Regulatory clearances delayed/denied ➤ Financial closure not achieved 	L – M	L	<ul style="list-style-type: none"> ➤ Grants, Contingent Grants (GEF) 	
Construction Phase					
Construction/ Completion Risk	<ul style="list-style-type: none"> ➤ Time overrun ➤ Cost overrun ➤ Project does not meet technical specifications ➤ Changes to project assumptions make the project unviable 	M – H	H	<ul style="list-style-type: none"> ➤ Insurance – All Construction Risks (CAR/EAR) 	<ul style="list-style-type: none"> ➤ Construction through turnkey contract
Counterparty Risk	<ul style="list-style-type: none"> ➤ Risk that the Construction Contractor does not perform as per contract 	M	H	<ul style="list-style-type: none"> ➤ Surety bonds - Performance guarantees ➤ Liquidation damages 	<ul style="list-style-type: none"> ➤ Due diligence process
Operating Phase					
Performance Risk	<ul style="list-style-type: none"> ➤ Technical performance ➤ Managing the facility ➤ Physical damage to facility 	M	M - H	<ul style="list-style-type: none"> ➤ Insurance 	<ul style="list-style-type: none"> ➤ Operation through O & M contract ➤ Product guarantee/warranty
Counterparty Risk	<ul style="list-style-type: none"> ➤ Risk that the O & M Contractor does not perform as per contract 	L – M	M	<ul style="list-style-type: none"> ➤ Surety bonds - Performance guarantees ➤ Liquidation damages 	<ul style="list-style-type: none"> ➤ Due diligence process
Fuel Supply Risk	<ul style="list-style-type: none"> ➤ Intermittent/Irregular fuel supply 	H	M-H	<ul style="list-style-type: none"> ➤ Weather Insurance/ Derivatives 	

Market Risk	<ul style="list-style-type: none"> ➤ Demand risks ➤ Price risks 	M	M		<ul style="list-style-type: none"> ➤ Power Purchase Agreement
Credit Risk	<ul style="list-style-type: none"> ➤ Related to default by off taker i.e. inability of the off-taker/ utility running to meet their payment obligations. 	M-H	M	<ul style="list-style-type: none"> ➤ Guarantees ➤ Credit derivatives 	<ul style="list-style-type: none"> ➤ Sovereign guarantee
Generic – All Phases					
Financial Risk	<ul style="list-style-type: none"> ➤ Fluctuations in interest rate, currency exchange rate, etc 	M-H	M	<ul style="list-style-type: none"> ➤ Standard derivative products 	
Legal	<ul style="list-style-type: none"> ➤ Contract enforcement 	M – H	H		<ul style="list-style-type: none"> ➤ Sovereign guarantee ➤ International Arbitration
Regulatory	<ul style="list-style-type: none"> ➤ Lack of long term view/plan on RE ➤ Regulatory uncertainties – changes in approach to determining the feed-in tariff 	M – H	H		<ul style="list-style-type: none"> ➤ Assurance statements from regulator on approach/policy directions
Political Risk	<ul style="list-style-type: none"> ➤ Currency inconvertibility ➤ Expropriation ➤ Political violence ➤ Breach of contract 	L – M	H	<ul style="list-style-type: none"> ➤ Political Risk Insurance ➤ MFI Guarantees ➤ Export Credit guarantees 	
<i>Force Majeure</i> Risk	<ul style="list-style-type: none"> ➤ Natural Catastrophe, etc ➤ Man-made interruptions – war, strike, etc 	L – M	H	<ul style="list-style-type: none"> ➤ Insurance ➤ Catastrophe bonds 	

*H: High; M: Medium; L: Low

3.2. Risks Associated With Geothermal Projects

Geothermal projects carry a unique risk associated with exploratory and drilling costs. These are costs that need to be incurred to determine the availability of the resource and determine feasibility of the project. It is estimated that detailed surface exploration studies leading to the pre-feasibility stage, may result in expenditure up to US\$1 M, which is at risk (30% probability of failure) through not identifying a useable heat resource. The expenditure on exploration drilling (frequently 3 wells) is an order of magnitude greater (US\$1.5 - 2 M per well) and this is similarly at risk if the wells do not result in useful production (commonly through low reservoir temperatures or low permeability). Fewer or less costly shallower wells may be applicable for smaller developments. On the other hand, the risk pertaining to deep exploration drilling will increase with decreasing reservoir temperature below about 200°C. Further, while the technology and risks associated with drilling are well understood by financial institutions and insurance companies on account of their experience with the petroleum industry, geothermal projects pose an added technology risk on account of the higher temperatures, corrosive fluids, harder rocks, unproven stimulation technology⁵ and the technical elements of integration of geothermal electricity.

Another risk is associated with the assessment of resource size and production capacity (resource assessment). At the feasibility stage without long-term production data, resource assessments rely on the extent of the reservoir, as defined by drilling and geophysical anomalies, and knowledge of reservoir fluid temperatures. Such assessments can be subject to large errors thus increasing the risk of plant size incompatibility. There are several geothermal fields having oversized power stations for the exploited reservoir size, the most well-known being the Geysers in California. The Momotombo field in Nicaragua is another example. It was initially exploited with a 35 MW(e) power station in 1983 but with the addition of a second 35 MW(e) plant in 1989 the reservoir was over produced, resulting in reservoir decline, to the extent that in 1998 the field was only producing 20 MW(e).

These risks have been mitigated in some cases through partial risk guarantees and contingent grant facilities. Insurance companies have also developed a product called Discovery Risk Insurance to address this risk, which has been applied in one project successfully.

3.3. Carbon Financed Projects

The demand for carbon credits (CERs) through the CDM mechanism provides a much required boost for investment in RE projects in developing countries. However, the CDM process is extremely complex and adds some risks to the overall project.

- ❑ ***Registration Risk*** – The process of getting a project registered under the CDM process is elaborate, with several stages of documentation from a Project Inception Note (PIN) to a Project Design Document (PDD), approval from a Designated

⁵ Refers to techniques such as chemical and explosive stimulation that are used to try and improve the natural productivity or recover lost productivity of geothermal wells.

National Authority and the CDM Board, and reporting to the Operating Entity (OE). The transaction cost associated with this process is high. Thus, there is a risk that a project does not clear all the above stages and hence is not registered. This risk is higher in cases where established methodologies are not adopted to determine additionality. This risk can be addressed by a thorough due diligence process to ensure that the project clears all the stages of the registration process and adopts established methodologies for the baseline.

- ❑ **Market Risk** – The demand for CERs is fairly high in the near term with clear targets set for all Annex 1 countries. However, there is no clarity on how the market for CERs will evolve post 2012, after the first commitment period. There is an added risk with respect to the mechanism being sustained, given that USA, a major emitter, is not a signatory to this protocol. Standard derivative products could be used to hedge against price risk but are not available currently due to the absence of a CER market and forward curve for CER prices.
- ❑ **CER Delivery Risk** – There is a possibility that projects do not deliver CERs as projected. This is especially so in the case of RE projects dependent on natural resources, which are intermittent in nature. There are some insurance companies that are working on carbon delivery guarantees and permit delivery guarantees that will address this risk.

3.4. Medium Scale RE Projects

Medium scale RE projects can be grid connected, isolated mini-grid projects for rural electrification, or captive projects for industry. When comparing medium and large scale projects, the characteristics/nature of risks associated with regulatory, market and legal aspects are significantly different. However, with respect to risks that can be mitigated through FRM instruments, such as completion risk, performance risk, financial risk, political risk and *force majeure* risk, it is observed that the risks and associated mitigation approaches are similar to those under large scale projects. The difference is only with respect to the magnitude of the respective risks.

These projects are typically funded through the corporate finance route, where a significant portion of the project risk is assumed by the project sponsor, thereby making the credit worthiness of the project sponsor critical. Given a strong project sponsor, financing can be executed quickly with lower associated transaction costs. However, where such projects are for rural electrification, financing becomes a challenge primarily because the project sponsors are small and unknown, have a limited track record, or suffer from weak financial positions (for this aspect, refer to credit risks of project sponsor under small scale RE projects). Guarantee funds can play a role here to make an economically viable project bankable.

Table 3: Risks Associated with Carbon Finance Projects

Risk	Nature of Risk	Probability of Occurrence (H/M/L)	Extent of Impact (H/M/L)	Risk Mitigation Approach	
				FRM Instruments	Other
Registration Risk	➤ Risk that a project is not registered as a CDM project	M - H	M		➤ Due diligence ➤ Established methodologies
Market Risk	➤ Demand Risk – uncertainty on evolution of CER markets post 2012 ➤ Price risk – linked to demand risk	M - H	M	➤ Standard derivative products to hedge against price	➤ Financing of project by CER beneficiary
CER delivery Risk	➤ Project fails to generate projected CERs. This is linked to the intermittent nature of resource supply	M - H	M	➤ Insurance – carbon delivery guarantee, permit delivery guarantee	

*H: High; M: Medium; L: Low

3.5. Small Scale RE Projects

Small scale stand alone systems often find application in rural and semi-urban areas, where people have limited or no access to energy. The risks associated with such projects are significantly different from large and medium scale projects. Project developers here are equipment dealers or system integrators. The major barriers they face are in terms of raising start-up capital, raising working capital loans, and limited end consumer financing for their products. The risks associated with small scale projects have been split as per the risks associated with the project developer and those associated with end customers.

3.5.1. Risks Associated with Project Developers

- ❑ **Development Risk(Credit Risk)** – Small scale project developers are relatively unknown and have limited track records as a result of which financial institutions are reluctant to lend either towards capital investment or towards meeting working capital requirements. Even when they lend, they impose higher interest rates and significant collateral requirements. As discussed under medium scale projects, guarantee funds can play a role in making economically viable projects bankable. The need for start-up capital can also be met through sources that provide grants or patient capital.
- ❑ **Market Risk** – RE entrepreneurs and innovators require substantially large investments upfront to generate awareness of their products and to establish elaborate and effective servicing networks (that are a key requirement for their business). Almost all project developers interviewed have quoted that significant time and effort has been required to generate awareness and associated benefits for their products. Moreover, they have had to use their own resources for such activities with limited support from intermediaries and government organisations. Another challenge is that there is no “first mover” advantage for these entrepreneurs. Late entrants can ride on the efforts of the first movers and still grab a fair share of the market. There is also a challenge associated with affordability of these systems by the end users. Developers have had to tie up with consumer finance or micro-finance institutions to develop innovative financing solutions to address this issue.
- ❑ **Regulatory Risk** – There is a lack of clear direction and policies for investment in this segment. Further, the markets are mainly driven by subsidies which may not be sustainable in the long run. Some project developers have adopted successful non-subsidy driven business models, but they face a continuous threat from developers operating on a subsidy-driven model.

3.5.2. Risks Associated with End Users

- ❑ **Performance Risk** – Systems supplied by small scale developers may not meet the required quality standards. Also, small scale developers may not provide adequate maintenance as a result of which these systems do not perform as required. There is also a risk associated with theft or damage to equipment during natural disasters. Micro-insurance has a role to play here, especially in cases where such systems are linked to income generation. Developers have also realized that poorly performing systems lead to credit default i.e. the end customer stops meeting his loan repayment

obligations, if the system is no longer working. Thus, project developers that work closely with micro-finance institutions are bound to provide good quality systems and establish a strong network for maintaining the systems.

- ❑ **Credit Risk** – Standard approaches to consumer financing cannot be applied in rural areas since most households have seasonal or variable incomes. Further, due to the size of the transaction being very small, high transaction costs result. While traditional financial institutions have a limited role to play here, entrepreneurs have tied up with micro-finance institutions, rural co-operative banks and self-help groups to develop innovative financing solutions. The results in these cases have been very encouraging, with the defaults rate being low in many countries.

Table 4: Risks Associated With Small Scale Projects

Risk	Nature of Risk	Probability of Occurrence (H/M/L)	Extent of Impact (H/M/L)	Risk Mitigation Approach	
				FRM Instruments	Other
Project Developer					
Development (Credit) Risk	<ul style="list-style-type: none"> ➤ Lack of start-up capital ➤ Project sponsors with limited track records, poor credit history 	M – H	H	<ul style="list-style-type: none"> ➤ Guarantee Funds 	<ul style="list-style-type: none"> ➤ Patient capital – quasi equity
Market Risk	<ul style="list-style-type: none"> ➤ Lack of demand for systems – awareness and affordability issues 	M – H	H		<ul style="list-style-type: none"> ➤ Awareness building exercise ➤ Strong network to provide quality service ➤ Innovative financing options
Regulatory Risk	<ul style="list-style-type: none"> ➤ Lack of appropriate policy/ regulations ➤ Markets largely subsidy driven 				<ul style="list-style-type: none"> ➤ Innovative non-subsidy based business models
End User					
Performance Risk	<ul style="list-style-type: none"> ➤ Poor quality of systems ➤ Inadequate maintenance ➤ Physical damage /Theft of equipment 	M – H	H	<ul style="list-style-type: none"> ➤ Micro-insurance 	<ul style="list-style-type: none"> ➤ Strong supplier network ➤ Product warranties ➤ Annual Maintenance Contract
Credit Risk	<ul style="list-style-type: none"> ➤ Poor financial credibility of end users 	L – M	M	<ul style="list-style-type: none"> ➤ Guarantees ➤ Credit lines 	<ul style="list-style-type: none"> ➤ Innovative financing options ➤ Informal control mechanisms

*H: High; M: Medium; L: Low

4. FINANCIAL RISK MANAGEMENT INSTRUMENTS FOR RE PROJECTS IN DEVELOPING COUNTRIES

The following section details the various Financial Risk Management Instruments that are available for addressing some of the risks identified above. The focus is only on Financial Risk Management instruments and any risks that cannot be addressed by them have not been elaborated upon in this section.

Instruments given below are both insurance and non insurance products. As mentioned above, an availability survey was conducted in 9 countries to determine availability and use of such instruments for RE projects. In addition, the survey on insurance products was conducted to analyze the industry's capacity and appetite for RE projects in the global context.

The Country Survey which focused on 9 countries in 3 regions (i.e. Brazil, Chile, Mexico, China, India, Vietnam, South Africa, Senegal and Morocco) on availability of FRMs was conducted by Mirador Consulting Ltd via direct and indirect interviews. The survey covered various financial institutions, project developers and development agencies.

The key findings include:

- Secure contracts (such as PPA, EPC contract, O&M agreement and Fuel supply agreement etc), equipment warranties, insurance products and various national government guarantees are the most utilized risk management instruments to facilitate the construction and operation of renewable energy projects in the focus countries. Naturally, the underlying business case for generating renewable energy (tariff structures, privatization) will determine RE investments in the first case.
- There is more information on insurance products than non-insurance financial products because research reveals that non-insurance financial instruments (with the exception of weather and credit derivatives) are generally used only to hedge the market risk (currency and interest rate) component of large-scale RE project finance deals once terms are in place.

Non-insurance instruments

- The risk management products available from the multilaterals (such as Partial Credit Guarantees) are better understood by market participants. However, there appears to be little enthusiasm amongst project financiers interviewed for working alongside multilaterals unless there is a guiding strategic motive or large profit incentive. The fundamental reasons behind this private sector reluctance to partner with the public sector seem to stem mostly from different perceptions of time: both the time necessary to complete the deal and the value of time in general.
- Non-insurance instruments address market risk – the risk of adverse currency, interest rate or commodity price variations- are necessary to achieve financial closure of large privately financed RE projects. However, most of the difficulties in RE finance arrive at the front end of a deal when there is the greatest amount of uncertainty.
- In Latin America, where there are a variety of renewable energy transactions, contracts, guarantees, warranties, government subsidies, carbon finance, ECA support are the main instruments for risk mitigation. Non-insurance financial instruments such as swaps and futures are readily available to mitigate currency and interest rate market risk. The

frameworks for Carbon Finance are better developed in Latin America than Asia but the projects are relatively smaller.

- In Asia, India is the only survey country with a developed market for non-insurance financial instruments and boasts a wide variety of exchange traded instruments and intermediaries to hedge local market risk. However, most investors in India seem less concerned with market risk than the sanctity of their contracts. China's financial markets are miniscule relative to the size of the economy and Over The Counter (OTC) transactions originating in Hong Kong are generally used to hedge market risk.
- In Africa, there is a wide variety of non-insurance financial risk management instruments on offer in South Africa, but there is little focus on renewable energy. The tariff structures for power in South Africa are among the lowest in the world. In Morocco, carbon finance is expected to become an increasingly important tool to facilitate RE transactions.

Insurance products

- The depth and quality of the *insurance markets* determines the availability of certain classes of insurance products relevant to RE projects. For example, sophisticated instruments such as Alternative Risk Transfer products and hybrid securities are available in South Africa but none of the other focus countries.
- As is highlighted in the global insurance survey, local developing country insurers have limited expertise to write renewable energy business. However, where foreign insurers have access to developing country markets most traditional products relevant to RE projects – Property, Construction/Erection all risks; Business interruption, Machinery Breakdown etc- are available for mature RE projects. However, foreign insurers access to local insurance market is restricted by local insurance regulations.

General feasibility of introducing RE financial risk management instruments

- The success rate for financing renewable energy projects depends on both the level of domestic financial market development and sanctity of contracts governing off-taker and other agreements.
- Sophisticated financial instruments to mitigate risk are typically developed in mature financial markets with application in mature developing markets (South Africa) as is possible. Some emerging economies (Chile and Mexico) are now investment grade and have domestic markets that can provide long-term, fixed-rate local currency financing for infrastructure. Others (India, China and Brazil) have emerging long-term debt markets, where public sector interventions can be made to extend the loan tenors available for renewable energy projects and to improve access to other financial instruments. Vietnam and Senegal are now attracting investment from China and South Africa, demonstrating the general process of financial sector evolution relevant to the sustainable commercialization of renewable energy.

The detailed country survey and report have been attached as Annexure 1 of this report.

The key findings from the web-based *Global Insurance Survey* conducted by Marsh Ltd are:

Market Appetite and Capacity

- Onshore wind, energy from waste, offshore wind and small scale hydro are perceived by respondents to offer the greatest future business opportunities for (re) insurers
- Traditional products such as property damage, business interruption, machinery breakdown and construction all risks are more widely available for the more commercialised renewable technologies located in more benign environments (onshore wind, small scale hydro, energy from waste etc)
- Although offshore wind is attractive in terms of premium income, fewer insurance markets are able to participate in wind farms offshore due to the increased marine exposure and the requirements for specialist marine reinsurance protection
- With over **USD2 billion** of aggregated capacity, companies participating in this survey have more than adequate capacity to cater for the current insurance requirements of the renewable energy industry

Specific risks, underwriting concerns

- 61% of respondents identify New / Prototypical / Scale Up technology as being a major underwriting concern for most renewable energy technologies
- Inherent technical perils in handling, erecting, testing and commission were identified as a major underwriting concern for most renewable technologies. This concern is exacerbated by installation, operation and maintenance of projects in harsh marine environments (e.g. sub sea cable lay and maintenance activities associated with offshore wind, wave and tidal power)
- Inextricably linked to concerns over prototypical technology and technical perils (in handling, erecting, testing and commissioning), *faults in design, material and workmanship* was highlighted by underwriters as being a major concern for certain technologies. Typically underwriters impose an outright exclusion for this peril, some may provide cover for the resultant damage but exclude the faulty part itself. The increasing commercialisation and availability of performance / service warranties / guarantees provided by component part manufacturers for certain technologies such as wind may explain the reduced concern for certain technologies.

Greatest challenges to the insurance industry

- Due to the prototypical nature of many renewable energy technologies the limited data on commercial operating history presents a huge challenge to the insurance industry who are unable to accurately model future loss projections and price risk in an economic and sustainable manner
- Combined with a lack of data, a lack of technical expertise to undertake prudent risk assessment and evaluation was also identified as presenting a challenge to the industry.

Insurance Availability in developing countries

- Typically local developing country insurers have limited expertise to write renewable energy business. However, where foreign insurers have access to developing country markets most traditional products are available for the more commercial technologies.
- Many Lloyds and Company (re) insurers participating in this survey have licences to write business in most countries of the world, however, insurance availability in developing countries is restricted by a lack of adequate financial, legal and service infrastructure.

- Foreign (re) insurers trying to access developing country business in general are hampered by lack of credit worthy local insurers, restrictive local insurance regulations and limited distribution channels.

Product development opportunities

- Weather insurance / derivatives are perceived to be evolving products with the highest degree of commercial promise for application in the renewable energy sector. However, the large data requirements and costs associated with pricing these instruments can be prohibitive, particularly in developing country contexts
- A significant number of respondents (84%) are of the view that improved actuarial data and technical risk information could help to facilitate new product development in the renewable energy sector.
- The majority of respondents (50%) believe that a combination of brokers, insurers, project developers and financiers are best placed to drive innovation.
- Brokers are identified as being the best placed individual stakeholder to drive innovation and product development (with 28% of votes).

Key messages coming out of the survey

In theory sufficient capacity is available to meet the insurance requirements of the renewable energy industry. However in reality there are still a number of technical underwriting concerns and barriers associated with for example technology performance risks and the harsh offshore locations, which can restrict / limit participation.

The ability to deploy insurance capacity in developing countries is also hampered by local insurance regulations which restrict foreign market access.

Further practical evaluation of the scope for improving actuarial data and technical risk information flow and studies into new risk based pricing methodologies would serve as useful interventions by the working groups as part of the next phase of the UNEP / GEF project.

The detailed survey responses and report have been attached as Annexure 2 of this report.

4.1. Large Scale Projects

4.1.1. Instruments to mitigate Construction Phase Risks

Table 5: Overview of FRM for addressing construction phase risks in large scale RE projects

Risk	Instrument	Class of Instrument	Instrument Mechanics	Offered by
Counterparty Risks	Surety Bonds	Guarantee	Safe guards against non-performance by contractor and ensures completion of project as per agreed terms and conditions	Specialised divisions within insurance companies
Construction/ Completion Risks	Construction All Risks/ Erection All Risks	Insurance	Safeguards against risks of physical loss or damage and 3 rd party liabilities including all contractors work	Insurance companies

4.1.1.1. Commercial insurance products- CAR/EAR^{6,7}

Construction All Risk (CAR) Insurance offers comprehensive and adequate protection against loss or damage in respect of the contract works, construction plant and equipment and/or construction machinery, as well as for third party claims in respect of property damage or bodily injury arising in connection with the execution of a building project. The insurance premiums calculated are more accurate and realistic as compared to the safety margins included in the construction bids. A similar cover is provided by Erection All Risks Insurance (EAR). This policy covers physical loss or damage to property, as well as third party liability related to work conducted on the contract site. The cover includes works brought on to the site for the purposes of the contract as well as temporary works erected or constructed on-site. Additionally, the policy includes coverage for physical loss or damage to construction plant machinery equipment and tools used per the insured contract.

4.1.1.2. Surety Bonds

Surety bonds are designed in the form of an agreement between 3 parties – the owner (also referred to as the obligee), the contractor (principal), and the surety. For a premium the surety provides protection against the contractor failing to complete the project satisfactorily. The surety either assumes responsibility of the contractor's obligation or compensates the owner for delay in project completion.

⁶ Definition as provided by Munich Re

⁷ <http://sify.com/finance/insurance/fullstory.php?id=13370780>

There are different types of surety bonds covering the various risks associated with the contractor i.e. – bid bonds (the contractor will honour the bid at the agreed price); performance bonds (project will be completed on time and as per specifications); and payment bonds (all necessary payments will be made by the contractor thus ensuring owner is protected against lawsuits arising from unpaid labour, etc.).

The cost of such bonds ranges from 1% - 3 % of the contract amount.⁸ The premium is primarily a prequalification fee that the surety charges to evaluate the contractor and to provide a surety on his behalf. Sureties view their underwriting as a form of credit so the emphasis is on prequalification and selection.⁹

Surety bonds are considered superior to bank guarantees as they provide wider coverage against all potential risks, including financial, associated with a contractor. The emphasis is on timely completion of the project, and avoiding loss to the greatest extent possible. Though provided by insurance companies, the surety is not an insurance policy. It is merely an additional protection available to the owner in case the contractor fails to perform as per contract.

There were some challenges associated with surety bonds. Some of the key challenges were:

- The bonding capacity has reduced following failure of some deals such as Enron (2002). This has caused the surety companies to impose stringent conditions on contractors thus making it unviable for them to bid for contracts.
- In developing countries the construction sector does not have sufficient credit standing to provide corporate guarantees to financial institutions. Completion bonds covering debt service provided by financial institutions are generally required by lenders. This represents a major capacity issue for the contractors and contrasts with the practice in Europe, where lenders appear to be comfortable with partial surety bonds combined with other insurance, such as Professional Liability.
- Inconsistent risk management practices by financiers – Requirements of financiers differ from country to country. For example projects in Latin America do not require insurance arrangements as described above

Example: Recommended use of completion bonds for wind farm

BANCO DO NORDESTE (BNB) – Northeast (Development) Bank - the largest regional development bank in Latin America has recommended the use of completion bonds for a wind farm being developed under Brazil's PROINFA program. The discussions are underway and final decisions have not been arrived at.

Other risk mitigation suggestions on this deal are:

- **Inherent Insurance to the Engineering and Construction Agreements** for the operational phase of the plant;
- **Bonds offered by the EPC contractors** subject to validation and examination by BNB as to their effectiveness in their proposed coverage;
- **Offer of Property Guarantees for mortgage with BNB**, as signalled by the client and when applicable, for equipment and project facilities financed by BNB;
- **Collateral Agreement (Aval) or Guarantee (Fiança)** by the company's controlling entity to diminish the operational risk;
- **Liquidation Fund**, made on the date of the contract, in a reserve account of Banco do Nordeste, in an amount no less than 6 (six) reimbursement instalments, considering a posterior shortfall, throughout all the operation;
- **Shares of the constituted SPCs given as a lien, as well as the rights emerging from the concession.**

4.1.2. Instruments to mitigate Operation Phase Risks

Table 6: Overview of FRM for addressing operation phase risks in large scale RE projects

Risk	Instrument	Class of Instrument	Instrument Mechanics	Offered by
Performance Risks	Physical Damage Insurance	Insurance	Protects against sudden and unforeseen physical loss or damage to the plant/ assets	Insurance / Reinsurance companies
	Machinery Breakdown Insurance		Defects in material, design, construction erection or assembly, fortuitous working accidents	
	Business Interruption (BI)/ Delay in start-up Insurance/ Advance loss of profit insurance		For business interruption perils insured under the property damage policy, DSU/ ALOP	
	Operators Extra Expense		All expenses associated with controlling the well, redrilling/ seepage and pollution	
	General/ Third Party Liability		Legal liability in respect of death or bodily injury, physical loss or damage to third party property, trespass nuisance and interference. Separate liability policies available for hull and machinery, charters liability	
Counterparty Risks	Maintenance Bonds*	Guarantee	Ensures performance by O&M contractor as per stipulated terms and conditions	Specialised divisions of insurance companies
Fuel Supply Risk	Weather derivatives/ Weather Insurance	Structured products	Addresses risk of intermittent resource supply	Capital markets
Credit Risk	Partial Credit Risk	Guarantee	Guarantees performance on specified amount of loan.	MFIs
	Credit Derivatives	Structured products	Allows transfer of risk to an entity with higher risk appetite	Capital markets

* Maintenance bonds are a form of surety bonds that guarantee performance of a plant after completion. Surety bonds have been described above, and therefore not repeated here.

4.1.2.1. Commercial insurance products

*Physical Damage Insurance*¹⁰ cover is provided for sudden and unforeseen accidental damage to machinery. The machinery can be at work or at rest. Also covered is machinery being dismantled for cleaning / overhauling and in the course of these operations being shifted within specified premises or being re-erected subsequently also covered

*Machinery Breakdown Insurance*¹¹ indemnifies the insured against breakdown of any machines, Power generators, cooling/heating generators, lifts, escalators, switchboards, etc., against risks evolving from mishandling of the machines, mechanical flaws or short circuit, loss/damage caused faulty design/installation/inexperience or negligence whilst working or at rest or being dismantled, moved or re-erected for the purpose of cleaning inspection, repair or installation in another position or by an accident, perils of nature.

Business Interruption Insurance^{12,13} is the insurance of loss as a consequence of the interruption of business by an unforeseen event such as a fire or a breakdown of machinery... This insurance may cover:

- Profits the business would have earned, based on the financial records, had the disaster not occurred.
- Operating expenses, such as electricity, that may occur even if the main business activities are temporarily stalled.
- Some policies cover expenses incurred from operating out of a temporary location while the original premises are being repaired.

*Delay in Start Up (DSU) or Advanced Loss of Profit (ALOP*¹⁴*) Insurance* safeguards against loss in revenue resulting from delayed start up of a project. The insurance cover is designed to secure the revenue that is required to service debt and realize anticipated profits. The protection provided is usually broad and covers delays arising from physical damage caused by any type of peril included in the relevant material damage cover (i.e. CAR/ EAR etc.). The DSU cover is designed to indemnify only the principal against the financial loss arising from a delay attributable to an indemnifiable physical loss.

*Extra Expense Insurance*¹⁵ reimburses a business for reasonable expenses beyond normal operating expenses that keep the business from shutting down during a post-disaster restoration period. Usually, extra expenses will be paid if they help decrease business interruption costs. There are instances where extra expense cover is sufficient without business interruption insurance.

*Third Party Liability*¹⁶ *Insurance* is the "guarantee" by the Insurance Company to assume indemnity claims directed to the insured in virtue of losses caused by his action or failure to act. The choice of appropriate insurance coverage depends mainly on the nature of conducted

¹⁰ http://www.bajajallianz.com/BagicNxt/bajaj_home/products/businee_unit/contractors_plant.htm

¹¹ http://www.allianzcp.com/insurance/commercial/comengi_eng.asp

¹² http://www.1st-business-insurance.co.uk/business_interruption.html

¹³ http://www.rmiaa.org/Business/business_interruption_insurance.htm

¹⁴ definition as provided by Swiss Re

¹⁵ http://www.rmiaa.org/Business/business_interruption_insurance.htm

¹⁶ http://www.aon.com/lt/en/risk/third_party_liability.jsp

activity and individual needs of the insuring party. For example, General Third Party Liability insurance covers the insured's third party liability in virtue of losses to a person or property caused to third parties in relation to conducted business activity or property ownership. Professional Liability Insurance coverage includes third party liability of the insured for losses in property of third parties resulting from offences committed during the realization of professional activities mentioned in the insurance contract.

The availability survey and the scoping study clearly highlight that there is wide application of insurance products for RE projects. There is sufficient underwriting capacity for this sector as well. However, the application of insurance to the RE sector is restricted by:

- Lack of adequate data – Most RE projects do not have the required statistical data for measuring probability distributions and correlations between random loss events. This has a direct bearing on the premium calculation.
- Underwriting restrictions on most of the technologies. Insurance covers are provided on case by case basis and are expensive and have restrictive clauses at times.
- Internal capital allocation decisions – Capital allocation decisions involve assessment to ensure that the business case for underwriting certain risks meet minimum underwriting requirements. Such an assessment (which is the same for large scale and small scale projects) includes charge for the risk capital employed, a risk premium and an administrative cost. For medium to large size insurance companies, central cost allocation manifested through the administration costs are a significant barrier to entry. Consequently most small projects have a high opportunity cost and rarely exceed the internal hurdle rates required by management.

Example: Risk bundling to provide comprehensive insurance cover to wind mill customers

Wind Mill- Package Insurance in India

The proposed insurance package was developed by S&S General Insurance Professionals of India Ltd to provide a comprehensive cover for 7 years to all customers of a wind mill manufacturer. Cover included the following - Marine, Erection including Testing, Fire, Machinery Breakdown, Burglary, Extended Warranty and Minimum Generation Guarantee (Grid Basis) Insurances. The Insurance cover is being provided by a large public sector insurance company. The premium cost in this package insurance is considerably low than the comparable basic specific insurance products. (Minimum Generation Guarantee and Extended Warranty Insurances are not available as specific insurance products).

It is anticipated that this product will be replicated in India and elsewhere over the next 2 – 3 years. This will happen after the insurer has adequate data on the claims experience of this package insurance.

4.1.2.2 Weather Derivatives

Renewable energy projects have a natural weather position and, directly or indirectly, this is often the most significant source of day-to-day financial uncertainty. Weather derivatives¹⁷ are financial instruments that can be used by organizations or individuals as part of a risk management strategy to reduce risk associated with adverse or unexpected weather conditions. Weather derivatives are different from other derivatives as i) they are used to hedge volume risk as against price risk, and ii) there is always financial settlement as the underlying commodity (temperature, wind speeds, precipitation or rain) cannot be physically settled. However, like other standard derivative products these can be structured as swaps, caps, collars and futures.

Temperature is still the most commonly traded weather product but other risks are gaining prominence. Wind power indices (WPIs) are available to wind farm developers in areas where there is sufficient data to create an index that is highly correlated to the wind flow into the turbine. Entergy-Koch Trading (EKT) has developed proprietary wind power indices for select locations in the US and Europe. The expected power output for a particular location can be calculated as a function of wind speed and direction as well as the turbine type installed at a particular location. The wind farm can then hedge for fall in production for very low or very high speeds.

Weather derivatives are increasingly offered as part of structured finance packages or “quanto” hedges that may also include power and currency derivatives. As a general guide (to *all* derivatives), the more transparent the product, the cheaper it will be to use. The quality and sparseness of available data is a barrier to the development of weather products for many regions but cheaper satellite monitoring systems are evolving to reduce this information deficit.

Wide scale application of weather derivatives, however, is restricted by non availability of good quality weather data. Even in the developed European countries where weather derivatives have been traded based on wind power indices, the quality of data and the performance of the index have been circumspect which has undermined investors’ confidence.¹⁸

Example:

In July 2003 HypoVereinsbank, together with Hamburg based underwriters König & Cie., generated the first wind hedge deals to hedge the wind risk of a wind farm in Europe. This was done through weather derivatives with which investors in the Herzogtum Lauenburg wind farm are insured by König & Cie. against loss of earnings in case the wind is not strong enough.

Source: [http://www.investis.com/reports/hvb sr 2004 en/downloads/part12.pdf](http://www.investis.com/reports/hvb_sr_2004_en/downloads/part12.pdf)

¹⁷ http://en.wikipedia.org/wiki/Weather_derivatives

¹⁸ “Weakness exposed in wind index system”, p59-60 Wind Power Monthly, January 2006

Example:

In another deal, Centurion Energy has entered into an agreement with HVB to protect itself against variations in wind speed. Centurion is to buy three-year 'collars' from HVB, which involve buying a put option linked to a wind power index created specifically for the wind farm site, and financing the put by selling a call option on the index. The index takes account of regional wind speed measurements and also the turbines used at the site. In a bad year for power production, the contract will pay Centurion, whereas it will pay HVB if it has a profitable year. The pay-out is capped symmetrically so neither party will have to pay more than 25% of the expected wind farm turnover. More details of the deal are not in the public domain.

Source: <http://www.environmental-finance.com/2004/0404apr/whedge.htm>

4.1.2.3 MFI Guarantee (Partial Credit Guarantee)

Acting as a *credit enhancement mechanism*, a partial credit guarantee,¹⁹ represents a promise of full and timely *debt service payment* up to a *predetermined amount*. The sum paid out under the guarantee covers creditors, irrespective of the cause of default (i.e. covering for both political and commercial risks). The guarantee amount may vary over the transaction life cycle, as it is based on the borrower's expected cash flows and creditors' concerns regarding the stability of these cash flows.

These guarantees aim to increase local currency funding thus addressing currency risk as well as assisting in the raising of capital. Another important feature is that project developers are able to avail of longer maturities than what the lenders in the market would usually offer. This will positively impact the cash flows and improve project viability.

PCG is offered by various multilateral institutions and may or may not require a sovereign guarantee. The following table provides a snapshot of sovereign guarantee requirements by different MFIs.

Table 7: Various PRG programs offered by various MFI Organizations

Some Examples of MFI Partial Credit Guarantees	
Sovereign Guarantee Required	Sovereign Guarantee Unnecessary
IBRD Partial Credit Guarantee	IFC Partial Credit Guarantee
Asian Dev Bank PCG (Public Sector)	IADB Credit Guarantee (Private Sector)
African Dev Bank (Public Sector)	Asian Dev Bank PCG (Private Sector)
ICIEC Bank Master Insurance	African Dev Bank Enclave Projects

¹⁹ IFC website – <http://www.ifc.org/ifcext/proserv.nsf/Content/PartialCreditGuarantee>

4.1.2.4. Credit Derivatives

Credit Derivatives are securities that offer protection against credit or default risk of bonds or loans. Credit derivatives may involve single name reference assets or a basket of names and can be customized to meet investor needs. Sovereign single- name credit default swaps are the most liquid. Transactions on corporate credits tend to be customized and structured using CLNs, CLDs or a structured default swap.

As per all credit derivatives, Emerging Market Credit Derivatives (EMCD) essentially involve the bilateral contractual transfer of credit risk on an underlying class of reference obligations of a particular reference entity (sovereign or corporate) between participants. EMCD facilitate a range of investment and hedging opportunities including longer tenors than those available in the cash market and hedging of bank lending to emerging market borrowers (while maintaining client relationships); creating/hedging bond positions; and alternative investments by local financial institutions and investors, particularly in shorter-dated instruments.

A **credit default swap** is a bilateral financial contract in which the risk shedder pays a fixed periodic fee in return for a contingent payment by the risk taker triggered by a credit event on a reference asset. Credit events can be the failure by the reference entity (corporations, banks and sovereigns from the developed countries or emerging markets) to pay, bankruptcy, obligation default or restructuring. Repudiation/moratorium is an additional credit event included where sovereigns are the reference entity. The spectrum of deliverable assets is specified in the CDS contract and may include bonds and loans in the investment or high-yield category. The credit default structure is very close to that of a guarantee. Nevertheless, there are three important differences: the range of credit events that trigger payment is much broader under derivative contracts; the risk shedder is not required to prove that it itself has suffered a loss in order to receive payment; and CDSs are based on standardised documentation to encourage trading. In 1999, ISDA published revised standard credit derivatives definitions for use with its Master Agreement.

Credit-linked notes (CLNs) are funded balance sheet assets that offer (synthetic) credit exposure to a portfolio of reference assets. CLNs embed credit derivatives in a security issued by the risk shedder. The performance of the note is linked directly to the performance of the reference pool. The investor receives coupon payments that include a risk premium and par redemption at maturity. The risk taker has a counterparty risk on the risk shedder but not vice versa as the proceeds of the note issuance are passed on directly to the risk shedder. If the risk taker wants to avoid counterparty risk an SPV may be used and the structure becomes a synthetic CDO

Credit-linked deposits are similar to CLNs, but involve the placement by the protection seller of a deposit with the protection buyer – rather than upfront payment of note principal – in exchange for a coupon incorporating the premium for default protection on a reference asset together with a spread reflecting issuer credit risk. In a credit event, the depositor typically forfeits the deposit and takes physical delivery of the defaulted underlying reference asset. CLDs are not listed and are thus generally cheaper and easier to effect.

Synthetic CDOs are usually structured transactions in which a special purpose vehicle (SPV) is established to sell credit protection on a range of underlying assets via individual credit

default swaps. The SPV in turn issues several prioritized tranches of notes to investors, with note proceeds typically invested in collateral consisting of high-quality government paper to meet contingent credit default swap payments, while note-holders (in order of seniority) receive both cash flows on the underlying collateral and premiums on the SPV default swaps. Synthetic CDO's provide an attractive way for banks and other financial institutions to transfer credit risk on pools of loans or other assets without selling the assets.

Currently credit derivatives cannot be supported by all developing economies. Poor liquidity and shallow markets are some of the limiting factors. Then credit derivatives in emerging markets address a limited set of risks (primarily country risks) and ignore other risks such as currency convertibility, political and legal risks. Further the availability survey highlighted other challenges such as lack of loan-loss history on corporate borrowers and a cloud of country risk uncertainty in the investment community that overshadows analysis of specific company credit risks. Synthetic CDOs generally require credit ratings and credit loss histories which are difficult in the emerging market context. Some bankers highlighted that there is insufficient portfolio diversification to construct emerging market synthetic CDOs.

Securitization of Wind Portfolio

In the E100m (US\$130m) Max Two Ltd "Breeze One" securitization, Energiekontor financed and refinanced a portfolio of eight wind farms in Germany and Portugal (two of which were not built at the time of financing). This is an example of a financial institution, which has provided debt to individual projects, trying to free up its balance sheet to optimize their return on capital.

Additional features can be used to enhance the overall credit ratings of such a transaction by issuing subordinated tranches of bonds to provide credit enhancement to the more senior ranking bonds, using swaps to mitigate interest rate/basis rate mismatches, using liquidity facilities to smooth cashflow blips in order to keep the bonds current for agreed periods so as to support their ratings and (assuming an investment grade rating on the portfolio) availing monoline insurance to enhance ratings on the notes.

Source: Securitization as a financing option for Wind Farm Portfolios, Client Note, Lovells (www.lovells.com/NR/exeres/156D8844-6584-476A-B48A-93FBB9298880.htm)

Synthetic CDO

Depfa Bank plc recently closed £391.7 million partially funded synthetic CDO of its Private Finance Initiative (PFI) loan portfolio. The transaction was undertaken with KfW Foderbank to transfer risk thereby freeing up capital to further its lending activities in the public infrastructure market. This is an example of a simple solution to provide relief from potential illiquidity of funding long term infrastructure transactions.

Source: Securitization as a financing option for Wind Farm Portfolios, Client Note, Lovells (www.lovells.com/NR/exeres/156D8844-6584-476A-B48A-93FBB9298880.htm)

4.1.3. Instruments to mitigate Generic Risks

Table 8: Overview of FRM for addressing generic risks in large scale RE projects

Risk	Instrument	Class of Instrument	Instrument Mechanics	Offered by
Political Risks	Political Risk Insurance	Insurance	Provides protection to lenders against risks arising from: <ul style="list-style-type: none"> ➤ Currency inconvertibility ➤ Political violence ➤ Confiscation, Expropriation and Nationalization ➤ Breach of Contract 	Private players such as AIG, Lloyds, and Bilateral agencies such as OPIC,
	MFI Guarantees (PCG) */ (Political Risk Guarantee)	Guarantee		MFIs
	Export Credit Guarantee			Export Credit Agencies
Force Majeure	Insurance	Insurance		Insurance companies
	Catastrophe Bonds	Securitisation		Capital Markets

- PCG is described in the section above and therefore not repeated here.

4.1.3.1. Political Risk Insurance

Political Risk insurance (PRI) provides protection against failure arising from political actions in emerging markets. Protection is provided against:

- *Currency Inconvertibility* – protects against losses due to currency transfer restrictions. It is to be noted that the cover is not available for currency fluctuations or devaluations.
- *Confiscation, Expropriation & Nationalization* – protects against losses due to various acts of expropriation.
- *Political Violence* – protects against losses caused by war, civil disturbance or terrorism.
- *Breach of Contract* – Breach of contract coverage refers to losses arising from a host government’s breach or repudiation of a contract with the owner of an insured project. For example, for a power project such a breach may result from failure by a government-owned entity to make payments in accordance with the power purchase agreement between the independent power producer and the user or distributor.

PRI is provided by private sector insurance companies and Official Bilateral Institutions (OBIs).

- Private sector players are driven primarily by economic considerations and may not extend cover for least developed countries. Costs of providing insurance cover are:

Figure 2: Representative Premium Costs for PRI provided by private insurance companies

Illustrative Private Sector PRI Premia²⁰

Guarantee Cover	Premium Range
Expropriation	From 0.45 upwards
w/ Breach of Contract	from 2.50 upwards
FX Inconvertibility	0.25-2.00
Political Violence	from 0.30 upwards

- Bilateral Institutions will have a mandate to safeguard interests of investors from their home countries. OBIs have been one of the oldest presences in the field of PRI.

Figure 3: Representative Premium Costs for PRI provided by OBIs

OPIC’s Base Fee (percent per annum)²¹

Guarantee Cover	Guarantee Fee	Standby Fee
Inconvertibility	0.45	0.2
Expropriation	0.40-0.90	0.2
Political Violence	0.40-0.70	0.2

²⁰ “Review of the Partial Risk Guarantee of Asian Development Bank”, Asian Development Bank, November 2000.

²¹ “Review of the Partial Risk Guarantee of Asian Development Bank”, Asian Development Bank, November 2000.

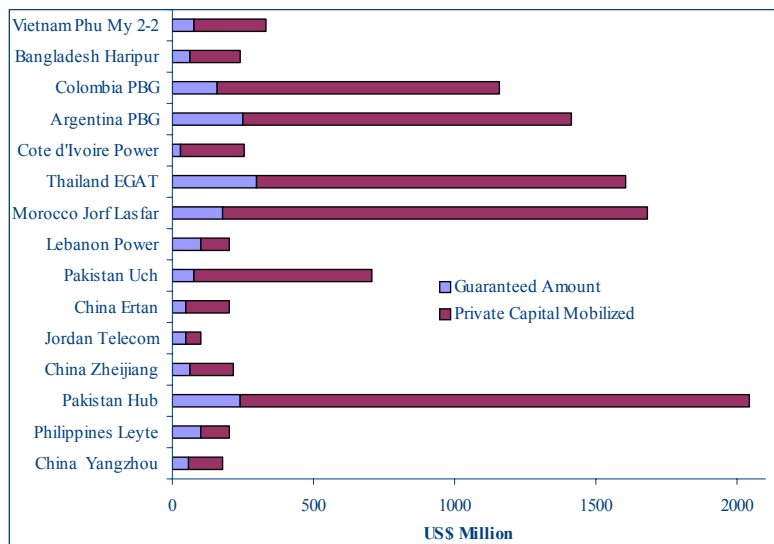
MIGA and ADB have partnership programs in place wherein they may be the front end insurance provider, but most of the risk is then passed onto private insurance companies. For example, MIGA has a Cooperative Underwriting Program (CUP) wherein MIGA is the insurer-of-record and issues a contract of guarantee for the amount of insurance requested by an investor (subject to available capacity), but retains only a portion of the amount for its own account²². This is a good approach for introducing private players into the emerging markets.

An innovative application of PRI is the PRI ensured bonds. PRI ensured bonds have been used as a credit enhancement mechanism wherein the borrower is able to achieve a higher investment rating and access foreign markets which would have been inaccessible otherwise. These bonds have been successfully issued in Brazil for some power sector players.

4.1.3.2. Partial Risk Guarantee

The Partial Risk Guarantee (PRG) offered by MFIs is similar to the political risk insurance discussed above. While the product remains the same, the objective and principle of operations are quite different from private sector players. A major variation is that PRGs work on the principal of deterrence. MFIs have the ability to negotiate with governments to resolve situations before these guarantees are invoked. This is clearly reflected in MIGA’s operating history. In all its operations since 1990, MIGA has had to settle only one claim. Another variation is that MFIs will offer these guarantees as a means to support specific mandates of encouraging investments in certain countries. This implies that PRGs are more stable and likely to be available for investments in least developed countries.

Figure 4: Impact of PRG in mobilizing private capital²³



From the above diagram it is clear that for every \$1 of guarantee, approximate \$5 of private capital can be raised

²² <http://www.miga.org/sitelevel2/level2.cfm?id=1172#con6>

²³ Lindlein P., Mostert W. “Financing Instruments for Renewable Energy”, final draft report, KFW 2005 – adapted from: Babber S “Infrastructure Financing; growing risk aversion in emerging markets and the need for Risk Mitigation”, workshop on tools for risk mitigation for small scale and clean infrastructure projects, 2003.

Given below are indicative costs of such guarantees provided by the MFIs

Figure 5: Representative Premium Costs for PRI provided by MFIs

*MIGA's Base Guarantee Fee (percent per annum)*²⁴

Guarantee Cover	Manufacturing	Natural Resources	Infrastructure
Expropriation	0.60	0.90	1.25
FX Transfer & Inconvertibility	0.50	0.50	0.50
Political Violence	0.55	0.55	0.60
Breach of Contract	0.80	1.00	1.25

4.1.3.3. Export Credit Guarantees

Available through various Export Credit Agencies, Export Credit Guarantees cover any political or commercial risks that may arise from exports to emerging economies. In addition, Export Credit Agencies have great potential to promote renewable energy products and services to non-OECD countries as they have the capacity to:²⁵

- Assess economic and political risks in non-OECD countries
- Provide significant capacity to assume risk through relatively larger exposure limits than commercial banks and insurers
- Offer longer-term repayment schedules than commercial banks and insurers.

A UNEP-SEFI sponsored study had identified some areas where ECAs could play an important role in promoting investments in the RE sector. Some of these areas are:

- Extension of loan repayment tenors
- Adjustment of premium and interest rates to reflect extended repayment terms
- Study development of new tools and structures such as:
 - Bundling of small scale RE projects to address issues of high transaction costs. ECAs could develop guidelines for financing of such bundles; and
 - Developing acceptable RE project financing development models
- Provide cover in local currency to address currency risks
- Develop alternate risk criteria to ascertain an RE exporter's capacity to repay loan etc.

Although there is enough capacity for Renewable Energy projects by ECAs- for example ECGD (UK's ECA) has 50 million pounds-, these funds has not been used and the contribution of ECAs to RE projects remains dismally low. This is due to the shortage of interest and qualified deals which meet the set conditions. However, there have been changes to the Official Agreement wherein ECAs can now extend coverage to 15 years for some types of RE projects, and ECAs may consider adopting a more aggressive strategy to market themselves to RE project developers and exporters.

²⁴ "Review of the Partial Risk Guarantee of Asian Development Bank", Asian Development Bank, November 2000.

²⁵ "Making it happen: Renewable Energy Finance and Role of Export Credit Agencies", UNEP SEFI

4.1.3.4. Catastrophe Bonds

Catastrophe bonds (also referred to as Cat bonds) are a structured product to transfer risks of large catastrophes from the insurer/ reinsurer to the capital markets. The bonds were first issued in the market in 1990. With more experience and increasing investor confidence, the cat bonds are characterized by reducing coupons and associated transaction expenses.

The relative advantages of catastrophe bonds when compared with traditional reinsurance, from a sponsor's perspective, are that they:²⁶

- Provide full collateralization of losses
- Lock in capacity and price over a multiyear period
- Provide a new, diversified source of risk capital
- Limit risks of future capacity and/or price shocks from the traditional reinsurance market

Cat bonds have evolved over the years with certain product developments having taken place. Some of the key developments are:

- Bond terms – Bond terms are now relatively stable at 2 – 4 years (earlier terms used to vary from 1 – 10 years).
- Single vs. multiple peril bonds – Both types of bonds are issued in the market. Sellers prefer multiple peril bonds to reduce transaction costs associated with bond issuance whereas buyers prefer single peril bonds.
- Increase in demand for cat bonds (demand now outstrips supply of such bonds). This is mainly due to:
 - Better pricing of cat bonds
 - Surge of catastrophes in 2004
 - Development of a dedicated investor base for Cat Bonds

Catastrophe bonds are proving to be a viable alternative to traditional insurance and reinsurance. However, this is a relatively new product developed in the mid 1990s. All applications till date have been found in developed country markets. Developing economies lack the information and investor sophistication that is required for cat bonds

²⁶ The Growing Appetite for Catastrophe Risk, Guy Carpenter & Company, Inc., 2004

4.2. Small Scale Projects

4.2.1. Instruments to mitigate risks associated with Project developers

Table 9: Overview of FRM for addressing project developer related risks in small scale RE projects

Risk	Instrument	Class of Instrument	Instrument Mechanics	Offered by
Development (Credit) Risk	Supplier Guarantee Funds/ Partial Credit Guarantees	Guarantee	Share risk with the lender to cover default of project developer.	Funds established by MFIs, SME promotion bodies, banks etc.

4.2.1.1. Supplier Guarantee Funds/ Partial Credit Guarantees

A credit guarantee fund is a financial product made available to support small and medium scale enterprises to secure finances from the commercial lending sector. A small scale entrepreneur can buy a credit guarantee as a partial substitute for collateral requirements.

Guarantee funds assume that the project developers have strong business models and that they are not able to mobilise financing due to their small size. Some of the benefits of guarantee funds are:

- Increased liquidity in the market – Once a guarantee is available, local banks are willing to invest
- Correcting information asymmetries – Credit guarantee funds tend to be closer to their users than banks can be. They are in a position to address an information void that banks may have identified.

Guarantee funds could be established by governments or MFIs to promote growth in specific sectors. There have been instances wherein a group of project developers have also pooled their resources to provide guarantee for one another.

It is recommended that there is a risk sharing agreement between the borrower, the guarantee fund and the lender. This will ensure that each party has stake in the arrangement and is motivated to carry out proper due diligence. For e.g. if the lender receives a 100% guarantee from the fund, then they may be lax in evaluating the borrower's proposal.

The costs of securing guarantees are a fixed percentage of guaranteed loan amounts. This rate usually does not exceed 2% as the guarantee fee is paid over and above the regular interest being paid to the lender²⁷.

*Partial Credit Guarantees*²⁸ can also be obtained from multilateral financing institutions. These guarantees are similar to those described under Section 4.1.2.3. In this case the guarantee would be extended for the project developer and not for a project. Partial guarantees can be either in local currency (for domestic transactions) or foreign currency (for cross-border transactions). Local currency partial guarantees help project developers' access to local currency financing of the desired tenor.

²⁷ L. Deelen, K. Molienaar, "Guarantee Funds for Small Enterprises; A manual for guarantee fund managers", ILO publications, 2004

²⁸ <http://www.ifc.org/ifcext/proserv.nsf/Content/PartialCreditGuarantee>

Cross-border partial guarantees are best for a client company that cannot access international markets on its own because of the high-risk premium associated with the country in which it is domiciled. With a cross-border partial guarantee a client may gain access to international markets by mitigating the sovereign risk associated with the borrowing.

The example below is a UNDP-GEF guarantee fund which provided guarantee both for vendors and end customers. The program seems to be a success both at the vendor and end user level.

Example: Portfolio Guarantee Fund in Uganda (Vendor Financing scheme)

Program duration: 1998- 2004

GEF contribution: US\$ 1,756,000

UNDP providing a US \$ 500,000 credit fund (vendor financing component – US \$ 150,000)

Vendor financing credit fund – (arranged through a commercial bank to help suppliers buy in bulk). Funds were provided at a lower interest rate (12 percent) with reduced collateral requirements. Over the course of the project, six companies borrowed funds to procure and install several hundred PV systems. 12 loans were disbursed and there was no need to draw down from the guarantee fund)

Increased competition amongst vendors led to 15% decline in costs of PV systems. After-sales services were also found satisfactory by the end users.

The UNDP-GEF-supported Uganda Pilot Photovoltaic Project for Rural Electrification installed 2,300 solar home systems by PV vendor financing and PV consumer lending over three years.

Note: there was a consumer financing component as well that has been discussed later in the document

Source: Solar Photovoltaics in Africa, Experiences with financing and delivery models, UNDP and GEF

4.2.2. Instruments to mitigate risks associated with End users

Table 10: Overview of FRM for addressing end user associated risks in small scale RE projects

Risk	Instrument	Class of Instrument	Instrument Mechanics	Offered by
Risks of physical damage including theft	Micro Insurance	Insurance	Safeguards against loss in income or theft of system components	Insurance / Micro Insurance companies
Credit Risk	Guarantees	Guarantees	Guarantee mechanisms or facilities are put in place to safeguard lenders against end user's credit defaults	MFI's

4.2.2.1. Micro-Insurance^{29,30, 31}

Micro insurance is a system of protecting poor people against specific shocks using risk pooling in return for regular affordable premium payments proportional to the likelihood and cost of the risk involved. Appropriate delivery mechanisms, procedures, premiums, and the coverage, define micro insurance policies that respond to the limited and variable cash flow of low-income households, and the often unstable economic environment in which they live.

To date, interest in micro insurance has mostly focused on credit/life, life, and health insurance. A few institutions have introduced property insurance. New experiments with weather insurance for crops are showing promise. There are various models, which are differentiated based on the party absorbing risk. Some of the models attempted are

- **Partnership model:** Insurers, with products, are pairing with Micro Financing Institutions and others, with low-income markets, to provide micro insurance, as AIG does with micro finance institutions in Uganda.
- **Community-based model:** Local communities form groups that capitalize and manage a risk pool for their members. ILO STEP and CIDR deliver health services using this model.
- **Provider model:** Hospitals and clinics create prepaid or risk pooling coverage for people at their facilities. Microfinance institutions such as ASA and Grameen use this model but manage their own clinics.

²⁹ M. Cohen and M. J. McCord, "Financial Risk Management Tools for the Poor", *Micro-insurance Centre Briefing* Note # 6, www.microinsurancecentre.org.

³⁰ E. A. Barbin, C. Lomboy, & E. S. Soriano, "A Field Study of Microinsurance in the Philippines", Working Paper No. 30, *Social Finance Programme & InFocus Programme on Boosting Employment through Small Enterprise Development*.

³¹ S. Neftci, "Contingent Capital: Providing Insurance Opportunities", Credit Risk Special Report, *Risk*, 2000

- **Full service model:** Regulated insurers downsizing insurance services like Delta Life (Bangladesh), which offers a long-term savings product (annuity) with life insurance and a premium affordable by the poor. Some microfinance institutions³² also assume the role of insurers. Most of these offer only basic credit life insurance to protect their loan portfolios.
- **Social protection models:** National governments often underwrite cover for certain risks through social insurance programmes such as with health care, crops and livestock, and covariant risk.

Micro-insurance could be a good risk mitigation instrument, especially if the RE system is playing a role in end-user financing. Micro-insurance has already found some application with RE systems as theft insurance for solar home systems. Project developers in India are offering this insurance cover to protect against module thefts. The cover is competitively priced and ensures stable performance from the system.

In the instances where RE systems are being used for income generating activities/productive use, any disruption in system performance has direct impact on income earning, and consequently on loan repayment. Moreover, in the case where the RE system is considered as collateral for the loan or even an asset for the securitization, micro insurance could be effective in facilitating RE financing.

However, insurers often believe that investments in RE systems do not enhance incomes of small households and are unwilling to look at providing appropriate covers. Other barriers are very small transaction size and lack of experience and understanding of RE systems.

Example:

Environ Energy- Tech Services (EETS), a Solar Home System (SHS) Integrator in the East Indian state of West Bengal has tied up with 2 reputed insurance companies to provide theft insurance for SHS. The companies take around 3 months to process claims. EETS replaces the components for the end user at the earliest and follows up with the insurance companies separately.

Note: Based on interview with the system integrator

³² Beyond acting as an agent, the provision of micro insurance can be treacherous for microfinance institutions because the risk structure of insurance is significantly different from that of credit. Microfinance institutions do not have, nor should they develop such capacity. Insurance risk should be borne by professional insurers not microfinance institutions. Bad pricing by UMASIDA in Tanzania meant that initial premiums covered less than 20% of their costs. The result is an erosion of confidence with repeated upwards price adjustments, lack of funds to cover care, providers refusing to provide “covered” care, and heavy non-renewals. However, the interest from professional insurers has been limited.

4.2.2.2. Guarantees

Guarantee structures are useful for mitigation of end users' credit risk as well. Partial credit guarantee could be made available for the end user where MFI's guarantee a certain portion of the lender's portfolio.

Guarantee facilities have also been set up with a drawdown facility. The facility covers losses after defaults exceed a predetermined percentage of the total portfolio. However, the onus is on the lender to prove that all possible efforts have been made to recover the defaults.

The example below is a UNDP-GEF guarantee fund which provided guarantee both for vendors and end customers. The program has now ended and could be evaluated for performance. The program has been a success both at the vendor and end user level.

Example: Barrier Removal to Malawi Renewable Energy Program (BARREM)

Program duration: 2001 - 2006

GEF contribution: US\$ 3.4 million

Other partners – UNDP (US \$ 1.199 million), DANIDA (US \$ 2.25 million), SOBO (US \$ 2 million) and Government of Malawi (US \$ 1.855 million)

Key targets-

SHS installations – 4000 (400% increase over baseline)

Installations for institutions or for social service – 200 health clinics, 400 schools, 300 solar refrigerators and 190 tobacco fans

Credit Guarantee Fund –

Delay in repayment beyond a certain period – system to be repossessed

Loan agreement is cancelled with buyer.

Financier can recover outstanding balance on loan from Guarantee Fund.

Success to date is modest as number of loans though increasing is still quite small. Also, program features are not suitable for the market and there is not balanced risk sharing between different players. System suppliers have to bear significant default risk (almost 50%) whereas financiers are fully covered through the guarantee account.

Source: Solar Photovoltaics in Africa, Experiences with financing and delivery models, UNDP and GEF

4.3. Geothermal Projects

As discussed in Section 3.2, the main risks associated with geothermal projects are related to exploratory and drilling risks. In almost all circumstances, governments or MFIs have supported the initial exploratory stage and assume the risks associated with this stage. There is one instance where a private insurance company providing a cover known as “Discovery Risk Insurance” (see the box below).

African Rift Geothermal Development Facility (ARGeo):

Aims to remove barriers to development of geothermal energy in the East African Rift Valley

Components: Technical and policy support, *Partial Risk Guarantee Fund* (including subsidies, seed capital in the initial stages, transaction advice window and power plant development funding)

Partial Risk Guarantee Fund proposed:

- Fund will address resource and explorations
- 2 window facility – early stage resource drilling and advanced stage of production drilling
 - Initial stage – high risk exploratory risk. Soft window wherein guarantees are also supported by a subsidy component.
 - Advance stage – lower risk, advanced drilling stage – guarantee will be provided on commercial basis.

GeoFund: The paramount objective of the GeoFund is to build sustained market capacity to develop and finance geothermal projects on commercial terms using local private capital in the ECA region.

Main components of the program are:

- Technical assistance: work with participating governments to identify the barriers, determine their resolution queue and devise means to implement improved policies, legal, regulatory and institutional frameworks.
- Partial Risk Guarantee Facility: will partially insure project promoters/investors against the short-term, up-front geological risk of exploration (not finding a suitable geothermal deposit), and/or the long-term geological risk of facing a deposit with lower-than-estimated temperature, higher than estimated mineralization etc,
- Investment Funding Window: provide contingent grants, low cost loans or, in limited cases, grant financing, thereby **covering** a part of the project cost through monetization of external benefits.

Source: Geothermal Energy Development Project In The Europe And Central Asia Region And Its Geothermal Energy Development Fund, GEF Project brief, April 2003

Munich Re has arranged the first private sector discovery insurance for the Unterhaching Geothermal Energy Project in Germany. Based on data available from the few existing projects in the region, Munich Re applied probabilistic models to develop an insurance solution that made an incalculable risk calculable. The extent to which this risk is considered insurable in the future, and hence the future of this technology, will depend on the degree of success achieved in this unique experiment.

Source: Renewable Energies, Insuring a technology of the future, Munich Re publication

4.4. Carbon Financed Projects

Carbon Financing is undeniably opening up new and unique financing opportunities for project developers. The private and the public sector can partner to create a structure that addresses the most significant risks associated with carbon financing.

Some of the risks associated with carbon financed projects can be addressed by standard risk management instruments. For example there are standard derivative products to address the market risk or price risk. There is an evolving insurance product to address the CER delivery risk - Carbon Delivery Guarantees which is designed to protect investors in carbon credits whether they are credit purchasers, project developers or traders. The insurance helps monetise the future value of carbon credits and allows them to be incorporated into project financing decisions.

However, to date most of the risk allocation is being managed through the structure and pricing of CERs in the Emission Reductions Purchase Agreement. The following example - Plantar project in Brazil³³ - provides a synopsis of how several risks were mitigated by the structure of the ERPA thus making the project viable.

Table 11: Overview of risks and mitigants in the Plantar Deal. Brazil

Risk (Pre CDM stage)	Risk Mitigant (provided by carbon finance deal)	End Result
Credit Risk		
Pig Iron related industrial activity perceived as risky and lender reluctant to extend financing	ER payment not related to industrial activity ER payment related to annual sequestration of greenhouse gases.	Low credit risk results in better loan terms from the lender.
Local currency depreciation. Borrower subject to currency risk when loan is in hard currency	Emission Reduction Purchase Agreement denominated in hard currency thus acting as a natural currency hedge	
Exporters face risk of non payment from importing companies	Buyer in this case was the World Bank – a riskless buyer. Moreover, countries interested in purchased CERs are developed nations with very low sovereign risk	
Country Risk		

³³ The Plantar project in Brazil is one of the projects from which the Prototype Carbon Fund is buying greenhouse gas emission reductions. The Plantar project consists of the substitution of coal by charcoal in the pig-iron industry. The project aims to establish Eucalyptus' plantations in degraded pasture areas, which under local conditions require seven years to mature and ready for harvesting. Upon harvesting, the timber is sufficiently carbonized to generate charcoal, which is subsequently mixed with mineral iron in furnaces to produce pig iron. Due to the long lead time necessary for the eucalyptus to mature it may take up to eight years before the project generates any cash-flow income.

<p>Borrower was exposed to local government's actions that could have hindered repayment of loan in hard currency.</p>	<p>Deal structure such that payments made directly to lenders overseas account. Carbon deals provide natural protection as buyers are in industrialized nations with low sovereign risk</p>	<p>Country risk effectively eliminated. Lender viewed the deal as "low country risk" and waived requirement for political insurance.</p>
<p>Confiscation and nationalization of goods, and expropriation of assets, which threaten the sponsor's capacity to produce and export their goods.</p>	<p>Emission reductions are intangible. Moreover, carbon financing process requires approval from Designated National Authority in the host government. Once such an approval is received, probability of disruption is minimal</p>	

4.5. Other Instruments

There are a few instruments that address different risks across varying scales and types of projects including the following.

4.5.1. GEF Financing Mechanisms

GEF, through its implementing agencies (UNDP, UNEP and the World Bank) has been instrumental in addressing barriers associated with RE projects and technologies. In addition, there are quasi risk management structures (such as guarantees and contingent financing) that have been introduced to address risks associated with RE projects. GEF contingent finance instruments are useful when there is substantial uncertainty about the existence and extent of incremental costs, characteristics not unusual in RE projects. The presence of GEF funds in a deal can provide comfort to other lenders and thus leverages commercial finance. These instruments are available for different scales of projects as can be demonstrated in the examples below.

Some of these financing mechanisms are:

- Contingent Grants: Grant becomes repayable on successful completion of predefined milestones. In the event of failure, the grant need not be repaid. This has to be provided with other due diligence measures to ensure that project developers do not fall short of the milestones deliberately
- Performance Grants: Grant is tied to specific output and is paid on completion of some predefined milestones.
- Contingent Loans: Similar to contingent grants but differs from it in that a loan is treated as debt and therefore has a higher repayment priority over the grants.
- Concessional Loans: Loans at below-market rates. Contingent or concessional loans would likely supplement (and probably be subordinate to) other project debt.
- Partial Credit Guarantees/ Guarantee Funds: Used to encourage private-sector lenders including commercial banks and leasing companies to make loans for projects that they would otherwise not lend to by sharing the risk of the loan.
- Investment Funds: Commercial or quasi-commercial financing to subprojects through a fund manager, with a possible financial return on capital. GEF has supported investment funds in several ways, including: (i) grants for the incremental fund management costs to identify and process GEF-eligible investments; (ii) concessional co-financing for smaller/riskier projects; and/or, (iii) as a lower tier of capital to boost investment returns to higher-tier, commercial investors.
- Reserve Funds is a method of leveraging GEF capital by allowing lending institutions access to a pool of reserves (or bank capital).

During its first decade, GEF allocated \$4.5 billion in grants, supplemented by more than \$13 billion in additional financing, for more than 1200 projects in 140 developing countries and transitional economies. In 2002, donors pledged \$3 billion to finance projects from 2002 to 2006³⁴. The following elements seem to be important in designing successful mechanisms:

- Programs should focus on sustainability: Private sector and local partners should be involved from the onset.

³⁴ *Solar Photovoltaics in Africa, Experiences with financing and delivery models*, UNDP and GEF

- Appropriate risk sharing between program partners is critical to provide motivation and ensure that program achieves its objectives (the BARREM initiative described in Section 4.2.2.2 suffered due to inappropriate risk sharing arrangements)
- Programs should focus on capacity building rather than direct financing: Research has indicated that project developers and financiers in developing countries can benefit from technical assistance and management guidance. GEF is placed in a unique position to provide such support.

Example: Palawan New and Renewable Energy Livelihood Support Project: Loss reserve fund and credit risk sharing mechanisms for financing SHS (UNDP-GEF) – Pilot Implementation

This program aims to develop a sustainable financing mechanism for SHS in off-grid communities in Palawan. The program will involve different stakeholders such as system vendors, local retail banks including microfinance institutions, escrow agent who manages loss reserve fund which provides additional cash security for the SHS lending program to participating financial institutions.

Under the pilot implementation program involving a bank (Cooperative Bank of Palawan), a vendor (Shell Solar Philippines), and an escrow agent (DBP) where the GEF resource was used to provide technical assistance to the bank and to establish the loss reserve fund, 788 loans have been generated after a year of operation. Based on outstanding balance, past due default loan accounts for only 1% representing a very healthy portfolio.

Source: Palawan New and Renewable Energy Livelihood Support Project, Design Risk Sharing Finance mechanisms, Pilot Implementation Report, prepared for UNDP, Makati, Philippines by IIEC and John MacLean, September 2005

4.5.2. Contingent Capital^{35,36,37,38}

Contingent Capital or “Just in case” capital is a committed “trigger”-based financing that is negotiated in advance with a highly rated counter-party or syndicate, ensuring that the balance sheet and capital resources of a company are not unduly strained should significant and unexpected losses or major unplanned expenditures occur. The organization pays a capital commitment fee to the party that agrees in advance to purchase debt or equity following a loss. With a contingent capital arrangement, the organization does not transfer its risk of loss to investors. Instead, after a loss occurs, it receives a capital injection in the form of debt or equity to help it pay for the loss. Because the terms of the capital injection have prior agreement, the organization generally receives more favorable terms than it would receive if it were to raise capital after a large loss, when it is likely to be in a weakened financial condition.

A contingent capital facility can be used to address several risks such as Credit Risk; Risks caused by Force Majeure - High impact, low probability event related impacts. It is viewed as a more economic alternative to reinsurance. Research has indicated that costs of contingent capital can be as low as 1/4th the costs of reinsurance.

³⁵ R. Manham, “Just-in-Case Capital,” CFO Magazine, 2001.

³⁶ M. C. Eliot, “Contingent Capital Requirements,” Risk Management Section Quarterly, Vol. 18, No. 2, 2001.

³⁷ S. Neftci, “Contingent Capital: Providing Insurance Opportunities,” Credit Risk Special Report, Risk, 2000.

³⁸ Marsh Canada Securities Ltd., “Contingent Capital,” 2004.

Examples of events and/or conditions for Contingent Capital facilities include:

- natural catastrophic events
- product recall
- product liability claims
- all-risk property / liability program
- terrorism
- excess credit defaults
- a significant economic event; and/or
- a failure of a major supplier to perform.

Contingent Capital is a relatively new form of risk management. Though it is proving to be an effective supplement with traditional insurance products, its full potential is still to be realized even in developed countries. It will be difficult to mobilize contingent financing for RE as risks associated with RE projects are still not understood well and providers for such instruments would be hesitant to cover RE specific risks.

5. POTENTIAL RISK MANAGEMENT INSTRUMENTS FOR RE PROJECTS IN DEVELOPING COUNTRIES

5.1. Approach to Identifying Potential FRM Instruments

A demand- supply approach was adopted to identify potential FRM instruments for RE projects in developing countries. In Stage I where the risks associated with RE projects were outlined, the probability of occurrence as well as the extent of impact was also documented based on experts' opinion. Considering these factors together, it is possible to specify a priority of demand for FRM instruments for RE projects. It is to be noted that the rating below has been generalized based on the information gathered in the availability survey. Though the economies are in different stages of development, an average has been taken to arrive at the high (H), medium (M) and low (L) ratings given below.

On the supply side, the typical parameters taken into account when evaluating the readiness of a market for introduction of a financial instrument are:

- Financial Market Parameters**
 - Depth of the market
 - Liquidity in the market
 - Stability of financial markets
 - Market efficiency
 - Capital movement across markets
 - Transparency
 - Investment grade debt rating
 - Institutional capacity
- Insurance Market Parameters**
 - Regulatory considerations
 - Institutional capacity
- Economic Parameters**
 - Free movement of financial assets
 - Convertibility
- Legal Framework**
 - Contract enforcement
- Regulatory Framework**
 - Extent of privatization
 - Transparent rules and policies
 - Ease of entry to foreign players

Table 12 indicates how developing countries measure against these parameters. On the basis of data collected through the availability surveys, the information is presented on a regional basis but it applies to developing countries in general. This was compared against the conditions required for introduction of instruments/class of instruments to arrive at the markets' ability to make available certain FRM instruments or class of instruments.

Table 12: Evaluation of Key Market Characteristics in Developing Countries³⁹

Market Characteristic	Status in Developing Countries (H/M/L)			
	Asia	Africa	Latin America	Aggregate
Financial Market Parameters				
Depth of Market	M	L-M	M	M
Liquidity in the Market	M	L-M	H	M – H
Stability of Financial Market	M	L-M	M	L – M
Market Efficiency	L-M	L-M	M	L – M
Capital Movement across Markets	M	M	M	M
Transparency	M	M	M-H	L – M
Investment Grade Debt Rating	L-M	L-M	M	L
Institutional Capacity	M	M	M	M
Insurance Market Parameters				
Regulatory Considerations	L	M	M	L – M
Institutional Capacity	L-M	M	M-H	M
Economic Parameters				
Free Movement of Financial Assets	M	L	L	L – M
Convertibility	L-M	L-M	M	L – M
Legal Framework				
Contract Enforceability	L-M	M	L-M	L – M
Regulatory Framework				
Extent of Privatization	M	L-M	M	L – M
Transparent Rules and Policies	L-M	L-M	L-M	L – M
Ease of Entry to Foreign Players	L-M	L-M	M	L – M

*H: High; M: Medium; L: Low

The demand for FRM instruments was matched with the ability of the market to support such instruments to identify a set of instruments with the highest potential for introduction in developing countries.

5.1.1. Priority of Demand for FRM Instruments

5.1.1.1. Large Scale RE Projects

Table 13 provides, in decreasing order of priority, the demand for FRM instruments in large scale RE projects. This analysis indicates that the maximum impact in terms of increasing investments in large scale RE projects can be achieved by introducing standard insurance covers for the

³⁹ Based on desk review and information gathered in the availability survey

construction and operations phase, using derivative products to address the credit risk, and extending MFI guarantee products to address the political risk.

Table 13: Demand for FRM Instruments in Large Scale RE Projects

Risk	Probability of Occurrence (H/M/L)	Level of Impact (H/M/L)	FRM Instruments
Political	M - H	H	Political Risk Insurance, Partial Risk Guarantee, Export Credit Guarantee
Construction	M - H	H	Insurance – Construction All Risks, Erection All Risks, Delay in start-up
Credit	M - H	H	Multilateral Financial Institution Guarantees, Credit Derivatives
<i>Force Majeure</i>	L	H	Standard Insurance Covers, Catastrophe bonds
Performance	M	M - H	Insurance - Physical Damage, Business Interruption
Fuel Supply	M	M - H	Weather Derivatives
Counterparty	M - H	M	Surety Bonds
Financial	M - H	M	Standard Derivative Products

5.1.1.2. Geothermal Projects

In the case of geothermal projects, the added risks faced are on account of resource development, which includes exploratory and drilling risks. Aside from pure public sector assistance, to date, the products used to address these risks are: contingent grants, partial risk guarantees and discovery risk insurance.

5.1.1.3. Carbon Financed Projects

In the case of carbon financed projects, there have been attempts to develop insurance products such as carbon delivery guarantee and permit delivery guarantee in order to mitigate the risk associated with non-delivery of carbon credits. However, given the early stage of product development, the level of impact is yet to be determined.

5.1.1.4. Small Scale RE Projects

Table 14 outlines the demand for FRM instruments in small scale RE projects. In the case of risks associated with project developers who require assistance in the project developmental stage, there is a need to bring in various instruments such as guarantee funds, partial credit guarantees and patient capital. In the case of risks associated with end-users, there is a demand for micro-insurance, especially in cases where these systems are linked to productive use. Credit risk does not appear to be a major problem in some developing markets, but availability of financing is still difficult and can be enabled through guarantees provided to local financial institutions in establishing credit lines.

Table 14: Demand for FRM Instruments in Small Scale RE Projects

Risk	Probability of Occurrence (H/M/L)	Level of Impact (H/M/L)	FRM Instruments
Project Developers			
Development/ Credit	M - H	H	Guarantee Funds, Partial Credit Guarantee,
End-users			
Physical risks including theft	M - H	H	Micro-insurance
Credit	L - M	M	Guarantees

5.1.2. Ability of the Market to Provide FRM Instruments

5.1.2.1. Large Scale RE Projects

Table 15 provides details of the market status that is required for introducing various FRM instruments for large scale RE projects. Market based instruments such as standard insurance covers are already available in developing countries for other types of projects, and extending this to RE projects is technically not likely to be very difficult. Instruments from multi-lateral agencies, such as political risk insurance, and MFI guarantees are also available in developing countries for other types of projects and can be extended to RE projects. In the case of instruments such as credit derivatives, contingent capital, weather derivatives and catastrophe bonds, many markets in developing countries generally lack the capacity to absorb such complex products. There are exceptions, such as South Africa and Chile, where the markets are well-developed, and products such as credit derivatives are already available, as indicated in the availability survey.

Table 15: Market Characteristics Required for Introduction of FRM Instruments for Large Scale RE Projects

FRM Instrument	Status of Market (H/M/L)					Market supports introduction of Instrument (Y/N)
	Financial	Insurance	Economic	Legal	Regulatory	
Insurance – Standard Covers	M	H	H	M	M	Y
Political Risk Insurance	M	M	-	M	-	Y
MFI Guarantees	M	-	M	M	M	Y

GEF Contingent Mechanisms	M	-	H	M	M	Y
Credit Derivatives	M	-	M	M	H	Y
Surety Bonds	-	M	L	L	M	Y
Contingent Capital	M	L	M	M	M	Y
Weather Derivatives	H	-	H	M	H	N
Catastrophe Bonds	H	-	H	M	M	N

5.1.2.2. Geothermal Projects

Table 16 gives details of the status of the market required for introducing FRM instruments for geothermal projects. Partial risk guarantees and contingent grants have been applied to geothermal projects in some developing countries and can be extended to similar projects in other countries. There is only one instance of a private insurer providing insurance against discovery risk in a developed country, which is yet to be replicated. Discovery risk insurance by a private insurer may therefore not be feasible in the very near future in most developing countries. However, possible risk sharing with private insurers should be investigated as alternative approach for the future geothermal projects.

Table 16: Market Characteristics Required for Introduction of FRM Instruments for Geothermal Projects

FRM Instrument	Status of Market (H/M/L)					Market supports introduction of Instrument (Y/N)
	Financial	Insurance	Economic	Legal	Regulatory	
Partial Risk Guarantees	M	-	M	M	M	Y
Contingent Grants	M	-	M	M	M	Y
Insurance	M	H	H	M	H	N

5.1.2.3. Carbon Financed Projects

Both derivative products to hedge against price risk as well as insurance covers to mitigate risk associated with non-delivery of carbon credits are still under development. Although the pricing of such products may require sophisticated techniques, potential demand may be high among Annex I investors. While primary risk allocation systems remain the pricing of CERs in ERPA and

institutional risk sharing, such financial instruments could be examined as part of risk mitigation of a RE project to maximize financial benefits for investors and lenders.

5.1.2.4. Small Scale RE Projects

Table 17 provides details of the status of the market required for introduction of various FRM instruments for small scale RE projects. Guarantee funds and partial credit guarantees have played a significant role in rural finance, and there are encouraging examples of applications to RE projects.

Micro-insurance can be also employed to insure against RE system asset damage or loss. This may be useful, especially in cases where the RE assets are linked to productive use/ income generation.

Table 17: Market Characteristics Required for Introduction of FRM Instruments for Small Scale RE Projects

FRM Instrument	Status of Market (H/M/L)					Market supports introduction of Instrument (Y/N)
	Financial	Insurance	Economic	Legal	Regulatory	
Project Developer						
Guarantee Funds	M	-	M	M	M	Y
Partial Credit Guarantees	M	-	M	M	M	Y
End-user						
Micro-insurance	M	M	M	M	-	Y
Guarantees	M	-	M	M	M	Y

6. RECOMMENDATIONS FOR FURTHER RESEARCH

The above section highlights the instruments that are needed and can be supported by the markets in developing countries. These instruments were further reviewed to assess the replicability and sustainability, given their differing levels of scope and impact. Obviously, some interventions provided by Multilateral Financial Institutions or donors will have to be provided for RE projects in developing countries. Care should be taken to involve the private sector from the onset and to phase out the role of Multilateral Financial Institutions/ donors over a period of time. The following instruments and approaches are recommended for further analysis by the working groups.

6.1. Recommendations for Large Scale Projects

6.1.1. Standard Insurance Products

Insurance covers are becoming more and more standardized for large scale wind projects. Similar covers can be considered for other RE technologies, especially to mitigate risks during construction and operation. However, as per the availability survey and recommendations by insurance experts involved in this study, the following aspects need to be addressed:

- *Regulatory concerns* – Underwriting capacity is not an issue. But there are regulatory restrictions imposed in different countries.
- *Streamlined information flow* – Partnership approaches among different project participants such as project developers, lenders, and insurers are needed to better share information.
- *Best practices approach to procuring insurance* – Develop a best practices guide to insurance procurement.
- *Risk bundling* – Some risks could be combined and a comprehensive cover could be provided for the same. This will significantly reduce costs and make insurance more attractive for the project developers (for an example in India, refer to Section 4.1.2).

6.1.2. Political Risk Insurance

Political risks need to be addressed to encourage foreign investments in developing countries. The existing political risk insurance is found to be narrow and expensive. On the other hand, insurance companies spend considerable time and resources to price this insurance cover. The working groups could consider the following aspects:

- PRGs provided by MFIs is recommended. However, partnerships between the public and private sector should be fostered. MIGA and ADB have partnership programs in place wherein they may be the front end insurance provider, but most of the risk is then passed onto private insurance companies. An good example of such scheme, MIGA-CUP is introduced in Section 4.1.3.1.
- PRI insured bonds should be developed where possible. These bonds will be most effective for sub-investment grade countries and will open up new capital markets for such economies.

6.1.3. Credit Derivatives

Credit derivatives cannot be introduced in all developing countries. But there are some countries such as Latin American economies that are supporting these products. The liquidity in these markets will support derivative instruments and these should be considered for packaging non-liquid credit risks.

6.1.4. MFI Guarantees/ Credit Enhancement

MFI interventions are inevitable in some of the less developed countries. The various guarantees and credit enhancement products discussed in the previous sections are an effective way to mobilise finance and to encourage participation of the private sector. However, MFI involvement has to be reduced over a period of time. Newly introduced programs should involve the private sector from the onset and slowly increase their participation (the public – private partnership for PRI mentioned above is a good example). Also, guarantees can be structured in such a manner that they are variable over a period of time and are withdrawn as projects become more stable. For example, the partial risk guarantees designed for geothermal projects are needed more in the initial exploratory stages, and later again in the drilling stage (more details discussed under instruments for geothermal projects).

6.1.5. GEF Mechanisms

GEF mechanisms are an effective means of addressing various risks. They also play an important role in the initial stages of the project to either finance project development activities or to leverage financing from other more commercial sources at affordable rates. Again, involvement of the private sector is crucial in designing sustainable structures. The instruments developed (e.g. Guarantee Funds) should have an appropriate risk sharing approach to prevent, moral hazard among participants. Contingent loans, contingent grants and reserve funds are, amongst all instruments, generally suited for large scale projects.

6.1.6. Surety Bonds

Surety bonds are recommended in place of bank guarantees. These are often a requirement for standard public sector infrastructure projects and can be considered for application to renewable energy. The completion bond of a wind farm project in Brazil (refer to Section 4.1.1.2), is a good example of the application for RE projects.

6.2. Recommendations for Small Scale Projects

The following instruments are recommended for small scale projects:

6.2.1. Guarantee Funds, Partial Credit Guarantees

Guarantee funds and partial credit guarantees work as effective credit enhancement mechanisms both to manage credit risks of project developers and end-users of RE systems. Such funds lend a degree of comfort to financial institutions and lower their inhibitions to extend financing to small scale project developers or end users of RE systems. However, care has to be taken that there is adequate risk sharing amongst the various parties involved in the supported projects. The financial institutions have to maintain adequate due diligence measures and make all necessary endeavours

to keep their bad debts at the minimum level. This can be ensured through proper risk sharing or conditions of drawdown on such facilities (for e.g. guarantee facility can be used once the FI proves that there have been adequate measures taken to recover debt or the facility can be used to recover only a certain proportion of the debt).

6.2.2. Micro-Insurance

Micro-insurance could be a good risk mitigation instrument, especially if the RE system being used as collateral in end-user financing. Micro-insurance has already found some applications with RE systems as theft insurance against module theft of Solar Home Systems in India.

In the instances where RE systems are being used for income generating activities/ productive use, any disruption in system performance caused by theft or physical damage of the system has direct impact on income earning, and consequently on loan repayment. Moreover, in the case where the RE system is considered as an asset for the securitization, the insurance could be effective in facilitating the deal.

The challenge is to generate sufficient interest amongst the insurers to extend such covers especially as RE systems are viewed as an expensive investment for non-productive purposes in developing countries.

6.3. Recommendations for Geothermal Projects

There is one instance of private insurance being provided to cover risks associated with exploration and drilling but it is in nascent stages of transfer to developing countries.

6.3.1. Partial Risk Guarantee

The structures of GeoFund and ARGeo to mitigate exploration and drilling risks are based on partial risk guarantees. Similar structures are recommended for geothermal projects in developing countries, perhaps aiming at more active involvement of private sector insurers.

6.4. Recommendations for Carbon Projects

Although primary risk mitigation are done by risk allocation among the project participants through ERPAs, some evolving insurance and guarantees may be considered to respond to potential demand from Annex I investors. Structures to minimize the transaction costs associated with carbon financing, especially for small scale RE project should be looked at by the Working Groups, including bundling of such projects.

COUNTRY SURVEY

AVAILABILITY OF FINANCIAL RISK MANAGEMENT INSTRUMENTS

FORWARD

This document is an edited extract from the Part 2 (country survey) of the report produced by Edmund Olivier of Mirador Consulting Ltd for the United Nations Environment Programme. It is one of the two provided to fulfil Task 2 of the assignment under the Contract # 283: “Assessment of Financial Risk Management Instruments for Renewable Energy Projects (GEF Countries). The other document is the global insurance survey conducted by Marsh Ltd. The information was gathered through research, information interviews, telephone conversations and discussions at conferences in London and New York. Edmund Olivier would like to acknowledge the help he received from many different people and sources in compiling Task 2.

SUMMARY

Methodologies of the Survey

There are 9 focus countries for the UNEP survey

- Brazil, Chile, Mexico (Latin America);
- China, India, Vietnam (Asia); and
- South Africa, Senegal, Morocco (Africa).

These countries were chosen to represent differing stages of commercial and regional development with respect to renewable energy projects. Latin America is the most advanced of these regions from an RE finance perspective but China and India offer the greatest potential for renewable energy project development over the coming years. The choice of three very different countries in Africa / North Africa reflects the diversity of that continent and the difficulty of making any generalizations about Africa.

The survey has been produced utilizing a combination of desk-based research and anecdotal information collected from personal meetings, telephone conversations with financiers, developers, insurers and fund managers. The objective of this section is to provide an overview of the market conditions for RE projects in the focus countries. The list of interviewees contributed to the survey is attached at the end of the report.

The report summarizes the results of the country survey of the availability of insurance and non-insurance instruments. Appendix provides some comparative information on the development of financial markets and support for RE business in the surveyed countries to help assess feasibility of introduction of financial risk management instruments for RE projects in these markets.

Main findings:

- Secure contracts (such as PPA, EPC contract, O&M agreement and Fuel supply agreement etc), equipment warranties, insurance products and various national government guarantees are the most utilized risk management instruments to facilitate the construction and operation of renewable energy projects in the focus countries. Naturally, the underlying business case for generating renewable energy (tariff structures, privatization) will determine RE investments in the first case.
- There is more information on insurance products than non-insurance financial products because research reveals that non-insurance financial instruments such as derivatives (with the exception of weather and credit derivatives) are generally used only to hedge the market risk (currency and interest rate) component of large-scale RE project finance deals once terms are in place.

Non-insurance instruments

- The risk management products available from the multilaterals (such as Partial Credit Guarantees) are better understood by market participants. However, there appears to be little enthusiasm amongst project financiers interviewed for working alongside multilaterals unless there is a guiding strategic motive or large profit incentive. The fundamental reasons behind this private sector reluctance to partner with the public sector seem to stem mostly from different perceptions of time: both the time necessary to complete the deal and the value of time in general.
- Non-insurance instruments address market risk – the risk of adverse currency, interest rate or commodity price variations- are necessary to achieve financial closure of large privately financed RE projects. However, most of the difficulties in RE finance arrive at the front end of a deal when there is the greatest amount of uncertainty.
- In Latin America, where there are a variety of renewable energy transactions, contracts, guarantees, warranties, government subsidies, carbon finance, ECA support are the main instruments for risk mitigation. Non-insurance financial instruments such as swaps and futures are readily available to mitigate currency and interest rate market risk. The frameworks for Carbon Finance are better developed in Latin America than Asia but the projects are relatively smaller.
- In Asia, India is the only survey country with a developed market for non-insurance financial instruments and boasts a wide variety of exchange traded instruments and intermediaries to hedge local market risk. However, most investors in India seem less concerned with market risk than the sanctity of their contracts China's financial markets are miniscule relative to the size of the economy and Over The Counter (OTC) transactions originating in Hong Kong are generally used to hedge market risk. .
- In Africa, there is a wide variety of non-insurance financial risk management instruments on offer in South Africa, but there is little focus on renewable energy. The tariff structures for power in South Africa are among the lowest in the world. In Morocco, carbon finance is expected to become an increasingly important tool to facilitate RE transactions.

Insurance products

- The depth and quality of the *insurance markets* determines the availability of certain classes of insurance products relevant to RE projects. For example, sophisticated instruments such as Alternative Risk Transfer products and hybrid securities are available in South Africa but none of the other focus countries.

- As is highlighted in the global insurance survey, local developing country insurers have limited expertise to write renewable energy business. However, where foreign insurers have access to developing country markets most traditional products relevant to RE projects – Property, Construction/Erection all risks; Business interruption, Machinery Breakdown etc- are available for mature RE projects. However, foreign insurers access to local insurance market is restricted by local insurance regulations.

General feasibility of introducing RE financial risk management instruments

- The success rate for financing renewable energy projects depends on the both the level of domestic financial market development and sanctity of contracts governing off-taker and other agreements.
- Sophisticated financial instruments to mitigate risk are typically developed in mature financial markets with application in mature developing markets (South Africa) as is possible. Some emerging economies (Chile and Mexico) are now investment grade and have domestic markets that can provide long-term, fixed-rate local currency financing for infrastructure. Others (India, China and Brazil) have emerging long-term debt markets, where public sector interventions can be made to extend the loan tenors available for renewable energy projects and to improve access other financial instruments. Vietnam and Senegal are now attracting investment from China and South Africa, demonstrating the general process of financial sector evolution relevant to the sustainable commercialization of renewable energy.
- The quality of relationships and the sanctity of contracts is not something that risk management *instruments* can change. Respondents repeatedly brought up the importance of local relationships and information flow as being the number one risk management tool in their business operations. Transparency and the ease of doing business in a particular country or region are critical factors for all parties involved in financing renewable energy projects. These factors frequently guide investment decisions.

Overview of Financial Risk Management Instruments

The table below is a general overview of risks relevant to RE projects and the instruments that mitigate these risks.

Among those instruments, the survey indicated that Secure contracts, equipment warranties, insurance products and various national government guarantees are the most utilized risk management instruments to facilitate the construction and operation of renewable energy projects in the focus countries. Naturally, the underlying business case for generating renewable energy (tariff structures, privatization) will determine RE investments in the first case. For example, South Africa has one of the lowest power tariffs in the world and the state utility Eskom dominates over 90% of the market.

There is more information on insurance products than non-insurance financial products because research reveals that non-insurance financial instruments such as derivatives (with the exception of weather and credit derivatives) are generally used only to hedge the market risk (currency and interest rate) component of large-scale RE project finance deals once terms are in place.

Overview of Risks and Risk Management Instruments

Risk	Available Instruments For Risk Mitigation	Risks Covered	RE Applications
Construction Risk	CONTRACTS, GUARANTEES and INSURANCE	Various risks during the construction phase	Construction and start-up of project
Operational Risk	WARRANTIES, CONTRACTS and INSURANCE	Equipment / Other Failure	Revenue Protection
Market Risk	FINANCIAL MARKET PRODUCTS: LISTED and OTC DERIVATIVES, BOND STRUCTURES	Adverse currency, interest rate & commodity price changes	Achieve financial closure
Fuel Supply / Resource Risk	CONTRACTS, WEATHER DERIVATIVES	Revenue Protection	Project Bankability
Technology Risk	WARRANTIES and INSURANCE	Equipment Failure	Revenue Protection
Country Risk	POLITICAL RISK INSURANCE, MFI & GEF PRODUCTS, EMCD	Non-commercial Risks	Achieve financial closure

Non- Insurance Instruments

The depth and quality of the *financial markets* (equities, bonds and derivatives) is an important indicator of the financing structures available. These listed below and over the Counter instruments address market risk – the risk of adverse currency, interest rate or commodity price variations. These are necessary to achieve financial closure of large privately financed RE projects. However, most of the difficulties in RE finance arrive at the front end of a deal when there is the greatest amount of uncertainty. Commodity futures contracts are useful for partially hedging (or proxy hedging) certain inputs or outputs, such as grains and ethanol in Brazil.

Non-insurance Financial Risk Management Instruments and Limitations

Stakeholder	Type of Instruments Offered	Risk Addressed	Limitations
ECAs & Bilateral Agencies	PRI Project Finance Loans Customized Financing packages <i>(for exporters)</i>	Non-commercial risks + a range of financing solutions	ECAs provide funding and guarantees covering commercial and political risks to public or private projects. However their participation in any project is limited to the export content. Technical underwriting restrictions apply.
Multilateral & Regional Financial Institutions	Breach of contract cover A – loans, syndicated B-loans Portfolio Equity from Funds Political Risk Guarantee Partial Credit Guarantee	Multiple non-commercial and commercial risks. New modalities to finance projects with private sector are being developed.	Products and policy provisions are complex and project and insured eligibility is an issue. Funding must generally come from private institutions. MFIs generally do not guarantee a state-owned banks or regional developmental agencies.
Private Financial Institutions	Commercial Bank Loans Infrastructure Funds Quasi Equity (Preferred Shares) FX, Commodity & Interest Rate Derivatives Convertible Loans & Bonds Fixed Coupon Bonds & FRNs Securitized Receivables Credit Derivatives & CDOs Weather Derivatives	Commercials Risks: Market Risk Business Risk Resource Risk	Sub-investment grade clients pay premiums for services and products if accessible. Product availability depends upon capital markets development.

In Latin America there are a wide variety of RE transactions and so analysis of several deals was undertaken to determine the predominant risk management instruments deployed. Contracts, guarantees, warranties, government subsidies, carbon finance, ECA support and insurance are the main instruments. Non-insurance financial instruments such as swaps and futures are readily available to mitigate currency and interest rate market risk. Commodity futures contracts in Brazil may be used to protect ethanol prices and some grain inputs for biofuel production. Weather derivatives are being developed by the IFC in Mexico but no data on private transactions was available. Liquidity in credit derivatives is improving and these may be used to hedge credit risk for most of the major state energy companies in Latin America.

In Asia, India is the only survey country with a developed market for non-insurance financial instruments and boasts a wide variety of exchange traded instruments and intermediaries to hedge local market risk. However, most investors in India seem less concerned with market risk than the sanctity of their contracts and this is reflected in the low Transparency rating from TI. China's financial markets are miniscule relative to the size of the economy and OTC transactions originating in Hong Kong are generally used to

hedge market risk. Japanese investment banks in Vietnam offer a number of OTC products to manage FX and interest rate risk but the Dong is not a convertible currency so these have some natural limitations.

In Africa, there are a wide variety of non-insurance financial risk management instruments on offer in South Africa, but little market risk to hedge from the perspective of the UNEP study as there is little focus on renewable energy aside from community development schemes using solar. The tariff structures for power in South Africa are among the lowest in the world and there are no feed-in deals for renewable energy. In Morocco, carbon finance is expected to become an increasingly important tool to facilitate RE transactions and there is scope for the development of weather derivatives – particularly wind power indices.

Availability of these non-insurance financial instruments and rate the financing modalities in each focus countries are summarized in the following matrices.

Tables on the following pages summarize information about the focus countries on color-coded charts. A simple (**1, 2, 3**) ranking has been used for comparative purposes because it helps to reflect inherent complexities in a simple fashion. The colors codes used are shown below:

well developed	1	mixed reviews	2	undeveloped or no info	3
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LATIN AMERICA: AVAILABILITY OF NON-INSURANCE RISK MANAGEMENT INSTRUMENTS

PRODUCT→ COUNTRY↓	Local Finance Bonds	Local Finance Equities	Futures & Options, OTC Products	Credit Derivatives	Weather Derivatives	Carbon Finance
BRAZIL	YES – improving but pensions not in market	OK – growing	YES – active local derivatives markets	Some – sovereign, state oil & power companies	Limited - Precipitation	YES – good framework now
CHILE	YES – best bond market of the focus countries	YES	YES	Some – Codelco	Limited - Precipitation	YES
MEXICO	YES – IFC active in securitization	YES	YES – peso futures on CME, OTC local	Some - sovereign, Pemex, some others	Limited – Precipitation, Wind in development	YES

	1		2		3	INSTRUMENT AVAILABILITY RATING
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General information on financing modalities for RE projects

FINANCING MODALITY →	PROJECT FINANCE	CORPORATE FINANCE	MICROFINANCE
BRAZIL	Project Finance for HYDRO is well understood in Brazil and recently large WIND deals have been transacted using multi-tranche project bonds. Guarantees are an issue for infrastructure investors who lack confidence in judicial process. State companies still the biggest investors but foreign utilities present particularly in WIND .	Local venture capital as a financing mechanism is gaining some momentum in Brazil as conditions are improving and appetites for risk are increasing. Frequent changes in local interest rates, exchange rates, and market conditions temper investment. BIOFUELS	The microfinance / retail financial networks are fairly well developed and innovative in Brazil. This is particularly relevant to BIOFUELS / rural development and SOLAR “Luz de Campo” (see “Brazil Snapshot” page)
CHILE	Project finance is fairly straightforward to arrange in Chile and there is a complete range of international financial service providers. HYDRO is best understood - and the only RE of scale.	Chile has the best developed IPO market in Latin America followed by Mexico and Brazil respectively. There are a number of sophisticated private equity boutiques: HYDRO .	Chile has a well developed microfinance network and rural electrification programs in the works – SOLAR, SMALL WIND, HYBRID
MEXICO	Despite Mexico’s investment grade rating, institutional investors require complex structures to ensure adequate protection but are not afraid to invest long-term once such structures are in place. HYDRO is well understood. WIND is emerging as the commercial leader.	There will be large potential for private equity boutiques in Mexico to finance WIND as the RE programs and incentive schemes gather pace.	The foreign banks that have made large investment in Mexico in recent years have not paid much attention to small retail business but there is a solid market with applications for SOLAR and COMMUNITY WIND . The state is working on rural GEOTHERMAL .

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ASIA: AVAILABILITY OF NON-INSURANCE FINANCIAL RISK MANAGEMENT INSTRUMENTS

PRODUCT→ COUNTRY↓	Local Finance Bonds	Local Finance Equities	Futures & Options, OTC Products	Credit Derivatives	Weather Derivatives	Carbon Finance
CHINA	EMERGING	NOT YET	FX hedging	Some	Not Yet – will be case by case for large wind farms as required	Huge Potential, currently undeveloped
INDIA	YES	YES	YES	Some	EMERGING – IFC development programs	Big Potential, emerging
VIETNAM	NO	Some	NO	NO	NO	NO

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INSTRUMENT AVAILABILITY RATING

General information on financing modalities for RE projects

MODALITY →	PROJECT FINANCE	CORPORATE FINANCE	MICROFINANCE
CHINA	Cash rich state owned banks finance 70-80% of all deals and this includes RET: WIND and HYDRO . Risk is largely uninsured / retained by the government / local authority. Foreign investors are able to structure deals with additional securities but it is still a leaning process.	Private equity/VC funds are investing in FUEL CELLS . The domestic equities markets need a big spring clean – way too many non-traded issues. Reforms are underway to delist and rationalize the listings and bureaucracy surrounding the stock markets to enable proper domestic IPOs.	It is difficult to assess the Microfinance situation in China but Rural Energy Service Companies are a topic of discussion to provide SOLAR and HYBRID systems.
INDIA	Local banks serve local markets fairly well. India has a poor track record of infrastructure investment compared to China and is seeking to remedy this. International investors are still wary of involvement with the corrupt State Electricity Boards. Foreign money goes to oil & gas. Local investors are focusing on WIND .	India has well developed equity markets and a wide variety of private equity and venture funds are active in the market. To date, WIND , appears to have attracted some private equity investment.	India and Bangladesh have well developed microfinance programs that could be adapted for various rural schemes: SOLAR and HYBRID systems.
VIETNAM	The project finance market in Vietnam is just starting to emerge and offers some promising opportunities in a less than transparent environment. Natural Gas and HYDRO projects are the focus. The State can be an interesting project partner but is learning the ropes.	There are some private equity funds: <ul style="list-style-type: none"> • Vietnam Enterprises Investment • Mekong Enterprise Fund • PXP Capital • Indochina Capital • Prudential Vietnam • CLSA Private Equity Fund • Unison Capital 	An informal market is being slowly transformed but consumer education is a priority. SOLAR will be the main beneficiary of improving microfinance schemes.

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MODALITY RATING

AFRICA: AVAILABILITY OF NON-INSURANCE RISK MANAGEMENT INSTRUMENTS

PRODUCT→ COUNTRY↓	Local Finance Bonds	Local Finance Equities	Futures & Options, OTC Products	Credit Derivatives	Weather Derivatives	Carbon Finance
SOUTH AFRICA	YES – improving	YES	YES	Sovereign & couple parastatals	Eskom only customer	NA
SENEGAL	Possible	Theoretically possible	NO	NO	NO	NA
MOROCCO	YES – small market	YES – small market	Some / can hedge	NA	Emerging – MFI assistance / crop insurance	YES – first African / Arab CDM project registered

	1		2		3	INSTRUMENT AVAILABILITY RATING
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General information on financing modalities for RE projects

MODALITY →	PROJECT FINANCE	CORPORATE FINANCE	MICROFINANCE
SOUTH AFRICA	(SPLIT RATING) Straightforward to arrange but little RE activity. Large scale RE is not yet a priority. As more municipal finance bonds emerge (recent Johannesburg issue with IFC) some RE opportunities should open up.	Lots of corporate finance activity and a number of private equity funds. IFC is investing in FUEL CELLS . Local SOLAR producers source some finance from the markets here.	Rural development is the #1 priority in South Africa and, although problems exist and programs have failed, there is large potential for the cheapest new technologies. Farmers interested in SOLAR schemes.
SENEGAL	International guarantees are required by institutional investors but Chinese investors are making some infrastructure investments.	There is some activity but nothing relevant to RE. See the African Venture Capital Association http://www.avcanet.com/ for information.	A thriving microfinance industry exists in Senegal. <u>Donor financed RE programs have failed in the past.</u> SOLAR / hybrid potential.
MOROCCO	(SPLIT RATING) Framework less developed than SA but MFIs lending to the power sector in Morocco and WIND deals are well understood. Larger deals here than elsewhere in Africa.	There is increasing interest from private equity investors in WIND .	Community financed SOLAR schemes are under discussion.

	1		2		3	MODALITY RATING
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INSURANCE PRODUCTS

The depth and quality of the *insurance markets* in the focus countries influences the availability of certain classes of insurance products. The specific products, risks addressed and underwriting concerns are depicted in the table below. ART products and hybrid securities are available in South Africa but none of the other focus countries and so have not been included in this study.

Insurance Products for RE Projects

Risk Transfer Product	Basic Triggering Mechanisms	Scope of Insurance / Risks addressed	Coverage Issues / Underwriting Concerns
Construction All Risks / Erection All Risks	Physical loss of and/or physical damage during the construction phase of a project	All risks of physical loss or damage and third party liabilities including all contractors work ⁴⁰	Losses associated with cable laying can be significant for wind projects Quality control provisions for contractors. Cables for wind projects represent a high concentration of value for relatively horizontal risk exposure Recent cable snagging losses
Physical Damage	Sudden and unforeseen physical loss or damage to the plant / assets during the operational phase of a project	“All risks” package including Business Interruption	Explosion / fire concerns for biogas, geothermal Increase in fire losses for wind Quality control provisions for contractors.
Machinery Breakdown (MB)	Sudden and accidental loss or damage necessitating repair or replacement	Defects in material, design construction erection or assembly Fortuitous working accidents	Concern over errors in design, defective materials or workmanship for all RE Lead times for replacement Manufacturing guarantees (especially for turbines) Wear and tear can be an issue for biogas (typically excluded from MB)
Business Interruption / Delay in Start Up (DES) / Advance Loss of Profit (ALOP)	Interruption / interference / delay resultant directly from, or in consequence of loss or damage causing loss of profits / reduction in gross revenue	For Business Interruption perils insured under the Property Damage policy DSU / ALOP	Cable losses represent largest potential BI scenarios Reinstatement periods can be long (e.g biomass resource supply, lead-times for repairing / replacement of items offshore (e.g. wind)
Operators Extra Expense⁴¹	Sudden, accidental uncontrolled and continuous flow from the well which can not be controlled	All expenses associated with controlling the well, redrilling / seepage and pollution	Some geothermal projects require relatively large loss limits Exploration risk excluded Well depths, competencies of drilling contractors
General / Third Party Liability	Liability imposed by law, and/or Express Contractual Liability, for Bodily Injury or Property Damage	Includes coverage for hull and machinery, charters liability, cargo etc.	Concern over third party liabilities issues associated with toxic and fire / explosive perils

(Source) adapted from the UNEP Risk Management Scoping Study (2004)

As highlighted in the global insurance survey, local developing country insurers have limited expertise to write renewable energy business. However, where foreign insurers have access to developing country markets, most traditional products relevant to RE projects – Property, Construction/Erection All Risks; Business interruption, Machinery Breakdown etc - are available for mature RE projects. However, foreign insurers’ access to local insurance market is restricted by local insurance regulations and limited distribution channels.

⁴⁰ Scope of insurance cover activities including but not limited to: procurement, construction, fabrication, loading/unloading, transportation by land, sea or air (including call(s) at port(s) or place(s) as may be required), pile driving, installation, burying, hook-up, connection and/or tie-in operations, testing and commissioning, existence, initial operations and maintenance, project studies, engineering, design, project management, testing, trials, cable-laying, trenching, and commissioning.

⁴¹ Often forms part of a Package Policy including sections for Property Damage and Liabilities.

The table below shows the access to local insurance markets in the focus countries by Lloyd's which represents an innovative specialist insurance market. With the exception of South Africa, the local insurance regulations in the all focus countries have varying degree of restrictions and do not allow the direct underwriting by Lloyd's.

Focus Countries Access to Lloyd's Resources

COUNTRY	LLOYD'S?	The Lloyd's Market
BRAZIL	<i>Not Licensed for Direct</i> NO - State Reinsurer	<p>Lloyd's is the world's leading specialist insurance market, home to 44 managing agents and 62 syndicates*, which offer an unrivalled concentration of specialist underwriting expertise and talent.</p> <p>Lloyd's is not an insurance company but a society of members who underwrite in syndicates on whose behalf professional underwriters accept risk. Supporting capital is provided by investment institutions, specialist investors, international insurance companies and individuals.</p> <p>Lloyd's brokers bring business to the market. The risks placed with underwriters originate from clients and other brokers and intermediaries all over the world. (In the focus countries, the distribution channels are of particular importance. For instance, in Chile reinsurance can be placed directly. South Africa is completely open for all classes. However; State Reinsurance companies intervene in some markets.)</p> <p>The Lloyd's market structure encourages innovation, speed and better value, making it attractive to policyholders and participants alike. Immediate access to decision-makers means that answers on whether a risk can be placed are made quickly.</p> <p>The capital which backs the syndicates comes from corporate and individual members (known as 'Names'). Corporate capital was introduced in 1994 and now makes up 89.5%* of the market capacity. CURRENT CAPACITY £ 13.7 BILLION</p> <p>* Source for all figures: Lloyd's Members Services Unit</p>
CHILE	<i>Not Licensed for Direct</i> OK - Accepts reinsurance business directly.	
MEXICO	<i>Not Licensed for Direct</i> OK - reinsurance placed through a local broker, resident in Mexico.	
CHINA	<i>Not Licensed for Direct</i> OK -off shore reinsurance business permitted but small cession to China Re	
INDIA	<i>Not Licensed for Direct</i> OK but obligatory cession of 20% to GIC	
VIETNAM	<i>Not Licensed for Direct</i> NO - State Reinsurer	
SOUTH AFRICA	YES - Licensed to write all classes of short-term insurance business OK - Lloyd's is licensed to write reinsurance business.	
SENEGAL	<i>Not Licensed for Direct</i> OK –but only 75% of risk can be ceded to reinsurer of choice	
MORROCO	<i>Not Licensed for Direct</i> OK – but cession of 10% for all classes of business to State company	

1 2 3 Access to Lloyd's Resources

The following tables summarizes the insurance markets and major classes of insurance relevant to the construction and financing of RE projects in the focus countries. Liability cover is not included on the table but would normally constitute part of an insurance package and in some countries; Third Person Liability (motor insurance etc.) is required.

LATIN AMERICA: AVAILABILITY OF INSURANCE PRODUCTS

PRODUCT→ COUNTRY↓	INSURANCE INDUSTRY SYNOPSIS	PROPERTY	CONSTRUCTION / ERECTION ALL RISKS	BUSINESS INTERRUPTION	MACHINERY BREAKDOWN	SURETY, BONDS & CREDIT
BRAZIL	Opening Up The regulator, SUSEP has announced its intention to simplify insurance regulation and move towards a more self-regulatory climate, with greater emphasis on risk-based capital and solvency monitoring. The IRB still dominant.	For industrial risks average all risks rate probably in the region of between 1% and 2%. Deductibles are negotiable on a case by case basis.	Typical construction procurement method for private sector contracts is design-tender-build approach. Limits and rating do not seem to pose problems as the IRB involved with all major cases.	Business interruption coverage is available, but is normally only taken by multinational enterprises larger local companies.	Unibanco AIG, Bradesco and Sul America all offer policies. Large contractors' risks are placed by Aon, Marsh or Willis.	Surety bond market in Brazil has grown over 30% / year for 5 years but is still underdeveloped compared with other Latin American countries. Bond guarantees from insurance companies cost less than from commercial banks.
CHILE	Privatized Over the past 10 years or more, the process of deregulation has brought benefits to Chilean insurance market. International rates for large projects & cheaper local co-insurance for smaller deals.	<u>Earthquake</u> – up to 2%. International commercial rates for large risks. Small risks benefit from lower rates in local market.	International commercial rates for large risks. Small risks benefit from lower rates in local market – e.g. small hydro.	Normal maximum indemnity period 6 months for SMEs, with deductible of 48/72 hours, significantly higher deductibles are required for major energy exposures	Many companies include Chile MB risks in their global policies. Local market is thin but developing.	Bank guarantees are required for infrastructure work carried out under concession. Overall it is said that banks control an estimated 80% of construction bond business and insurance companies the balance.
MEXICO	Privatized Since 2000 companies from <u>NAFTA</u> countries have been permitted to hold 100% of the equity of a Mexican insurance company, and US, Canadian and other foreign insurers now have a major influence in the market	<u>Earthquake</u> between 0.25% in north of Mexico where the risk is low and 3.50% for high hazard areas.	Some competition for business in the CAR/EAR market. Fixed deductible between USD 5,000 and USD 20,000.	Variable – deductibles for energy companies can be quite high	Insurers depend on Munich Re policy wordings. Companies are free to use other policy texts which have been submitted to the CNSF.	<i>Administrative</i> bonds include all bonds associated with the construction industry. The government no longer requires bid bonds for government contracts, although performance and advance payment bonds are still a requirement. Competitive market.

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 INSURANCE MARKET DEVELOPMENT

ASIA: AVAILABILITY OF INSURANCE PRODUCTS

PRODUCT→ COUNTRY↓	INSURANCE INDUSTRY SYNOPSIS	PROPERTY	CONSTRUCTION / ERECTION ALL RISKS	BUSINESS INTERRUPTION	MACHINERY BREAKDOWN	SURETY, BONDS & CREDIT
CHINA	State Dominated Rates are reported to be some of the lowest in the world. The vast majority of projects, both by number and by value, are publicly funded. Except in Shanghai, where CAR insurance is a statutory requirement, public contracts are rarely insured.	Many factories are written for the same rate as an office block, and the average industrial all risks rate is lower than the Munich Re's recommended rate for the earthquake risk alone.	Because facultative rates are too high for local market so insurers forced to underwrite complex civil engineering projects without the technical assistance of special reinsurers ⁴² . Deductible levels up to 10 times below international minimum.	BI common for multinationals but rare for domestic enterprises. Policies are written on a gross profit basis with indemnity periods of 12 or 18 months.	Machinery breakdown insurance is mainly bought by foreign-invested enterprises. Engineering risks are still written under separate policies. Main demand from domestic market is for thermal power plants. A new insurer has formed as a quasi-captive by shareholders in the state-owned power industry.	Performance bonds are becoming more common but are not required from state owned contractors. In 2002 the Construction Ministry submitted a plan to the State Council for transferring more of the financial risk on public infrastructure projects to the insurance sector.
INDIA	In Transition Following new legislation in 1999, private non-life insurers began to return to the Indian insurance market after an absence 30 years. Most companies have multinational insurers as minority shareholders.	A property tariff scheme is in operation	Engineering business including CAR/EAR is subject to the engineering tariff but large risks are initially referred to Tariff Advisory Committee	No data	No data	State owned non-life insurers and the banks issue a wide range of construction and miscellaneous bonds. It is understood that in spite of higher rates, banks write a majority of the business because their claims settlement service is said to be more efficient.
VIETNAM	State Dominated, Small and undeveloped, poor quality agents & distribution, restrictive. Foreign and joint venture companies compete on an unequal footing with local insurers through restricted licensing arrangements.	Indication: Steel mill - 0.10% for fire and named perils; 0.15% for all risks. Manufacturing about 0.25%	No data	No data	No data	Cautious approach and limits of cover generally low at around USD 10,000. Domestic companies charge a rate of 5% on the limit of cover. Cash collateral sometimes requested.

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 INSURANCE MARKET DEVELOPMENT

⁴²China CAR Insurers' inexperience often forces them to accept the contractor's own assessment of risk.

AFRICA: AVAILABILITY OF INSURANCE PRODUCTS

PRODUCT→ COUNTRY↓	INSURANCE INDUSTRY SYNOPSIS	PROPERTY	CONSTRUCTION / ERECTION ALL RISKS	BUSINESS INTERRUPTION	MACHINERY BREAKDOWN	SURETY, BONDS & CREDIT
SOUTH AFRICA	Privatized, British Model SA has a sophisticated financial services sector and numerous banking and insurance conglomerates. Captives, A.R.T and a broad range of traditional products at reasonable cost.	Despite rating increases to date some reinsurers are believe the market is too cheap. Industrial risks price at about 70% of the international average.	Open policies are generally requested by the brokers. All risks policies are issued with specific exclusions.	Rating is applied either by the insurer or by the leading reinsurer - often Munich Re - for the larger and more complicated cases. Deductibles are fairly standard for the market.	Low rates compared to the international standard – about 20% cheaper despite big increases.	South Africa has comprehensive credit insurance coverage and a wide availability of bonds. Rates are fairly cheap but excesses large.
SENEGAL	Privatized, French Model Industrial insurance is increasingly offered as a package. For SMEs the package would be called "globale dommages" and would cover everything from fire and theft to third party liability and loss of profits.	The bulk of property business is industrial and commercial. AXA has about 25% market share. Rates in line with international standards.	Senegalese insurers would like to see compulsory construction insurance. Legislation being passed – premiums variable.	Business interruption cover is normally included in packages for companies.	Engineering risks, and machinery breakdown, are increasingly included in "globale dommages"	SONAC is the only credit insurer in the region. PRI for Senegal costs 0.8% to 1.6% depending on % covered. Rates for domestic credits vary from 0.6% to 2% for cover of up to six months.
MOROCCO	Privatized, French Model with State interference. Since liberalization, premium rates fell significantly, but have stabilized in 2003 due to pressure from reinsurers.	80% of business) relates to industrial and commercial risks. Multirisk policies are increasingly used.	Construction and erection all risks insurance is a small class in Morocco. Construction cover is nearly always written on a project basis	No data	Machinery breakdown cover is not widely purchased in Morocco. It is covered by the foreign insurers.	Bonds are usually written by banks. Assurances Credit du Maroc (ACMAR) writes short-term domestic credit.

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 INSURANCE MARKET DEVELOPMENT

APPENDIX

Overview of Financial Market and Support for FDI and Renewable Projects in the Focus Countries

The table below provides an overview of the default risk and stage of capital markets development of each of the focus countries. Major support programmes for FDI and RE projects are also summarized in the respective country snapshot tables.


OVERVIEW OF FINANCIAL MARKET DEVELOPMENT

FOCUS COUNTRY	CURRENCY / DEFAULT RISK	CAPITAL MARKETS
1. CHILE	AA/Stable/A-1+ Local (S&P) A/Stable/A-1 Foreign	Chile has the most robust and transparent capital markets in Latin America. The pensions are investing and an IPO market has developed.
2. SOUTH AFRICA	A+/Stable/A-1 Local (S&P) BBB+/Stable/A- Foreign	South Africa has the most robust and sophisticated markets of the focus group. The bond markets lag the equity markets but are improving.
3. MEXICO	BBB+ Local (Fitch) BBB Foreign	Mexico has returned to form in recent years and NAFTA is the predominant influence. Still lacks the transparency of Chile.
4. CHINA	A-/Positive/A-1 Local (S&P) A-/Positive/A-1 Foreign	The currency market is huge but the capital markets are very small and cash is king. Chinese banks just did first securitizations.
5. MOROCCO	BBB/Stable/A-3 Local (S&P) BB+/Stable/B Foreign	The local stock and bond markets have come back from a bad patch in recent years and there are sophisticated players in this small market.
6. BRAZIL	BB/Positive/B Local Currency Rating BB-/Positive/B Foreign Currency Rating (S&P – rating agency)	There is little depth to the corporate bond market but local currency financing is possible and a wide range of financial products are available for hedging interest rate, currency and commodity risk. Few long-term local investors.
7. INDIA	BB+/Stable/B Local (S&P) BB+/Stable/B Foreign	India has a range of advanced financial services and products but the market is mostly local and small relative to the size of the economy.
8. VIETNAM	BB/Positive/B Local (S&P) BB-/Positive/B Foreign →VND is not freely convertible, see “snapshot” page	Vietnam recently entered the capital markets with its first sovereign bond issue. Japanese investment banks setting up. Should develop quickly.
9. SENEGAL (West African Economic and Monetary Union)	B+/Stable/B Local (S&P) B+/Stable/B Foreign BBB- (Fitch) (WAEMU linked to €)	Senegal has the least developed capital markets of the focus group but is the most promising country in West Africa at this time.


LATIN AMERICA: Exchanges, ECAs and Development Banks

	PRIVATE FINANCIAL INSTITUTIONS ORGANIZED EXCHANGES for FUTURES & OPTIONS, EQUITIES and BONDS	EXPORT CREDIT AGENCIES	DEVELOPMENT BANKS
BRAZIL	Brazil has a thriving commodities futures exchange: Bolsa de Mercadorias & Futuros (BM&F) with a carbon finance facility and many listed contracts (corn, cotton, sugar, ethanol, US\$, interest rates etc). The BOVESPA is an active equities market with strong performance despite high interest rates. The Brazilian bond markets are poorly developed by comparison.	Brazil has a medium risk rating with most ECAs who will generally offer loan terms out to 10 years or more along with a variety of incentive programs for domestic exporters. For instance, Exim (USA) will offer working capital loans to credit-worthy US companies prospecting for business in Brazil. Commercial risks are viewed as more onerous than political risks.	CORPORAÇÃO ANDINA DE FOMENTO (CAF) Financial Products: Equity, Loans, Capital Mobilization, Guarantees, Co-financing, Project Finance INTER-AMERICAN DEVELOPMENT BANK (IADB) Financial Products: Loans, Guarantees INTER-AMERICAN INVESTMENT CORPORATION Financial Products: Loans, Equity, Guarantees, Co-financing
CHILE	The Bolsa Comercio de Santiago is one of the best managed stock exchanges in Latin America. Equity issues are active and there is a good IPO stream. The Bolsa offers futures contracts in a share index and Chilean peso/dollar contracts but futures activity is limited compared to Brazil or Mexico. Chile's bond markets are liquid and local investors provide depth.	Chile is a low risk destination for ECAs almost all of whom offer the maximum terms allowed by OECD regulations to exporters and buyers. Political Risk Insurance (PRI) is unnecessary.	INTERNATIONAL FINANCE CORPORATION (IFC) Financial Products: Equity, Loans, Capital Mobilization, Guarantees, Co-financing MULTILATERAL INVESTMENT GUARANTEE AGENCY (MIGA) Financial Products: Investment Guarantees
MEXICO	The Mercado Mexicano de Derivados (MexDer) contract size for peso futures is \$10,000 nominal making FX hedging more accessible to local companies. The Mexican Stock Exchange (Bolsa Mexicana de Valores) has approximately 250 issuers and an index of 40 companies which are actively traded. The IFC has been active in local bond markets and local currency financing is possible.	Mexico is a low to medium risk country for ECAs who offer the maximum terms allowed by OECD regulations to exporters and buyers. PRI is unnecessary. USA and Canadian companies are favoured through NAFTA agreements.	EUROPEAN INVESTMENT BANK (EIB) Financial Products: Loans, Structured Finance GERMAN INVESTMENT & DEVELOPMENT COMPANY (DEG) Financial Products: Loans, Equity, Guarantees


BRAZIL: SNAPSHOT

 <p>BB/Positive Local BB-/Positive Foreign (S&P)</p>	<p>RET APPROACH: Typically, an RE deal in Brazil means HYDRO (large and small) project financed in association with BNDES and a state owned utility as off-taker under the PROINFA program. The vast majority of Brazil's electricity comes from Hydropower. However, large WIND transactions are now the centre of attention. The biggest of the WIND deals (150 MW - second largest in the world) will be installed in the municipality of Osório and BNDES is providing a direct facility of R105 million (\$46.5 million). <u>However, recently a multi-tranche SPV wind financing facility was completed without any direct assistance from the development bank and this is a hopeful indicator of market development.</u> BIOFUELS are an integral part of Brazil's domestic energy mix, increasingly important as an export market (held back by poor infrastructure) and a building block of rural development. Rural SOLAR schemes are a priority (see below).</p> <p>RISKS: <u>are plentiful and sometimes bizarre.</u> Tales of mindless bureaucracy and public sector incompetence abound in Brazil. Corruption is endemic. The judicial system lacks transparency. Frequent changes in local interest rates, exchange rates, and market conditions temper investment in most sectors. One benefit of the failing infrastructure – especially ports and roads – is that it prevents inflationary growth. Many infrastructure projects are on hold or require high hurdle rates because companies are unsure that the judiciary will uphold or enforce contracts. And yet, the potential is huge. As ever, Brazil remains a bit of an enigma.</p>	
<p>BANKING / INVESTMENT Generally, credit from private sources is difficult to obtain and rates are very high. Creditors have little protection in Brazil and are hesitant to lend. Strong US-dollar project revenues and established banking relationships are a big help when seeking funding. ECAs can usually offer help with bank relationships. Local venture capital as a financing mechanism is gaining some momentum in Brazil.</p>	<p>RE PROGRAMS / INVESTMENT INCENTIVES The PROINFA Programme is Brazil's Main RET incentive scheme. In 12.05 BNDES maximum share in investments went from up to 70% to up to 80%; the maximum amortization period was extended from 10 to 12 years. The program has been extended from 12/30/2005 to 12/30/2006 and guarantees have been improved. The requirements still include; the pledge of: beneficiary's shares (SPE); credit rights for the Energy Purchase and Selling Agreement [CCVE], entered into by Eletrobrás and the beneficiary; reserve of means of payment; fiduciary property of machinery and equipment; mortgage on real estate where the financed undertaking is installed; and an insurance package, to comprise engineering, performance and execution risks. <u>Under PROINFA in 2006 BNDES can finance up to 80% of capital costs (excluding site acquisition and imported goods and services) at the basic national interest rates (TJLP) plus 2% of basic spread and up to 1.5% of risk spread. Interests are not charged during construction and amortization is of 12 years. Payments are due 6 months after commercial operation. Eletrobrás guarantees in the long-term electricity purchasing contracts a minimum income of 70% of the contracted energy during the financing period, as well as a full coverage to exposure risks to the short-term market.</u></p> <p>National Programme for Energy Development of States and Municipalities or PRODEEM was set up to develop 20,000 MW of renewable energy capacity in communities. Recently, PRODEEM and ANEEL have started to sponsor mini-grid pilot projects (with hydro and biomass generation), to test different service provision models.</p> <p>Programa Nacional de Electrificação (National Rural Electrification Programme) Effective from 1999, the "Luz no Campo" ('Light in the Countryside') national rural electrification programme was launched to provide electrical power to one million rural homes and benefit approximately five million people.</p>	
<p>COMMERCIAL BANKS</p> <p>Banco do Brasil Itaú Unibanco BankBoston Bradesco Caixa Econômica Federal Banco Real ABN Amro Santander Brasil HSBC Bank Brasil Safra Citibank Votorantim</p>	<p>Local Development Banks:</p> <p>Brazilian Development Bank (BNDES) Website: http://www.bndes.gov.br Provides long-term funding for investment projects with a focus on infrastructure including RET.</p> <p>Banco do Nordeste do Brasil (BNB) Website: http://www.bnb.gov.br A regional development bank that provides equity financing and loans to SMEs.</p> <p>The Brazilian Investment Promotion Agency Website: http://www.investebrasil.org Provides support and co-ordinates resources and tools to facilitate investment.</p> <p>Long-term local currency financing.</p>	

CHILE: SNAPSHOT

	<p>RET APPROACH: Over the past decade, Chile has privatized 100% of its electricity industry and unbundled the national generation, transmission, and distribution systems. HYDRO is the principle renewable energy source in Chile. Hydro has historically been Chile's single largest power source. Droughts periodically curtail hydropower production, causing supply shortfalls and blackouts. Gas imports are important. In 2005, Argentine gas shortages hit the Chilean mining industry hard. A study showed that Santiago businesses also suffered as a result of the gas shortfall. <u>Forty-six renewable energy generation projects have been selected for funding by Chile's state development corporation CORFO and national energy commission CNE as part of a program to diversify the country's energy resources.</u> The 46 projects, chosen out of the 75 presented to CORFO and CNE in November 2005, include 12 wind projects, 11 biomass projects, 22 small-scale hydro projects and one geothermal project. CORFO will offer subsidies totaling US\$1.32mn to carry out feasibility studies as well as other necessary studies for the private sector to attract the necessary investment interest. The approach appears to be successful. Lack of scale is the only ongoing issue.</p> <p>RISKS: Corruption in Chile has always been limited, although a number of cases have occurred in recent years. The GOC responded with vigor in 2003 and the courts and Congress enacted a number of legal and administrative reforms. There is general agreement that the measures, along with financial market reforms, have further improved Chile's transparency. Earthquakes are the major risk for RE projects (See Insurance).</p>		
<p>AA/Stable/A-1+ Local A/Stable/A-1 Foreign (S&P)</p>			
<p>BANKING / INVESTMENT In general, mid-to-long term financing is available from Chilean commercial banks. This includes loans and private capital market bond intermediation. An IPO market is gathering strength. High commodity prices and low interest rates have been good for Chile. Brazil and Mexico are the only other Latin American countries with a significant IPO market.</p>			
<p>COMMERCIAL BANKS Banco Santander Santiago Banco de Chile Scotia Bank Sudamericano BBVA Banco Bhif Banco BICE Corp Banca Banco de Crédito e Inversiones Banco del Desarrollo Banco Security Banco Estado Dresdner Bank ABN Ambro Bank BankBoston Citibank</p> <ul style="list-style-type: none"> • Asset Chile • Banco Penta (investment banks) 	<p>LOCAL DEVELOPMENT BANKS:</p> <p>La Corporacion de Fomento de la Produccion (CORFO) Website: http://www.corfo.cl/ Provides financial assistance to companies interested in investing in Chile at various project stages. The TodoChile program provides funding for feasibility studies (\$1.3 million recently for RE projects).</p> <p>Fundación Chile Website: http://www.fundacionchile.cl/ Provides co-financing for the introduction of advanced technologies in agriculture, forestry, eco-tourism, and marine resources.</p> <table border="1" data-bbox="472 1185 1081 1432"> <tr> <td data-bbox="472 1185 777 1432"> <p>Example Utilities:</p> <p>Endesa (Spain) Iberdrola (Spain) Total (France) AES Corporation (US) Sempra Energy Entergy (US)</p> </td> <td data-bbox="777 1185 1081 1432"> <p>Sask Energy (Canada) Tractebel (Belgium) Repsol-YPF (Spain-Argentina) Pacific Hydro (Australia). Hydro-Québec (Canada) PSEG Global(US)</p> </td> </tr> </table>	<p>Example Utilities:</p> <p>Endesa (Spain) Iberdrola (Spain) Total (France) AES Corporation (US) Sempra Energy Entergy (US)</p>	<p>Sask Energy (Canada) Tractebel (Belgium) Repsol-YPF (Spain-Argentina) Pacific Hydro (Australia). Hydro-Québec (Canada) PSEG Global(US)</p>
<p>Example Utilities:</p> <p>Endesa (Spain) Iberdrola (Spain) Total (France) AES Corporation (US) Sempra Energy Entergy (US)</p>	<p>Sask Energy (Canada) Tractebel (Belgium) Repsol-YPF (Spain-Argentina) Pacific Hydro (Australia). Hydro-Québec (Canada) PSEG Global(US)</p>		
<p>INVESTMENT INCENTIVES The Chilean Economic Development Agency (CORFO www.corfo.cl) Incentives are mostly regional and fall into two main categories:</p> <p>1. GRANTS AND TAX INCENTIVES</p> <p>D.F.L. 15: Geographical coverage: Regions I, XI and XII, and part of Region X. Investor eligibility: Firms with annual sales of up to US\$ 1 million. Project eligibility: Projects with a maximum value of US\$ 1.4 million. Incentive: Grants equivalent to 20% of investment in fixed assets, excluding land. CORFO</p> <p>D.L. 889: Geographical coverage: Regions I, II, III, XI and XII, and part of Region X Incentive: Reimbursement of 17% of wage bill, up to a monthly maximum of approximately US\$ 38 per employee Additional information: Internal Revenue Service (www.sii.cl)</p> <p>Arica Plan (Until 2007) Project eligibility: Projects with a minimum value of US\$ 100,000 in the Arica province and of US\$ 50,000 in the Parinacota province Incentive: Corporate tax rebate equivalent to 30-40% of investment outlay on fixed assets, excluding land. Similar geographic plans: Austral Plan (Until 2008), Navarino and Tierra del Fuego Laws (Until 2035) and the Tocopilla Law (2027)</p> <p>2. INDUSTRIAL DEVELOPMENT PROMOTION SCHEMES CORFO provides a number of incentives. In general, investment projects with a minimum value of US\$ 100,000 are eligible for these incentives, which include:</p> <ul style="list-style-type: none"> • Co-funding of pre-investment studies • Co-funding of investment costs • Grants toward staff training <p>Credit guarantees: To facilitate the access of SMEs to finance and to encourage economic decentralization, CORFO operates a scheme to guarantee bank loans and a line of credit, available through commercial banks. CORFO's TodoChile program (www.todochile.cl) provides a number of additional incentives for investment outside of Santiago.</p>			


MEXICO: SNAPSHOT

 <p>BBB+ Local BBB Foreign (Fitch)</p>	<p>RE APPROACH: To hold its current market share in Mexico, RE will require an investment of at least US\$3 billion over the next nine years. There are opportunities for expansion in a number of sectors, particularly for American WIND developers. There are smaller opportunities in small HYDRO, SOLAR and BIOMASS from burning waste. Although the public sector dominates Mexico's power sector, generation investment is a mixed affair and there is room for private companies - although their obligation to sell power to state power company CFE detracts from their official status as independent power producers. BANOBRAS is Mexico's state development bank for infrastructure and provides long term loans to states and municipalities by borrowing from IADB and the World Bank and issuing its own debt and notes with guarantees from the federal government. BANOBRAS also operates a currency swap facility, which enables it to borrow in foreign currency and lend in pesos. BANOBRAS has just started offering Partial Credit Guarantees. The bank is still rather cumbersome and bureaucratic but its future role is as facilitator (rather than direct provider of funds). Peso Financing is available and local bond issues are fairly liquid. Financial Leasing is fast growing business often linked to banks like Banorte and Banamex or heavy equipment vendors.</p>
	<p>RISKS: Mexico has a solid legal framework but sometimes lacks aggressive enforcement and prosecution. Corruption has been pervasive in almost all levels of Mexican government and society. Combating corruption has been a priority of President Fox, and government agencies at the federal, state and municipal levels are engaged in anti-corruption efforts.</p>
<p>BANKING / INVESTMENT In recent years there have been several unusually large foreign investments in Mexico, principally in the financial services sector. Many foreign banks without commercial banking services in Mexico are also major providers of financing for Mexican projects from their home locations. Long, medium, and short term financing is available from selected commercial banks in Mexico.</p>	<p>INCENTIVES Mexico offers tax incentives such as exemptions or refunds and financial incentives such as loans and fixed assets. Ownership of electric power generation and some other major industries are reserved for state agencies. (See: http://investinmexico.com.mx).</p>
<p>COMMERCIAL BANKS</p> <p>Banamex BBVA Bancomer Banco Santander-Serfin Banco Bital (HSBC) Banorte Scotiabank-Inverlat Grupo Financiero Inbursa</p>	<p>LOCAL DEVELOPMENT BANKS:</p> <p>Banco Nacional de Obras y Servicios Públicos BANOBRAS Website: http://www.banobras.gob.mx Financing for infrastructure projects.</p> <p>Nacional Financiera (Nafinsa) Website: http://www.nafin.com/ Provides longer-term financing for industrial undertakings.</p> <p>North American Development Bank Products: Loans, Equity, Guarantees, Co-financing Priority Sectors: Renewable Energy Restrictions: Venture must be incorporated in USA or Mexico Contact: Arturo Nuñez, Project Development Website: http://www.nadb.org</p>
	<p>Accelerated Depreciation for Environmental Investment (<i>Depreciación acelerada para inversiones que reportan beneficios ambientales</i>) See www.ine.gob.mx</p> <p>Grid Interconnection Contract for RE (<i>Contrato de interconexión para fuente de energía renovable</i>) Federal Commission of Electricity See www.cre.gob.mx</p> <p>Project of Bill to Promote Renewable Energy (<i>Iniciativa de Ley para el Aprovechamiento de las Fuentes Renovables de Energía</i>) in development</p> <p>Project of Electricity Reform in Connection with Renewable Energy (<i>Iniciativa de Reforma Eléctrica en lo Referente a Energías Renovables</i>)</p>


ASIA: Exchanges, ECAs and Development Banks

	PRIVATE FIs ORGANIZED EXCHANGES for FUTURES & OPTIONS, EQUITIES and BONDS	EXPORT CREDIT AGENCIES	DEVELOPMENT BANKS
CHINA	In spite of the efforts of China's regulatory bodies most bankers interviewed say that accessibility for foreigners in financial services remains a complicated and sensitive issue due to the wider political issues involved and the fact that China's financial industry and market are still underdeveloped. At the same time, they are optimistic. An American broker said: "China has done in 15 years what took most Western markets a century to achieve, and I think the CSRC has taken commendable steps to restructure the capital market. It won't happen overnight and it's not surprising that there are a lot of issues with the fixed income market and the equity market in China today, given the little time it has had to get where it is."	Despite relatively higher risk ratings for expropriation / government action and commercial risk, most ECAs have a high risk appetite for China transactions motivated by their government policies to increase two-way business volumes. Transactions tend to be viewed case by case and large corporations such as GE have aggressively opened the wind turbine market.	ASIAN DEVELOPMENT BANK (ADB) Financial Products: Loans, Equity, Guarantees, Co-financing NETHERLANDS DEVELOPMENT FINANCE COMPANY (FMO) Financial Products: Loans, Equity, Co-financing, Guarantees
INDIA	India's oldest stock exchange is Mumbai (Bombay) Stock Exchange with more than 6,000 stocks listed. There are 22 local stock exchanges in India (Ahmedabad, Bangalore, Calcutta, Chennai, Delhi etc), a National Stock Exchange (NSE) and an Over The Counter Exchange (OTCEI) which allows listing of small and medium sized companies. MCX offers futures trading in a wide variety of commodities.	Commercial risks in India are viewed as better than China but the political and expropriation risks are rated about the same and perhaps worse due to numerous loss experiences. There is less appetite for India risk than China risk so long-term loan limits are lower than China's relative to transaction size, although 10-year terms are not problematic to get.	INTERNATIONAL FINANCE CORPORATION (IFC) Financial Products: Equity, Loans, Capital Mobilization, Guarantees, Co-financing MULTILATERAL INVESTMENT GUARANTEE AGENCY (MIGA) Financial Products: Investment Guarantees EUROPEAN INVESTMENT BANK (EIB) Financial Products: Loans, Structured Finance
VIETNAM	Vietnam has two stock exchanges. In the commercial capital Ho Chi Minh City, the first bourse opened in 2000 and in 2005, the Securities Trading Center opened in the political capital Hanoi	Cover of export transactions financed by medium/long-term credits is generally subject to the obtainment of a bank guarantee due to political and commercial risks.	GERMAN INVESTMENT & DEVELOPMENT COMPANY (DEG) Financial Products: Loans, Equity, Guarantees


CHINA: SNAPSHOT

 <p>A-/Positive/A-1 Local A-/Positive/A-1 Foreign (S&P)</p>	<p>RE APPROACH: CHINA'S new Renewable Energy Promotion Law (effective 01/06) is expected to have the greatest impact on WIND power. China is one of the world's biggest future markets for wind and has many potential 'world-class' wind farm sites. However, wind power development in China has lagged and total installed capacity is only about 800 MW compared to India with 3000 MW. GE, NORDEX and other major turbine manufacturers are aggressively entering the market and manufacturing on site. Chinese banks are involved in most project finance deals – 75% by the estimation of a banker in Beijing. Foreign investors should approach foreign banks for financing. Financing rural electrification schemes is a topic of interest and the working groups can look at the use of RESCOs. China's solar industry is well developed but suffers from a worldwide shortage of semiconductor-grade silicon and this is affecting plans for some rural schemes. Beyond interest rate and currency swaps there is little to report with respect to local non-insurance financial risk management instruments.</p> <p>RISKS: Were neatly summarized by one foreign financier: <u>"It is risky for us to be in China, but it would be riskier not to be there."</u> This is a market in rapid evolution. Judicial process is notoriously unreliable and, despite some recent executions, corruption is endemic. But the potential rewards are worth the risks for most. Insurance premiums are too low to attract any international interest except for oil and gas projects.</p>	
<p>BANKING / INVESTMENT Medium and long-term financing, including project finance, is available from commercial banks in China. Preference is given to firms with a proven presence in China, or with an international reputation. The authorities have encouraged China's commercial banks, all of which are wholly or partially state-owned, to improve their loan portfolios by increasing the proportion of their lending to SMEs & private firms.</p>	<p>ADDITIONAL INFORMATION National Development and Reform Commission: A detailed revision of the regulations governing foreign investment into China has recently taken place. While the new regulations have yet to be published or fully implemented, they are likely to greatly simplify the application process for foreign investors into China. State Electricity Regulatory Commission (SERC): In 2002, the vertically integrated utilities organized under the State Power Commission were divided into separate service providers - two grid companies, five national generation companies, four assistant companies (that provide engineering and other business services) and, importantly, one regulator. There are several aspects to the government's strategy for RE. The first of these is increasing the rural population's access to electricity. RE will be an essential component in supplying electricity to the 25 million people living in China who will probably never be connected to the grid. In general, over the last 10 years, Chinese policies on renewable energy development have three levels:</p>	
<p>COMMERCIAL BANKS</p> <p>Deutsche Bank Citibank Bank of East Asia HSBC Standard Chartered Bank BNP-Paribas Industrial & Commercial Bank of China (ICBC) Bank of China China Construction Bank Nanyang Comm. Bank Sumitomo Mitsui Bank of Tokyo Mitsubishi Société Générale JP Morgan Chase China Minsheng Banking China Merchants Bank</p>	<p>LOCAL DEVELOPMENT BANKS:</p> <p>Local development banks in China are not typical providers of project finance to foreign investors. Their mandate is mainly to implement priority development projects for the Chinese government.</p> <p>Private Equity Funds:</p> <ul style="list-style-type: none"> • Asia Development Partners (Infrastructure) • China International Trust & Investment Corp. • IMC Capital Corporation (Alternative Energy) 	<ul style="list-style-type: none"> • <u>First-level policies provide general direction and guidance.</u> These are normally issued by the 'Comprehensive Supervision Ministries and Commissions', and are included in speeches from state leaders. • <u>Second-level policies set up goals, objectives and development plans.</u> Policies at this level are normally issued by departments under ministries. These policies attempt to standardize the directions, focal points and objectives of renewable energy development from different viewpoints. • <u>Third-level policies consist of practical and managerial guidelines.</u> These outline specific supporting measures for developing and using renewable energy. For instance, many provinces and autonomous regions of China have adopted policies for developing renewable energy, including subsidies and tax credits. <p>The Renewable Energy Promotion Law was formally endorsed by the National People's Congress in 02/05. The new law stipulates the responsibilities of government and society in developing and applying RE. At the same time the law was passed, the Chinese Government set a target for RE to contribute 10% of gross energy consumption by 2020, a huge increase from the current level of 1%.</p>

INDIA: SNAPSHOT

 <p>BB+/Stable/B Local BB+/Stable/B Foreign(S&P)</p>	<p>INDIA: India ranks 4th in the world in WIND-energy production after Germany, Spain and USA. Wind farms have been installed in more than 9 states and more than 90% of installed capacity belongs to private sector. The cost of most infrastructure services in India runs 50 – 100% higher than China. <u>The electricity sector is India's biggest infrastructure bottleneck and there are daily supply cuts in many cities</u> and the country suffers from a major shortage of electric generating capacity. In 12/05, the prime minister said efforts have been made to remove some investment roadblocks in the power sector with the setting up of the <u>special purpose vehicle (SPV) for infrastructure investment</u>. India has big SOLAR plans and looks to this technology for uses beyond rural electrification.</p> <p>RISKS: Foreign investors frequently complain about a lack of "sanctity of contracts." Although Indian courts are independent, they are backlogged with unsettled cases. The poor operational efficiency and financial state of the State Electricity Boards (SEBs), which form the foundation of India's power system, prevent proper reform of the power sector despite ongoing efforts at the national level. Corruption is endemic and national "Vigilance" campaigns are seeking to address this.</p>
<p>BANKING / INVESTMENT The Indian capital market is fairly sophisticated and has grown in recent years, but remains relatively small compared other major emerging markets. <u>Medium and long-term financing is available from commercial banks in India along with equity finance from banks with venture capital arms</u>. State banks and privatized development banks remain the major source of longer-term capital.</p>	<p>RE FINANCING MODALITY Most new generating capacity in India in the last 4 years has been financed with domestic capital, or with the help of multilaterals. The Electricity Act of 2003 was <u>designed to remedy many of the problems besetting India's power sector, and to attract capital back to large-scale power generation projects</u>. The Act envisioned the unbundling of SEB assets into generation, transmission, and distribution companies, and the eventual privatization of these assets.</p>
<p>COMMERCIAL BANKS State Bank of India SBI Commercial & International Bank Industrial Development Bank of India ICICI Bank Canara Bank Bank of Baroda IndusInd Bank HSBC Scotiabank Citibank Standard Chartered Oriental Bank of Commerce The South Indian Bank Corporation Bank UCO Bank UTI Bank Union Bank of India Vijaya Bank</p>	<p>Local Development Banks: National level development banks in India generally focus on lending to small-scale industrial and agricultural ventures, or on funding housing projects. Most states have active development banks that can provide funding for a variety of projects, particularly in less-developed jurisdictions.</p> <p>Private Equity Funds:</p> <ul style="list-style-type: none"> • Asian Private Investment Company • AIG Asian Infrastructure Fund II • Asia Development Partners (Infrastructure) • ICICI Ventures
<p>The Ministry of Non-conventional Energy Sources (MNES) is responsible for small and mini hydro projects up to 3MW and announced a policy for accelerated development of small hydro power. India has 420 small hydro power projects up to 25 MW capacity and another 187 projects in this range are under construction. The Indian Renewable Energy Development Agency Limited (IREDA) administers some fiscal incentives from the Central and State governments including:</p> <ul style="list-style-type: none"> ▪ Income tax holiday ▪ Accelerated depreciation ▪ Concessional custom duty/duty free import ▪ Capital/Interest Subsidy ▪ Energy buyback, power wheeling and banking facilities ▪ Sales tax concession/benefits ▪ Electricity tax exemption ▪ Demand cut concession offered to industrial consumers who establish RE power generating units ▪ Capital Subsidies 	


VIETNAM: SNAPSHOT

 <p>BB/Positive/B Local BB-/Positive/B Foreign (S&P)</p>	<p>RISKS & DEVELOPMENTS: VIETNAM remains a one-party state, and is likely to continue this way but Nong Duc Manh, who became general secretary of the Communist party in 2001, is reform-minded. A younger, more outward-looking and technocratic leadership has emerged. The posts of "party advisors" who blocked change have been eliminated. However, Vietnam remains an opaque operating environment and potential investors should carefully scrutinize plans. In 2004, Vietnam only scored a 2.6 out of a possible 10 points on Transparency International's Corruption Perception Index. But foreign investment is growing. In 2006, Bank of Tokyo-Mitsubishi <u>is to start offering investment banking services in Vietnam including syndicated loans, project finance for infrastructure, and brokering mergers and acquisitions.</u> It has established specialist divisions in each of its Hanoi and Ho Chi Minh City branches. Other banks are planning to expand their financing operations in Vietnam. One development that could be useful to the UNEP project is a new draft Civil Code for insurance. Decree No. 18/2005/ND-CP (2005) establishes a legal framework to enable companies in a common industry to establish a mutual insurance operation. The measure is expected to benefit sectors that currently have difficulty in obtaining insurance.</p>
<p>BANKING / INVESTMENT Vietnam's financial system is in the early stages of reform. The Vietnam Dong (VND) is not a freely convertible currency. Medium, and possibly longer-term, financing is available from commercial banks in VND. Foreign investors are encouraged to approach the branches of major foreign banks as the state banks tend to favour state-owned enterprises.</p>	<p>POWER, RET & DEVELOPMENT BANK ACTIVITY Vietnam's per capita electricity consumption is amongst the lowest in Asia but demand is rising and straining the country's limited generating capacity. Electricity demand in Vietnam is forecast to grow 15%-16% per year until 2010. Vietnam currently buys power from China to prevent shortages in the North, and plans to begin purchasing from Laos in 2008. In 2005 the Asian Development Bank approved USD 434.3 million in loans to Vietnam to upgrade its power sector and irrigation systems. USD 360 would expand and upgrade transmission lines and sub-stations in the north to support planned industrial zones in the area, the ADB said in a statement. Under an agreement signed in December 2005 the Ministry of Finance will lend US\$120 million (borrowed from the ADB) to Electricity of Vietnam Corporation (EVN) to carry out the Northern Transmission Project. The loan has duration of 25 years, with the interest and borrowing fees being fixed by the ADB plus an intermediate fee of 0.2 per cent a year. <u>The Bank for Investment and Development of Vietnam has been assigned to manage the source of loans. This is the first time EVN and the Vietnamese Government have used the ADB's commercial loans.</u> The majority of Vietnamese electricity is produced using coal-fired plants. In order to meet increased demand, construction or expansion is planned for 32 power stations (7,547 MW) before 2010. EVN plans to commission 16 hydropower plants by 2010, as well as increase capacity in coal-fired plants. Currently there are five hydroelectric expansions underway. <u>JBIC is contributing equipment to some projects.</u> About 87% of households currently have access to electricity. The figure is expected to rise as a result of World Bank support for the Rural Energy II project, which began in 2005 and will continue for seven years. <u>A \$220 million World Bank loan for the project is designed to bring power to 2.5 million households.</u> Vietnam has great solar potential. RE consumption is on the rise. Under a solar power cooperation program between Solarlab, the French Ministry of Foreign Affairs, EDF and the EU, the "Vietnamese-French Friendship Solar Station" was installed in Ho Chi Minh City</p>
<p>COMMERCIAL BANKS Bank of Tokyo-Mitsubishi Standard Chartered Bank ANZ Bank Citibank HSBC Deutsche Bank ABN Amro Bank Crédit Lyonnais</p>	<p>LOCAL DEVELOPMENT BANKS: Industrial and Commercial Bank of Vietnam (Vietcombank) Contact: Medium, Long Term & Project Department Tel: (84-4) 942-1082 Website: http://www.icb.com.vn/ Funding for industrial development. Bank for Investment and Development of Vietnam Tel: (84-4) 826-8311 Website: http://www.bidv.com.vn/ Funding for infrastructure projects. Vietnam Bank for Agriculture and Rural Development Tel: (84-4) 821-1681 Funding for agricultural projects. Proparco (France) Financial Products: Equity, Loans, Guarantees Priority Sectors: Power, Financial Services Contact: Hanoi Office Email: afd@hn.vnn.vn Tel: (84-4) 823-6764 Website: http://www.proparco.fr</p>

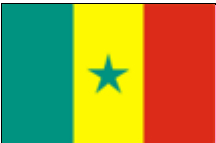
AFRICA: EXCHANGES, ECAS AND DEVELOPMENT BANKS

	PRIVATE FIS ORGANIZED EXCHANGES for FUTURES & OPTIONS, EQUITIES and BONDS	EXPORT CREDIT AGENCIES	DEVELOPMENT BANKS
SOUTH AFRICA	According to recent statistics, SA's financial markets are the 11 th busiest in the world. The JSE and futures exchange are liquid and bustling. The local bond markets have developed slowly by comparison but new municipal issues may offer local governments more room to negotiate their infrastructure and power needs. This would be helpful for the RE sector.	South Africa is a low to medium risk country for ECAs who offer the maximum terms allowed by OECD regulations to exporters and buyers. PRI is unnecessary.	AFRICAN DEVELOPMENT BANK (AfDB) Financial Products: Loans, Equity, Guarantees ISLAMIC DEVELOPMENT BANK (IsDB) Financial Products: Loans, Equity
SENEGAL	Bourse Régionale des Valeurs Mobilières S.A. (BRVM) serves the countries West African Economic and Monetary Union. It is a fully functional but sleepy electronic exchange located in the Ivory Coast. The interbank market is improving for OTC products.	Political risk and Transfer risk are rated as "high" by most Western ECAs and the terms on offer by OECD agencies reflect this. South Africa and China ECAs rate the risk lower and are assertively helping their companies displace the traditional French hold on this economy.	INTERNATIONAL FINANCE CORPORATION (IFC) Financial Products: Equity, Loans, Capital Mobilization, Guarantees, Co-financing MULTILATERAL INVESTMENT GUARANTEE AGENCY (MIGA) Financial Products: Investment Guarantees EUROPEAN INVESTMENT BANK (EIB) Financial Products: Loans, Structured Finance
MOROCCO	The Casablanca stock exchange (CSE) prospered in the early 1990s, but from late 1998 through 2002 suffered a long, severe bear market. A rebound in 2003 marked a return in investor confidence. Recent successful IPOs have boosted market liquidity. OTC derivatives volumes are light but the bond markets are attracting pensions.	Political risk and commercial risks are rated medium to high to but most ECAs are comfortable with the risk and deploy the maximum short-term OECD limits for Morocco. Longer-term transactions are done on a case by case basis.	GERMAN INVESTMENT & DEVELOPMENT COMPANY (DEG) Financial Products: Loans, Equity, Guarantees


SOUTH AFRICA: SNAPSHOT

 <p>A+/Stable/A-1 Local BBB+/Stable/A- Foreign (S&P)</p>	<p>SOUTH AFRICA: the large-scale RE situation in SA is in the hands of the state who are currently determining “market rules”. There is a clear need for better administration of microfinance and rural electrification programs and this is a priority. About 40% of SA’s population is poor and has no benefit from the sophisticated financial and insurance markets. South Africa's microfinance institutions face stiff competition from loan sharks who prey on the vulnerable, especially in the townships where a majority of the country's poor live, say microfinance experts. Attention is being focused on this issue and consumer education as well as the availability of micro finance (to pay for solar etc.) is a priority. South Africa has a highly developed synthetic fuels industry which takes advantage of the abundant coal reserves, and this expertise points to development of a local biofuels industry in the future. <u>Example deal:</u> KES (Total & EDF) is involved in a project to install equipment in 15,000 homes in KwaZulu-Natal province by end-2006. Tenesa, (Total subsidiary) assembles the panels locally and has a production capacity of 25 MW-peak a year. KES installs the panels and will provide maintenance and customer service for a period of 20 years from commissioning.</p> <p>RISKS: until the “market rules” are in place there is no framework for anything but SOLAR.</p>	
<p>BANKING / INVESTMENT South Africa's financial markets are robust, liquid and well developed. The Financial Services Board (FSB) governs a sophisticated non-bank financial services industry. The financial markets consist of: The JSE Securities Exchange SA (www.jse.co.za) The Bond Exchange of South Africa (www.bondex.co.za)</p>	<p>RENEWABLE ENERGY STRATEGIES</p> <p>Parastatal company Eskom, one of the largest utilities in the world, generates about 95% of South Africa’s electricity. Eskom’s 35,060 MW of nominal generating capacity is primarily coal-fired. <u>RE is viewed as a solution for rural communities.</u> As part of its rural electrification program, SA invited bids to provide 40,000 rooftop solar power systems to rural areas in June 2004. Financing for the project (\$19.4 million) was provided by KfW. The Ministry of Mines and Energy (MME) operates a "Home Power Revolving Fund" (1996), that allows the public to buy solar products with a 5% interest loan and a 5-year pay back period. The programme is being administered through Konga Investment. It has recently come to light that 50 percent of these accounts are not active. There appears to be low awareness of the Home Power Revolving Fund, but also significant interest in it by communal and commercial farmers. In 12/05 IFC awarded a \$3 million grant to IST Holdings (PTY) Ltd and Plug Power Inc., who will install 400 fuel cells in remote locations in SA.</p> <p>Eskom operates demonstration facilities / pilot plants for wind, solar, biomass, gasification, ocean/wave and fuel cells.</p> <p>In 5/04, MME drafted the first energy efficiency and RE strategy. The draft is expected to identify "market rules" (i.e. sources of financing and required technologies for new entrants in the electricity-generation sector). Plans for a national RE monitoring system were also announced. SA will target producing 4% of the country's electricity from renewable sources by 2013.</p> <p>The Department of Trade & Industry (DTI) has a "six pack" of useful investment incentives including a Critical Infrastructure Facility that pays a top-up grant of 9-30% of costs and can be applied for RE projects.</p>	
<p>COMMERCIAL BANKS</p> <ul style="list-style-type: none"> • ABSA • Standard Bank • First Rand Bank • Investec Bank • ABN Amro • Citibank • Commerzbank • Crédit Agricole • Société Générale • JP Morgan • ING Barings • Crédit Suisse • HSBC • Merrill Lynch • Old Mutual • Rand Merchant Bank • Nedbank • HSBC 	<p>LOCAL DEVELOPMENT BANKS & ASSISTANCE:</p> <p>Development Bank of Southern Africa Financial Products: Equity, Guarantees, Loans and a wide range of assistance programs. Website: http://www.dbsa.org Active in RET sector</p> <p>Industrial Development Corporation of South Africa Contact: Stephan Vermaak, Head, Project Structured Finance Email: stephanv@idc.co.za Website: http://www.idc.co.za</p> <p>Business Partners Business Partners provides a variety of financial products aimed at SMEs through four regional funds. Contact information for each fund is available at: http://www.businesspartners.co.za/FourFunds.htm</p> <p>Trade and Investment South Africa (TISA) offers assistance and information for investors: Website: http://www.thedti.gov.za</p>	

SENEGAL: SNAPSHOT

 <p>BBB- (Fitch) WAEMU linked to €</p>	<p>SENEGAL is becoming the gateway to Francophone regions of Africa. The country's lack of mineral resources has been a bit of a blessing, as gold and diamonds have fuelled conflicts around it. A recent survey by the South African Institute of International Affairs on the experience of SA businesses operating in Senegal found almost all regard Senegal as an increasingly investment-friendly destination. Senegal offers a promising market for Chinese, South African and Moroccan investors keen to penetrate France's influence in Africa. France is overwhelmingly the most important foreign investor in Senegal. World bank supports a government reform program to introduce private sector participation in the energy sector which is currently dominated by the interests of petroleum refinery shareholders. The Organization for the Development of the Senegal River (OMVS) consists of Mali, Mauritania and Senegal, and has constructed two dams.</p> <p>RISKS: No frameworks for RE. Senegal will be influenced by China and South Africa in its choice of energy mix.</p>	
<p>BANKING / INVESTMENT</p> <p>Medium and long-term financing is difficult to obtain from commercial banks in Senegal. Firms can access financing on a case-by-case basis when loans are highly-secured. Claims on the central bank have nearly doubled in the past 5 years to CFA 800 billion, indicating excessive liquidity and insufficient loans in the banking sector. SMEs have little access to credit. Private bond issuances are a topic of some interest, but have yet to make any impact on investment in Senegal. There are no local financial risk management instruments to be aware of beyond the insurance markets. FX facilities via WAEMU link to € are helpful.</p>	<p>POWER & RENEWABLE ENERGY</p> <p>FAILED PRIVATIZATIONS: Senegal's Societe Nationale d'Electricite (SENELEC) handles the generation, transmission and distribution of the majority of the country's electricity. The government's ownership was reduced to 41% in 1999, when a consortium comprised of the utilities Hydro-Quebec of Canada and Elyo of France acquired a 34% interest. In 2000, a series of power cuts prompted the government to take back the stake sold to the Franco-Canadian venture. Privatization negotiations with France's Vivendi fell through in February 2001, and government negotiations with U.S.-utility AES Corp ended unsuccessfully in July 2002.</p> <p>To date, RE programs in Senegal have been largely donor financed and have had mixed/poor results. The Africa Rural Energy Enterprise Development Program (AREED) has worked with a local developer successfully: AME a Senegalese business that maintains solar water heaters in Dakar and the surrounding urban areas of Senegal and this small-scale program demonstrates potential.</p> <p>There are some funds that could potentially provide loans and equity for large scale RE projects.</p> <p>Private Equity Funds:</p> <ul style="list-style-type: none"> • Emerging Africa Infrastructure Fund • Africa Millennium Fund (Infrastructure) • AIG Africa Infrastructure • West Africa Growth Fund 	
<p>COMMERCIAL BANKS</p> <ol style="list-style-type: none"> 1. Crédit Lyonnais Sénégal 2. Société Générale de Banques au Sénégal 3. BICIS 4. Banque de l'Habitat du Sénégal 5. CNCA du Sénégal 6. Ecobank 7. Citibank 8. Bank of Africa 9. HSBC Equator 10. Compagnie Bancaire de L'Afrique de L'Ouest 11. BMCE 	<p>Local Development Banks:</p> <p>West Africa Development Bank Financial Products: Equity (Cauris), Guarantees (GARI), Loans Ownership Restrictions: Incorporated in a WAEMU member country (or ECOWAS for GARI). Website: http://www.boad.org</p> <p>Fonds de Promotion Economique Contact: Assane Soumaré, Director, FIs Email: assanne@hotmail.com Tel: (221) 849-6478 Can provide some medium and long-term credit and equity participation in most sectors. Can only be accessed by firms incorporated in Senegal.</p> <p>Proparco (France) Financial Products: Equity, Loans, Guarantees Priority Sectors: Financial Services, Infrastructure Contact: Jean-Claude Chesnais, Senegal Office Email: afddkr@sentoo.sn Website: http://www.proparco.fr</p>	

MOROCCO: SNAPSHOT

	<p>WIND and SOLAR projects are underway. One of the wind power facilities (60 MW) will be located in Essaouira and the other (140 MW) will be located near Tangiers. The Essaouira facility is scheduled to come on-line in 2006 and KfW is loaning ONE 50 million Euros for this deal. Half of the amount is a 40-year loan carrying an annual interest rate of 0.75% with a 10-year grace period and the other half is a commercial loan. Morocco is gradually integrating its electrical grid with Africa and Europe (Spain) and this will be helpful for ongoing development of RE programs based on the European model. Agriculture is a critical sector and heavily dependent on the weather. It accounts for anything between 13% and 20% of GDP, depending on rainfall. As much as 50% of the population depends on the farm sector.</p> <p>RISKS: there are costly subsidies on domestic fuel. Concessions on utilities are helping to attract investment but the dirham is considered overvalued and this is a market risk. Transparency continues to improve. The insurance industry is sleepy and offers little to the RE sector.</p>
<p>BBB/Stable/A-3 Local BB+/Stable/B Foreign (S&P)</p>	
<p>BANKING / INVESTMENT Medium and long-term financing is available from commercial banks in Morocco although interest rates and collateral requirements are relatively high. After a few grim years, the Casablanca Stock Exchange (http://www.casablanca-bourse.com/homeen.html) rebounded in 2003 and fairly healthy performances in 2004& 2005 reflect a return in investor confidence. The dirham still looks expensive.</p>	<p>POWER & RENEWABLE ENERGY Morocco's electricity sector traditionally has been controlled by the state-owned Office National de l'Electricité (ONE). ONE was reorganized in 1995, after which it regained profitability. Power shortages and a desire to control public spending have led the Moroccan government to make more use of the private sector to meet the country's power needs. <u>The state's share of electricity generation likely will decline to 40% by 2020. The electricity sector is being liberalized but ONE will continue to be solely responsible for distribution and transmission.</u></p> <p>RE plays a key role in ONE's \$3.4 billion energy development plan, announced 1/04. The goal is to provide 80% of rural areas with electricity by 2008 and to increase the share of RE from 0.24% in 2003 to 10% in 2011. The plan calls for two new wind projects, as well as a 200 to 250-MW thermo-solar facility financed with an African Development Bank (AfDB) loan of €136.45 million.</p> <p>In 5/05, ONE selected TemoSol for a \$27.6 million project to supply solar power to 37,000 rural homes by 2007. Similar contracts were awarded in 2002 to and 2004 (Apex-BP). Currently, only 55% of outlying villages have access to electricity.</p> <p>Private Equity Funds:</p> <ul style="list-style-type: none"> • Moussahama • CFG Group • Capital Invest • Upline Securities • Capital Finance
<p>COMMERCIAL BANKS</p> <ol style="list-style-type: none"> 1. Banque Marocaine de Commerce Extérieur 2. Banque Commerciale du Maroc 3. Banque Marocaine pour Commerce & l'Industrie 4. WafaBank 5. Crédit du Maroc 6. Société Générale Marocaine des Banques 7. Citibank Maghreb 8. Banque Al Amal 9. Banque Centrale Populaire 	<p>LOCAL DEVELOPMENT BANKS:</p> <p>Banque Nationale de Développement Économique Contact: Ali Harraj, Director General Tel: (212) 3770-8844 Provides long-term funding.</p> <p>Caisse Nationale du Crédit Agricole Contact: Said Ibrahim, Director General Tel: (212) 3773-8888 Website: http://www.creditagricole.ma Provides funding for the agriculture sector, including rural development projects.</p>

Summary of the general conditions of financial markets for RE investment in the focus countries

South Africa (SA) has the best developed financial and insurance markets of the focus countries from a UNEP product development perspective. However, because of the underlying economics (low tariffs, dominant state utility) the business case for large-scale RE development is poor. The coming years will see changes as “market rules” for renewable energy are decided upon. SA’s coal driven cheap power is finite. A recent presentation by Eskom indicated that tariffs would be rising and their power sources diversifying in the coming years.

Participants indicated that they thought **Chile** has the best overall operating environment of the survey countries. This is reflected in the fact that many multinationals have their Latin American headquarters in Santiago. The financial and insurance markets are transparent and well managed. The government, via CORFO, is addressing one of the stickiest problems facing RE developers – they are providing funds for feasibility studies (see Chile Snapshot). The only downside to Chile is the generally small scale of remaining opportunities. Pac Hydro and other major RE developers have already tied up most of the larger projects. Chile is the right country to try out a product that can amalgamate and redistribute risk packaged as bonds for local investors – such as an asset-backed security issued by a utility that gets power from small-hydro.

Mexico is an investment grade NAFTA country. Corruption is still an acknowledged issue but it does not tend to slow down business the same way as in other countries with similarly perceived levels of graft. Government guarantees are required for large infrastructure projects. American wind power developers are increasingly comfortable with local government relationships. Local finance opportunities are readily available now⁴³ and the IFC has successfully issued securitized instruments. Foreign investment in the banking sector is large and the competitive environment is leading to a wider choice of OTC financial instruments. Leasing companies are emerging as a source of finance and this is an area that UNEP can look at.

China is the focus country of interest to the most (and largest) RE investors at this time. The new Renewable Energy Promotion Law (effective 01/06) is expected to have the greatest impact on wind power and turbine manufacturers such as GE and Nordex are aggressively expanding into the market. Insurance premiums in China are amongst the cheapest in the world. The financial markets are quite undeveloped relative to the size of the economy but financiers in Shanghai and Hong Kong are optimistic about the speed of development. The rural situation in China remains difficult and RE solutions funded by RESCOs would be helpful.

In **Brazil** local banks are taking a more active role in financial market development. The Brazilian insurance markets are still state dominated but opening up. Brazilian infrastructure is decrepit. One local banker laughed that bad infrastructure was a risk management tool to prevent runaway inflation. However, back-ups at ports and on bad roads are preventing the biofuels export market from developing. One of the biggest wind deals yet was funded in Brazil using SPVs and structured finance. It is rumoured that a custom wind index has been developed to provide a weather derivatives hedge but no data was available.

Morocco is quickly developing its RE capacity as a national priority and boasts the Arab world’s first CDM project. The key sector in Morocco is agriculture, which is heavily dependent on the weather and can account for anything between 13% and 20% of GDP, depending on rainfall. The financial markets are somewhat better developed than the insurance markets in Morocco. Local expertise is available to help develop a weather derivatives market and this would be a useful risk management priority.

India has well developed financial and insurance markets. The World Bank and IFC are actively developing weather insurance for farmers in the country and this type of work could be used to create weather derivatives for substantial RE installations. The trickiest aspect of doing RE business in India is dealing with the individual state power companies over whom the national government seems to have little control.

Vietnam is attracting foreign investment interest despite the country and commercial risk. Japanese investment banks are the most active in the primitive capital markets. The country recently issued a bond in the international markets as a signal that it was “open for business” but the currency (VD) is still not convertible and corruption is rife.

Senegal is on the map for South African and Chinese investors but none of the Western bankers that the consultant interviewed had any interest in participating in this market. GE has an ongoing deal in the power sector but no plans to invest more. Senelec, the state power company has suffered several failed privatizations and is about bankrupt. The BVRM is the local stock exchange where it is possible to raise limited amounts of finance. The country benefits from an increasingly sound microfinance system and this should probably be the basis of community RE development schemes.

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DEVELOPMENT FINANCE: Contacts for Focus Countries

WORLD BANK GROUP:	EUROPEAN-BASED:	REGIONAL
<p>INTERNATIONAL FINANCE CORPORATION (IFC) Financial Products: Equity, Loans, Capital Mobilization, Guarantees, Co-financing Brazil: Wolfgang Bertelsmeier, wbertelsmeier@ifc.org Morocco: Sami Haddad, shaddad@ifc.org South Africa: Haydée Celaya, hcelaya@ifc.org Vietnam: Deepak Khanna, dkhanna@ifc.org India: Dimitris Tsitsiragos, dtsitsiragos@ifc.org China: Karin Finkelston, kfinkelston@ifc.org</p> <p>Website: http://www.ifc.org</p>	<p>EUROPEAN INVESTMENT BANK (EIB) Financial Products: Loans, Structured Finance Latin America: Orlando Arango, o.arango@eib.org Morocco: Helen Kavvadia, h.kavvadia@eib.org Africa: Bram Schim van der Loeff, a.schimvanderloeff@eib.org Tel: (323) 235-0084 Website: http://www.eib.org</p> <p>ACTIS (UK, former CDC) Financial Products: Loans, Co-Financing, Equity Latin America: Michael Till, mtill@act.is Senegal: Xavier Lecacheur, xlecacheur@act.is South Africa: David Morley, dmorley@act.is Vietnam: Donald Peck, dpeck@act.is Website: http://www.act.is/</p>	<p>BRAZIL, CHILE, MEXICO</p> <p>INTER-AMERICAN DEVELOPMENT BANK (IADB) Financial Products: Loans, Guarantees Roberto Vellutini, Energy Projects Email: robertov@iadb.org Tel: (202) 623-2159 Website: http://www.iadb.org</p> <p>INTER-AMERICAN INVESTMENT CORPORATION Financial Products: Loans, Equity, Guarantees, Co-financing Contact: Southern Cone Regional Office (Uruguay) Tel: (598-2) 901-6063 Website: http://www.iic.int/</p>
	<p>MULTILATERAL INVESTMENT GUARANTEE AGENCY (MIGA) Financial Products: Investment Guarantees Roger Pruneau, Vice President, Underwriting Team RPruneau@worldbank.org Tel: (202) 473-6168</p> <p>Website: http://www.miga.org</p>	<p>GERMAN INVESTMENT & DEVELOPMENT COMPANY (DEG) Financial Products: Loans, Equity, Guarantees Brazil: Thomas Kessler, tkessler@degbrasil.com.br Mexico: Armin Albert, info@degmexico.com India: Hubertus Pleister, deg@degindia.com China: Markus Pesch, degchina@public.bta.net.cn Website: http://www.deginvest.de</p>
	<p>REGIONAL</p> <p>MOROCCO, SENEGAL</p> <p>AFRICAN DEVELOPMENT BANK (AfDB) Financial Products: Loans, Equity, Guarantees Luciano Borin, Director of Private Sector Operations Email: l.borin@afdb.org Website: http://www.afdb.org</p> <p>ISLAMIC DEVELOPMENT BANK (IsDB) Financial Products: Loans, Equity Contact: Director, Operations and Project Department 2 Email: telreedy@isdb.org Website: http://www.isdb.org</p>	

Development Partnership:Resources for RE Developers, Financiers and Insurers

The Public-Private Infrastructure Advisory Facility (PPIAF) is multi-donor technical assistance facilities aimed at helping developing countries improve the quality of their infrastructure through private sector involvement. PPIAF was developed at the joint initiative of the governments of Japan and the United Kingdom, working closely with the World Bank. PPIAF pursues its mission through channelling technical assistance to governments in developing countries on strategies and measures to tap the full potential of private involvement in infrastructure. Proposals for PPIAF support can originate from any source and can support activities intended to benefit any developing and transition country included on an extensive OECD list.

Private Infrastructure Development Group (PIDG) is a group of like minded donors seeking to increase private sector investment in the infrastructure of developing countries. PIDG was founded by the UK Department for International Development (DFID), the Swedish Government acting through the Swedish International Development Co-operation Agency (SIDA), the Netherlands Minister for Development Co-operation and the Swiss State Secretary for Economic Affairs of the Government of the Confederation of Switzerland. The group is active in organizing and funding a variety of public-private interactions and capacity building exercises.

The Emerging Africa Infrastructure Fund (EAIF, the Fund) is a public-private financing partnership initiated by the PIDG. EAIF represents a new financing approach for commercially viable, private sector infrastructure ventures in sub-Saharan Africa. The Fund was launched in 2002. Nick Rouse is the current Managing Director. The Fund's equity of US\$100 million is provided by the PIDG. The Fund's debt capital has been provided in two tranches - US\$120 million of senior debt (Barclays and Standard Bank providing US\$60 million each), and US\$85 million of subordinated debt from development finance companies. The Fund's manager is a joint venture by its shareholders. The Fund's core product is the provision of US dollar denominated senior-ranking term debt, usually between US\$10 million to US\$30 million per transaction and up to 15 years maturity. Subordinated debt may also be offered where appropriate (usually alongside senior debt), subject to the overall amount and tenor of lending being within these limits. The Fund may issue guarantees in respect of senior debt where this facilitates the provision of local currency funding. All EAIF's products are offered on commercial terms. However:

- The Fund is **able to lend without political risk cover**
- The Fund has the **ability to offer loans up to 15 years in tenor and can consider loan repayment profiles that suit the cash flow profile of the underlying business**
- The commercial orientation of the Fund management process seeks to provide clients of the Fund with a responsive, flexible and efficient service.

NEW INFRACO LIMITED (<http://www.infracolimited.com>)

INFRACO's mandate is to structure bankable infrastructure opportunities in developing countries. The concept of INFRACO originated as "DevCo Advisory" (mentioned in the Scoping Study) which was first conceived in 2003, when a MOU was signed between IFC and the United Kingdom's DFID which is contributing \$10 million over three years under the umbrella of a broader portfolio of work being developed in association with the PIDG. The mandate was put out to tender and a group of experienced banker won the bid and set up shop in London earlier this year. The mission of INFRACO is to facilitate infrastructure investment in low income developing countries (primarily Africa and South Asia) and make a profit for the concessionaires who are fulfilling a mandate to act as principal and honest broker, rather than as an advisor to governments.

INFRACO acts as a principal project developer and is able to take the earliest and highest risks in the development of infrastructure transactions, with the aim of selling them to investors once a full development process has been completed. Our involvement is designed to catalyze new investment in water, power, transport and other related sectors. **INFRACO bridges the "feasibility gap".**

Edmund Olivier would like to thank individuals from the following institutions and companies who were especially helpful in compiling Task 2:

<ul style="list-style-type: none"> • ABN Amro • Actis • BMCE Bank • Development Bank of Japan • Banco Bradesco • Emerging Africa Infrastructure Fund • Fortis Bank • GE Energy Finance • Macquarie Bank • Standard Bank of South Africa • Standard Bank PLC • Tarpon Investimentos • West LB 	<ul style="list-style-type: none"> • Marsh • SwissRe • Zurich • Dalkia • Corporación Mexicana de Hidroelectricidad • Cia. Vale do Rio Doce • GE Power • Global Olivine • Gilbert Gilkes & Gordon • INFRACO • ORMAT • Pacific Hydro • NORDEX • Rio Tinto
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There are a number of other contributors with whom the consultant spoke briefly - he apologizes for economical acknowledgements as these conversations were quite useful for context.

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ANNEXURE 2: GLOBAL INSURANCE SURVEY

January 2006

**Survey of Insurance Availability for
Renewable Energy Projects
United Nations Environment
Programme**

MARSH

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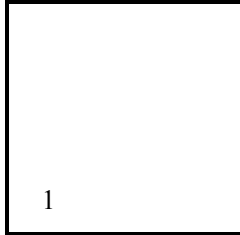
Foreword

This document is one of two provided to fulfil Contract # 283: “Assessment of Financial Risk Management Instruments for Renewable Energy Projects (GEF Countries) – TASK 2.

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EXECUTIVE SUMMARY

This report accompanies the Miridor Consulting Ltd report and together these form Task 2 of the UNEP Project titled Assessment of Financial Risk Management Instruments for Renewable Energy Projects.

Task 2 focuses on the availability of risk management instruments for renewable energy projects and builds on the findings from Task I and the 2003 UNEP Scoping Study both of which identify risks that could be effectively managed by financial risk management instruments.

To carry out this analysis an electronic web survey was used to gather information from a wide cross section of insurance companies, selected because of their reputation and involvement in the energy related sectors.

The objectives of the survey were to provide baseline information on insurance availability for renewable energy projects. This provides a basis from which to determine deficiencies, barriers and suitability of insurance for wider application in developing countries.

Respondent Profile

- Although not intended to demonstrate statistical significance based on the survey sample size (45 insurers approached) and the response rate of 40% the survey findings do in theory demonstrate a reasonable representation of commercial insurance market perceptions
- Respondents represented a diverse cross section of the insurance market including a combination of local insurers, specialist Lloyds markets, company markets and international (re) insurers
- As well as renewable energy business these companies were also active in a diverse portfolio of property and casualty lines of business
- Appetite to underwrite renewable energy business is strong with all respondents perceiving there to be commercial business opportunities from the renewable energy industry either currently or in the next 5-10 years.

Market Appetite and Capacity

- Onshore wind, energy from waste, offshore wind and small scale hydro are perceived by

- respondents to offer the greatest future business opportunities for (re) insurers
- Traditional products such as property damage, business interruption, machinery breakdown and construction all risks are more widely available for the more commercialised and simple renewable technologies located in more benign environments (onshore wind, small scale hydro, energy from waste etc)
- Although offshore wind is attractive in terms of premium income, fewer insurance markets are able to participate in wind farms offshore due to the increased marine exposure and the requirements for specialist marine reinsurance protection
- With over **USD2 billion** of aggregated capacity, companies participating in this survey have more than adequate capacity to cater for the current insurance requirements of the renewable energy industry

Specific risks, underwriting concerns

- 61% of respondents identify New / Prototypical / Scale Up technology as being a major underwriting concern for most renewable energy technologies
- Inherent technical perils in handling, erecting, testing and commission were identified as a major underwriting concern for most renewable technologies. This concern is exacerbated by installation, operation and maintenance of projects in harsh marine environments (e.g. sub sea cable lay and maintenance activities associated with offshore wind, wave and tidal power)
- Inextricably linked to concerns over prototypical technology and technical perils (in handling, erecting, testing and commissioning), *faults in design, material and workmanship* was highlighted by underwriters as being a major concern for certain technologies. Typically underwriters impose an outright exclusion for this peril, some may provide cover for the resultant damage but exclude the faulty part itself. The increasing commercialisation and availability of performance / service warranties / guarantees provided by component part manufacturers for certain technologies such as wind may explain the reduced concern for certain technologies.

Greatest challenges to the insurance industry

- Due to the prototypical nature of many renewable energy technologies the limited data on commercial operating history presents a huge challenge to the insurance industry who are unable to accurately model future loss projections and price risk in an economic and sustainable manner
- Combined with a lack of data, a lack of technical expertise to undertake prudent risk assessment and evaluation was also identified as presenting a challenge to the industry.

Insurance Availability in developing countries

- Typically local developing country insurers have limited expertise to write renewable energy business. However, where foreign insurers have access to developing country markets most traditional products are available for the more commercial technologies.
- Many Lloyds and Company (re) insurers participating in this survey have licences to write business in most countries of the world, however, insurance availability in developing countries is restricted by a lack of adequate financial, legal and service infrastructure.
- Foreign (re) insurers trying to access developing country business in general are hampered by lack of credit worthy local insurers, restrictive local insurance regulations and limited distribution channels.

Product development opportunities

- Weather insurance / derivatives are perceived to be evolving products with the highest degree of commercial promise for application in the renewable energy sector. However, the large data requirements and costs associated with pricing these instruments can be prohibitive, particularly in developing country contexts
- A significant number of respondents (84%) are of the view that improved actuarial data and technical risk information could help to facilitate new product development in the renewable energy sector.
- The majority of respondents (50%) believe that a combination of brokers, insurers, project developers and financiers are best placed to drive innovation.
- Brokers are identified as being the best placed individual stakeholder to drive innovation and product development (with 28% of votes).

Key messages coming out of the survey

In theory sufficient capacity is available to meet the insurance requirements of the renewable energy industry. However in reality there are still a number of technical underwriting concerns and barriers associated with for example technology performance risks and the harsh offshore locations, which can restrict / limit participation.

The ability to deploy insurance capacity in developing countries is also hampered by local insurance regulations which restrict foreign market access.

Further practical evaluation of the scope for improving actuarial data and technical risk information flow and studies into new risk based pricing methodologies would serve as useful interventions by the working groups as part of the next phase of the UNEP / GEF project.



SURVEY RESULTS

Respondent Profile

Overall 18 respondents participated in the survey. This small sample representing a combination of local insurers, specialist Lloyds markets, company markets and international (re) insurers from a wide geographical spread and with differing focuses on local / regional and international business.

Responding to UNEP's focus on facilitating innovation in financial risk management instruments, particularly those with application in developing countries, (re) insurers with reputations for creativity and innovation and the ability to write business in most countries of the world were selected. For this reason Lloyds of London and a number of large European Company markets made up 16% and 22% respectively of the overall respondents.

Other respondents included Company markets from Japan (11%), Canada (5%) and the US (5%) but as the results demonstrate business for these company markets largely emanates from Europe and Asia. Around 38% of participants in the survey were from domestic markets with over 70% represented by developing country insurers.

Insurers / reinsurers participating in the RE sector have strong and secure security with 83% of markets surveyed rated at A- or better (S&P or equivalent) insurer credit rating.

16% of respondents were unrated. These were largely local carriers which in many cases are not required by local regulations to be rated. This can restrict access to local capacity as brokers can not evaluate these companies in accordance with minimum financial guidelines (Marsh minimum security standards are A.M. Best Company rating of at least A-) and therefore cannot place business with such carriers without explicit instructions from the client to do so.

Classes of Business written

The (re) insurers participating in renewable energy business have a diverse book of business writing a range of property and casualty lines of business. The majority of (re) insurers (60+%) are mainly

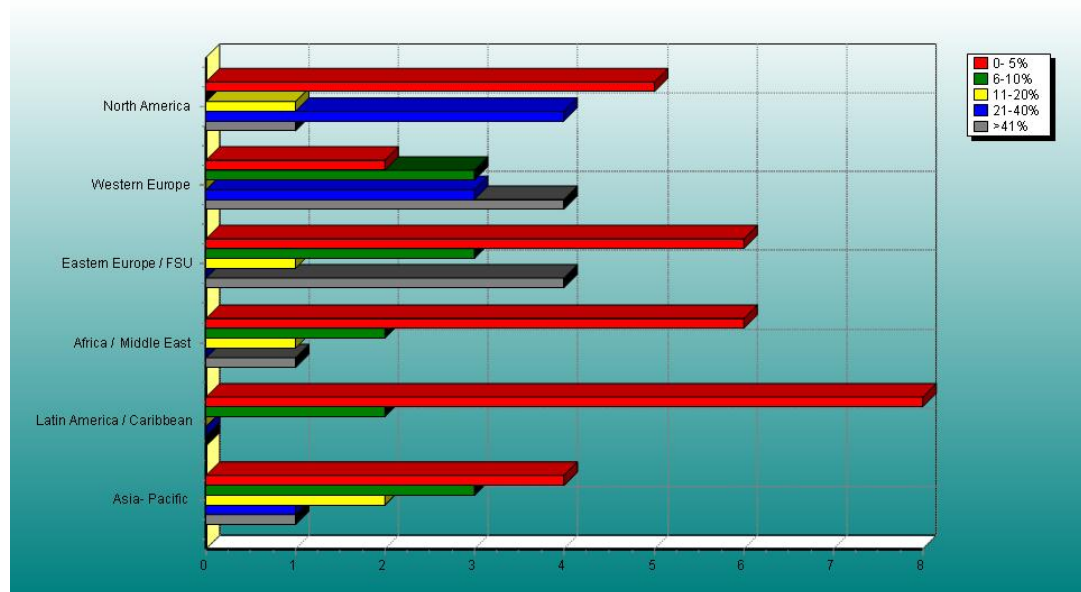
involved in property lines of business ranging from standard property to more technical and specialist areas such as Construction (84%), Energy (84%), Marine (78%) and Engineering (63%). These classes of business reflect the technically challenging and diverse requirements of the renewable energy industry and the increased attention underwriters are giving to the industry.

Other classes of business written include Terrorism, Personal Lines, Environmental Impairment and Political Risks but these were less common due to the niche nature of these classes.

Mix of Insurance Business by Geographical Region

Table 1 demonstrates the ability of Lloyds and many of the large company markets who participated in the survey to write business on an international bases with differing degrees of capital committed to each region.

Table 1 – Current estimated mix of insurance business by geographical region (percentage of written premium gross of Reinsurance)



The majority of premium income for (re) insurers is generated in Western Europe and Eastern Europe / FSU with 44% of respondents writing more than 41% of their total premiums in these regions. With over 77% of respondents writing business in the region, the particular appetite for Eastern Europe / FSU business can to some extent be explained by the local insurers who participated (making up 16% of total respondents). However, there is a clear indication that markets outside of Eastern Europe who participated in this survey are willing to write some degree of business in the region.

Over 55% of the respondents wrote a small amount of business in Latin America with 44% writing 1-5% of total premium income and 11% writing 6-10% of total premium income.

The lower percentages of total premium income emanating from developing countries, especially so for Lloyds and Company Markets can to some extent be explained by the foreign market restrictions imposed by the state and the capacity available from local markets. In some cases (for

example Vietnam and China) foreign (re) insurers are not given licences to write business on a direct basis i.e. writing policies directly with the local insured's. Where foreign insurance business is permitted typically there are requirements for compulsory reinsurance of local insurers for a certain proportion of the risk (for example in India, Senegal and Morocco). The ceding insurer acts on the reinsurer's behalf by issuing the underlying insurance policies consistent with local regulatory requirements, but the reinsurer administers the insurance program, including the handling and payment of claims.

For those countries with more liberalised insurance markets such as Chile, Mexico and South America few foreign market restrictions has created more sophisticated local markets who can provide competitive terms for smaller local business and utilise foreign reinsurers for reinsurance and international business.

Commercial Opportunities in Renewal Energy Business

Importantly no respondents believe that the Renewable Energy sector does not offer commercial business opportunities for their companies with 83% of respondents believing that renewable energy currently represents a commercial business opportunities for their company. 11% of respondents believe that there is a possibility that renewable energy will represent a commercial business opportunity in the medium to longer term (next 5-10 years). One respondent believes that commercial opportunities exist but only on a case by case basis.

Capacity for Renewable Energy Business

Table 2 demonstrates that a significant level (over USD2.2 Billion) of capacity exists for renewable energy projects among the (re) insurers participating in this survey.

Table 2: Worldwide insurance capacity ranges for renewable energy business (USD Millions)

Markets	% of total response	Security Ranges	Asia Pacific	Latin America / Caribbean	Africa / Middle East	Eastern Europe / FSU	Western Europe	North America
Lloyds of London	17%	A- to A	61 to >70	61-70	61-70	61-70	72-90	62-80
Company markets – Western Europe	22%	A- to AA	>150	>150	>150	>150	>150	>150
Company markets – Japan	11%	A to AA-	91 - >100	11-20	11-20	>50	>50	>50
Company markets – Canada	5.5%	AA	11- 20	11-20	11-20	11-20	11-20	11-20
Company markets – US	5.5%	A	41 - 50	41 – 50	41 - 50	41 - 50	41 - 50	41 - 50
Domestic insurers – Western Europe	11%	A-				<1	12-30	

Domestic insurers – Eastern Europe	17%	Not rated to A				71->80		
Domestic insurers – Africa / Middle East	11%	Not rated			>50	21-30		
TOTAL	100%		354->390	274->310	357->360	406->451	336->390	314->350

N.B. Respondents were given the following capacity ranges to select; <USD1m, USD2-10m, USD11-20m, USD21-30m, USD41m-50 and >USD50m.

The survey results demonstrate that many of the larger Lloyds syndicates are able to commit USD50 million plus capacity on a global basis. As discussed earlier this is largely due to the fact that they have licences and / or representations in most countries of the world (with the exception of certain state regulated markets such as China). For those respondents that selected “>USD50” the actual capacity above USD50 is likely to differ for each carrier in some cases larger company markets will be able to write up to a maximum USD100 million. However, it should be noted that there are also likely to be strict internal underwriting policies and restrictions concerning where and how much capacity can be committed to any one risk (project).

Table 2 shows over 27% respondents with over USD50m capacity in North America, Western Europe, Africa / Middle East and Asia Pacific. Some of the large Japanese insurers can also commit similar levels of capacity but as the results suggest they are more restricted in certain regions such as Latin America and Africa / Middle East.

In Africa / Middle East and Eastern Europe domestic insurers also have high levels of capacity (>USD50m) and thus have provided capacity in addition to company markets or where some company markets have not been able to. Table 2 shows that Eastern Europe has the greatest aggregated capacity available for Renewable Energy business totalling over USD450M. However, this can be explained to some degree by the respondents participating in this survey and may not be reflective of overall capacity in the market for this region.

Although 22% of respondents do not write business in Africa / Middle East domestic insurers participating in this survey have shown that they have large capacities available for this region. This is not uncommon, particularly for wind energy business in where a number of specialist niche insurers provide adequate local capacity for businesses but typically can not write business from across borders.

Most importantly Table 2 shows that the (re) insurers who responded to this survey have more than adequate capacity to cater for renewable energy insurance business. Many of the (re) insurers have traditionally been involved in the power and utility and energy industries where asset values and loss exposures on a vertical basis are considerably higher. Due to the low value horizontal loss exposures associated with renewable energy projects (e.g. the total loss of a single wind turbine is more likely and less costly than a total loss of a whole wind farm) capacity is unlikely to ever be in short supply for the industry.

Even as large offshore wind projects approach the CAPEX of USD1Billion Marsh believe that adequate capacity is available. Accessing this capacity at the right price will however be a

challenge.

Areas of Involvement in Renewable Energy Business

Over 33% of respondents concentrate their efforts (+61% of total involvement) on “leading” renewable energy business. One underwriter was only prepared to participate on the basis of “leading” the risk.

Lead (re)insurers are only prepared to quote and accept the first share of any risk on the basis of their terms and conditions. This is a fundamental requirement in the process of placing insurance as leading underwriters typically have a more technical approach to underwriting and risk assessment and often dictate the terms and conditions of the policy. This reputation for technical expertise will often influence the level of following market support that needs to be obtained to complete 100% of the placement.

This is reflected to some extent by 27% of respondents who are prepared “to follow” leaders terms and conditions. This suggests there is some confidence in the technical ability of the leaders in the market currently to provide appropriate terms and conditions. This may also suggest that due to the range of exposures associated with renewable technologies not all (re) insurers are leaders in every type of technology.

In fact recent trends in the offshore wind market show that there is a move away from leader only business to jointly led business (in some cases up to 5 or 6 leaders) as more underwriters opt to lead on their own terms and conditions. Clearly this can cause significant problems when negotiations on terms and conditions have to be carried out and agreed by several leaders. However, this does suggest a growing focus on technical underwriting and serious approach to this class of business.

Other areas of limited participation include Reinsurance and Fronting, which are linked, because fronting typically only involves retaining a small proportion of any risk and ceding the remaining portion of the risk to reinsurers. This is typically required in developing countries where foreign market direct business is restricted and fronting usually only carried out domestic insurers. In some cases the larger company markets that have managed to obtain licences in state regulated markets a small amount of business can be generated by fronting for non licensed carriers.

Insurance Products Currently Available for Renewable Energy

Table 3 shows that traditional insurance products are widely available for onshore wind. Over 77% of respondents currently write property damage coverage for onshore wind with only slightly fewer providing Construction / Erection All Risks (CAR / EAR), Business Interruption (BI) and Machinery Breakdown (MB) coverage’s with 72% and 66% respectively. This can be explained by the fact that this is the most commercialised renewable energy technology with a significant operating and loss history.

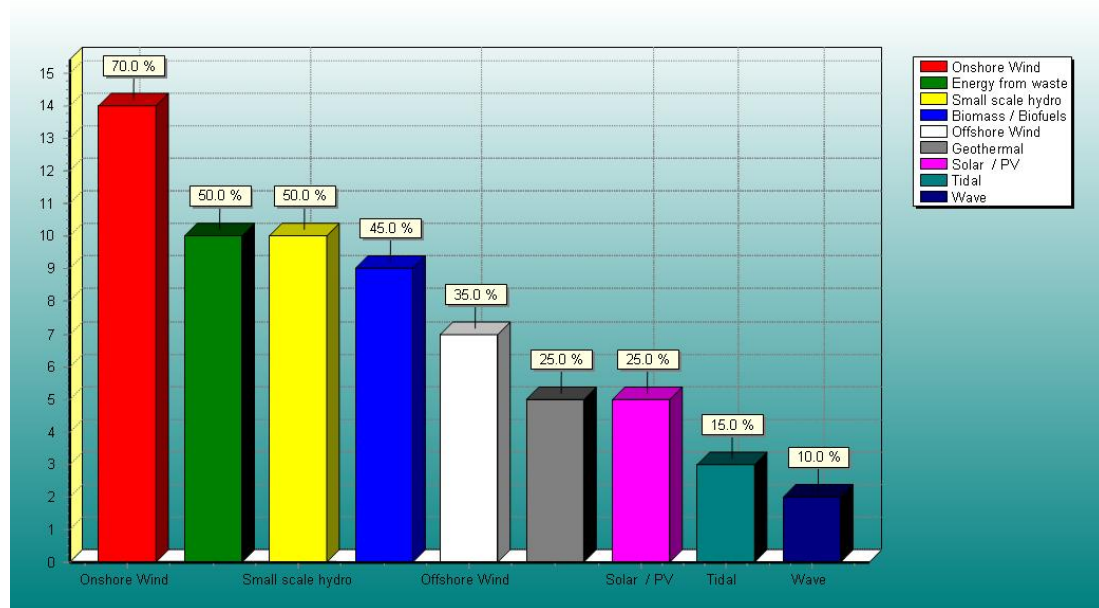
Interestingly, offshore wind features significantly lower down the order in terms of the number of underwriters providing products. Between 27% and 38% of respondents provide traditional products such as Property Damage (PD), CAR, Delay in Start Up (DSU), BI and MB which is more consistent than onshore wind where respondents participation ranged from 44% (for Marine

Transits) to 77% (for property damage). This variation in participation by underwriters for same technology can be explained largely as result of moving offshore. Apart from the increased asset values associated with offshore windfarms, construction and operating costs increase significantly, the exposures are more complex and as such fewer markets are able to write marine risks.

The next technologies with the most widely available coverages include Small Scale Hydro and Energy from Waste. Both these technologies are again well understood and tried and tested at scale. 55% of respondents currently write property damage for these technologies with the same number of respondents writing BI for Energy from Waste (EfW) with slight fewer for Small Scale Hydro (SCH)(44%).

Wave and Tidal Power technologies seem to be the least favoured technologies with only a small number of respondents providing Property (11% and 23% respectively), Construction (11% for both Wave and Tidal) and Machinery Breakdown (11% and 23% respectively) coverage's. The most advanced of these devices are still at prototypical stages in their development which is not traditionally a stage of development that insurers are prepared to consider.

Table 3: Availability of Property Damage coverage for different Renewable Energy Technologies



In terms of products, respondents selected PD, CAR, BI and MB in that order as the most widely available across the different technologies. Property Damage is the most widely available product for most technologies or at least equally available with the exception of Wave power (with 16% respondents providing Marine Transits and 11% providing PD).

General and Third Party Liabilities (GTPL) were not considered in the survey questions largely due to the generic nature of this class which does not require any major adaptation or specialist understanding to be made available to the renewable energy sector. As has been highlighted in

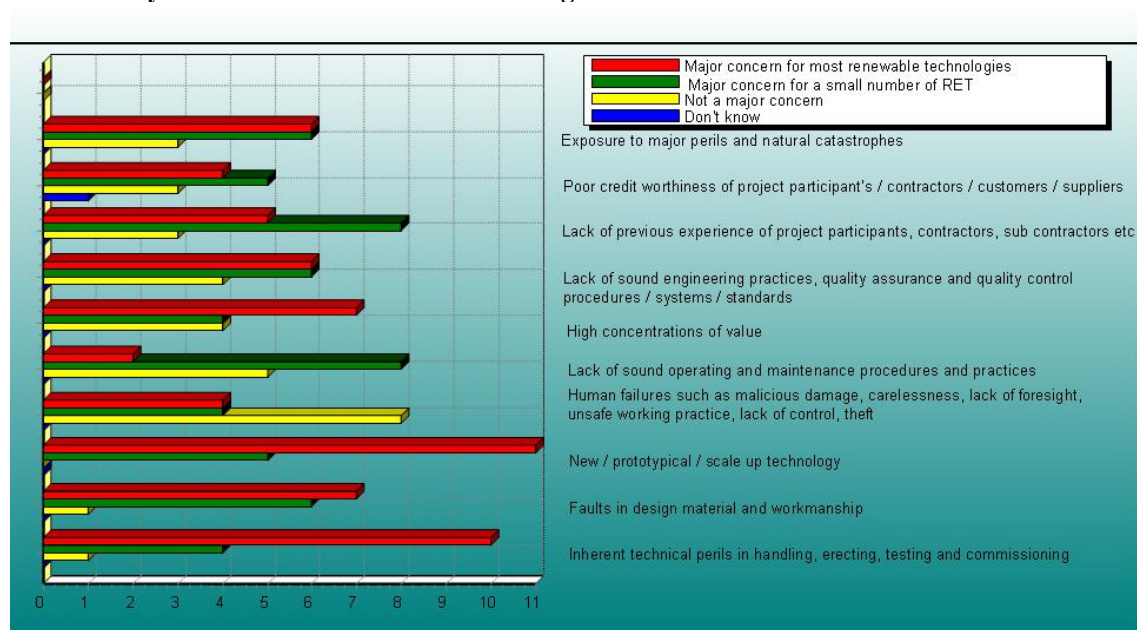
previous studies this class is widely available to the renewable energy sector with most underwriters who write liabilities willing to provide coverage for renewable energy projects. 11% of respondents specifically identified liabilities as product they provide for renewable energy projects.

Key Perceived Risks and Underwriting Concerns

The most common perceived risks and underwriting concerns across all RE relate to technology efficacy. Table 4 shows that over 61% of respondents identify New / Prototypical / Scale Up technology as being a major concern for most renewable technologies whilst 27% of respondents believe it is a major concern for a small number of technologies. The fundamental concern relates to the lack of operating history and therefore the limited amount of loss information upon which to base loss projections and pricing.

Closely behind technology concerns, 55% of respondents identified Inherent technical perils in handling, erecting, testing and commission as a major concern for most technologies. 22% of respondent’s believe technical perils are a major concern for a small number of technologies whilst 5% believe technical perils are not a major concern. As the results suggest most respondents agree that certain renewable technologies present concerns during construction and testing and commission phases which often involve high risk and complex engineering processes and procedures and specialist contractors and equipment.

Table 4: Key Perceived Risks and Underwriting concerns



There was some difference in opinion on whether *Faults in design, material and workmanship* was a major concern for “most” or a “small number of technologies”. Respondents were not asked to specify which renewable energy technologies they were referring to. Generally speaking *Faults in design, material and workmanship* are more of a concern for underwriters when technologies are new / noval / prototypical in nature and therefore have a limited operating history.

Table 4 shows that 38% of respondents raised faults in design, material and workmanship as being a major concern for most renewable technologies, whilst 33% believed this was only a concern for a small number of technologies. This may be explained by the fact that for some technologies such as wind, component part manufacturers provide 5 year or more performance / service warranties / guarantees. The existence of warranties substantially simplifies the insurance underwriting process in that for the warranty period, there is essentially no equipment risk to be insured from a mechanical or electrical breakdown perspective. In time, as the warranties expire on the early projects, operational histories should be sufficient for underwriters to begin offering more suitably priced mechanical breakdown insurance coverage for the projects. For less proven technologies such as wave / tidal power, there are fewer high grade commercial scale manufacturers able to offer manufacturing warranties. As such, as illustrated by Table 3, fewer markets are willing to provide standard Machinery Breakdown and Property Damage coverage.

Similarly, many underwriters will limit coverage for faulty design, material and workmanship typically excluding the loss or damage to the part faulty part itself as this is not deemed to be unforeseen and accidental and therefore insurable. In theory this should mean that this is less of a concern where the exclusion applies but even when manufacturers provide warranties for their parts these warranties have a limited tenure and the resultant damage and potential consequential loss can still leave underwriters exposed. For example, should a landfill gas to energy plant contain a defective part which causes a breakdown and a resulting fire and explosion, although the part may not be covered the resultant damage may be covered. Unless underwriters impose a full exclusion on faulty design, material and workmanship (including resultant damage from the part) there may still be an exposure which can cause a significant loss.

44% of respondents identified a *lack of sound operating and maintenance procedures and practices* and *lack of previous experience of project participants, contractors, sub contractors etc* as a major concern for a small number of technologies. Again this is likely to be more applicable to those technologies which are based offshore (wind, wave, tidal) and require specialist marine equipment / vessels and contractors during construction, operating and maintenance periods. Specific mention was made of the concerns over cable installation and maintenance associated with marine renewables.

33% of respondents believe that a lack of sound engineering practises; quality assurance and quality control procedures / systems / standards were a major concern for both “most renewable technologies” as well as “a small number of renewable technologies”. 22% of respondents do not believe this issue to be a major concern.

These types of perils are common place in large construction projects and to large extent have been addressed through better project management controls such as quality assurance and quality control (QA/QC) procedures and guidelines. For this reason many underwriters now warrant as a condition of the policy that strict QA/QC procedures are adhered to and in some cases underwriters will instruct a warranty surveyor to be present during key stages of construction / installation and testing and commissioning.

Key Barriers Preventing Business in Developing Countries

Lack of adequate financial, legal and service infrastructure is considered by over 77% of respondents to be a key barrier preventing business in developing countries. There is 100%

agreement on this as the key barrier if you exclude the 23% of respondents who don't write business in developing countries (see Table 5).

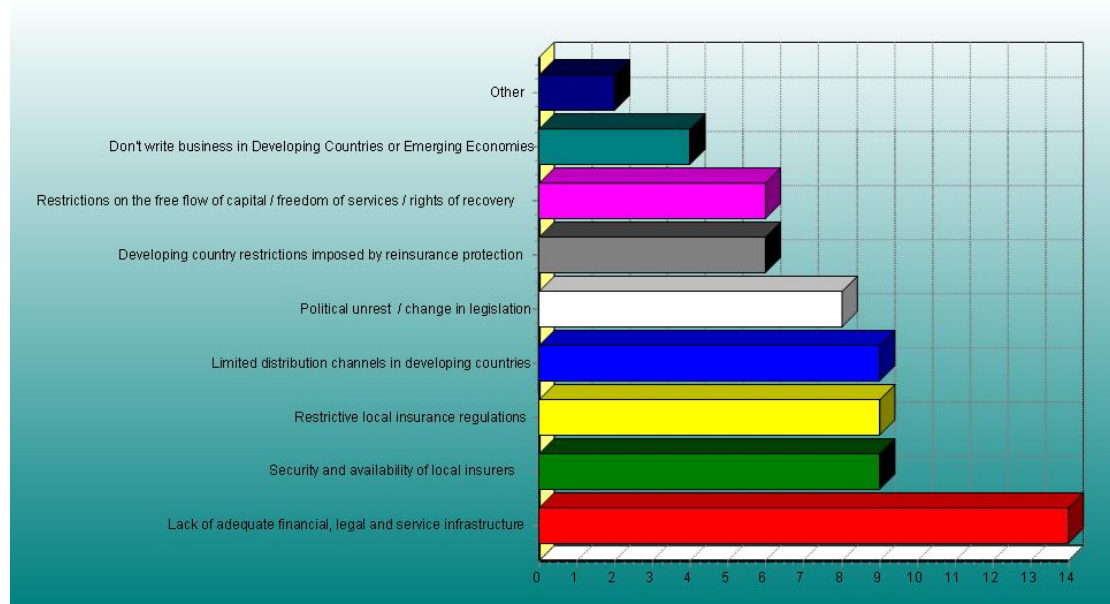
For many developing countries such as China which are experiencing rapid economic growth, (re) insurers recognise the business potential in these regions but are frustrated by the inability to access markets due to the extent of political change required to meet standards of liberalisation, stability and transparency sought by the wider international community. These deficiencies tend to result in negative economic and political outlooks by analysts which is generally bad news for the insurance industry since this can have a negative impact on issues such as FDI and trade, and can, in turn, reduce the demand for insurance cover.

Table 5 shows that 50% of respondents identified *security and availability of local insurers, restrictive local insurance regulations and limited distribution channels* as key barriers preventing business in developing countries. Taking each of these in turn, where foreign reinsurers are not permitted to write business in locally and are thus forced to use local carriers, as discussed earlier, the security of these local carriers is brought into question. As is demonstrated by 16% of the respondents in this survey many local carriers are not required by state regulation to be rated.

Should there be a claim and the local insurer is unable to meet its obligation due to insolvency, the commercial policy holder (insured) has no rights of recovery from the reinsurer who has entered into a reinsurance contract with the local insurer. This can cause concern for the underlying policy holder as well as the reinsurer who ultimately has a contract of indemnity with the local insurer.

Restrictive and discriminatory local insurance regulations are particularly common in certain developing countries such as China and Vietnam where state owned insurers enjoy over 90% market share. Whilst virtually all major international (re) insurers (including those participating in this survey) have a significant physical presence in many developing countries, this does not necessarily translate to market share because of restrictive local regulations.

Table 5: Key barriers preventing business in developing countries



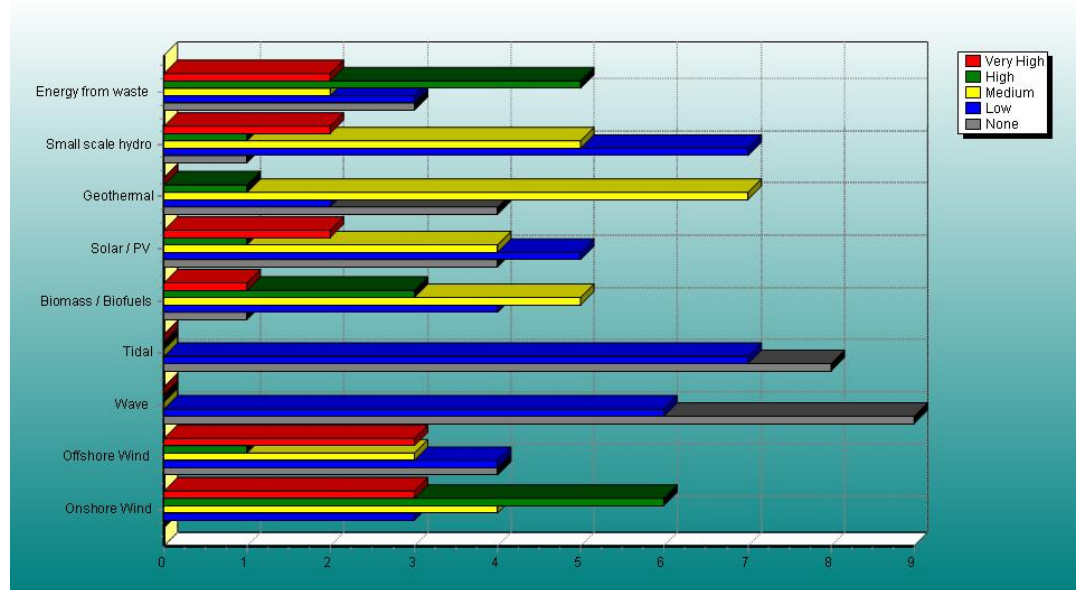
Restrictive local regulations also impact on brokers who also face restrictions on access and classes of business that they can deal with. In some developing countries brokers have only recently been recognised by insurance legislation and permitted to enter the market.

Access to specialist markets such as Lloyds is only provided by accredited Lloyd’s brokers, many of which have established extensive global distribution channels and local market relationships. Markets such as Lloyds also rely heavily on the extensive networks of brokers with a significant market penetration in order to stand any chance of being able to successfully source business and compete with local markets.

RE Technology with the Greatest Future Business Potential

Table 6 shows that Onshore wind is considered by respondents to have the greatest future business potential with respondents voting according to scales of very high (18%), high (37%), medium (25%) and low (18%). Although also considered to offer “very high” future business potential with 18% of responses, Offshore Wind had a greater number of less positive views on future business potential with the majority of responses ranging from medium (18%) to low (25%), with 25% of respondents considering their to be no future business potential. These divergent results for the same technology again reflect the large differences in perceived risk and underwriting approach to onshore and offshore projects.

Table 6: Renewable Energy Technology with greatest future business potential



Energy from Waste features highly in respondent views on future business potential with 13% voting very high, 33% high, 13% medium and 20% low. This ranks Energy from Waste 2nd overall in terms of positive responses but there were however some negative views with 20% of respondents not believing there to be any future business potential. Whilst underwriters are comfortable with the technology involved the negative view on future business potential may be

due to the small scale of many landfill gas to energy projects and the lack of potential to scale up to generate significant premium income.

Small scale hydro is ranked 4th in terms of future business potential behind offshore wind. This is a well understood technology from an insurance perspective but again the small scale may explain underwriter's views on the lack of future business potential. The lack of large scale commercial Solar PV applications again this is likely to explain the limited appetite from underwriters. Whilst there may be many examples of domestic and rural solar PV applications these would typically involve manufacturing warranties or would be covered under personal / household insurance policies.

Geothermal is considered by over 50% of responses to offer a "medium" level of future business potential, which is the highest out of all technologies. 24% of respondents also believe that there is no future business potential in this technology. This is a surprising result as this is well established technology with adequate coverage available for drilling risks.

Respondents were very negative in their views of wave and tidal power with 60% and 53% of respondents respectively believing there to be no future business potential. This reflects the low level of appetite for such prototypical technology still many years behind wind power in terms of its commercialisation.

The small scales involved in terms of insured value will in many cases make it un-economical for commercial insurers to participate in renewable energy business.

Greatest Challenges for the Insurance Industry

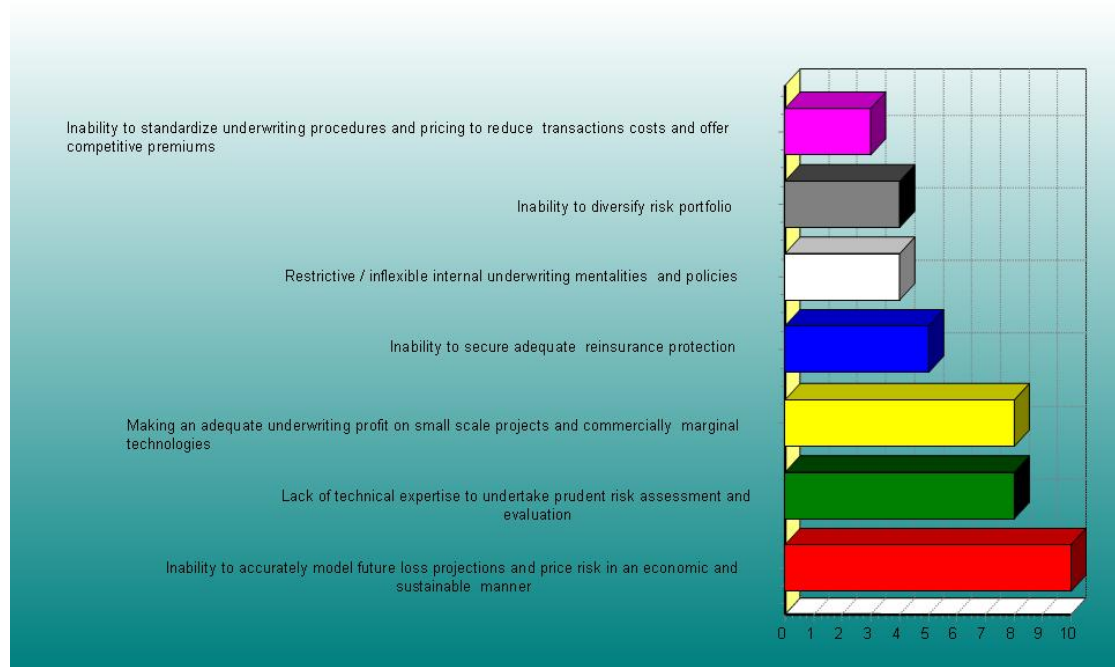
Based on the responses from 55% of respondents (Table 7), the greatest challenge for the industry in underwriting renewable energy business is the *inability to accurately model future loss projections and price risk in an economic and sustainable manner*. Although a number of technologies have been around for some time, the industry is still in its infancy in terms of successfully completed commercial operating history. For this reason most RE projects do not have the high-quality historical data available to be able to estimate with a sufficient degree of accuracy the likelihood and severity of losses from the insured events. This means underwriters may have to rely more on technical evaluation and expert judgement rather than actuarial data which can result in under / over pricing of the risk, making it less transparent and less competitive.

Table 7 shows that 44% of respondents believe that a lack of technical expertise to undertake prudent risk assessment and evaluation presents a challenge to the industry. This becomes even more critical when technical evaluation and expert judgement are relied upon to assess and rate the risk as discussed above. At a more fundamental level this lack of technical expertise is also reflective of the types of technology associated with renewables. The results of the survey show that underwriters who are writing renewable energy business have core expertise in other industries and classes of business. Whilst many of the risks exposures may be similar the technical understanding of the technology involved in many cases may be lacking.

Although obviously important in terms of the insurance industries involvement in renewable energy, *making an adequate underwriting profit on small scale projects and commercially marginal technologies* features as a equally high as the challenge of lack of expertise but is still below

inability to model and price risk.

Table 7: Greatest challenges for the insurance industry



Evolving Products Showing the Greatest Commercial Promise

There is a degree of divergent opinion on which of the identified evolving product show the greatest commercial promise. In many cases it is evident that the respondents were unfamiliar with the evolving products in question with over 47% of respondents answering “Don’t Know” for *Contingent Capital*.

With the greatest degree of consensus with 35% of respondents in agreement identify Weather insurance / derivatives as the evolving product with the highest degree of commercial promise for application in the renewable energy sector. Weather related volumetric risk such as that associated with lack of wind is not covered by traditional property and business interruption policies. It is likely that many (re) insurers writing property business have seen a great deal of interest from policy holders to extend coverage to include weather related losses which are not triggered by physical loss or damage events. Although closely linked to certain traditional insurance policies which cover revenue losses from weather related perils, weather derivatives are outside the underwriting polices and capabilities of most traditional property and casualty underwriters. Many (re) insurers now have specialist structured risk and / or risk financing departments which are licensed to write these types of product. Although weather derivatives can be an attractive option to hedge wind risk, especially in project finance situations, it should be noted that there are significant wind data requirements necessary for pricing the risk.

Manufacturing warranty / guarantee insurance - covering the manufacturer / supplier obligations

under the warranty, was rated second behind weather derivatives as showing the greatest commercial promise for application in the renewable energy sector. As discussed previously in relation to perceived risks and underwriting concerns, coverage for technology risks and faulty design and workmanship is either limited or excluded. As equipment manufacturers offer more and more warranties, maintenance / service guarantees with increasing tenure to this fill this gap, the aggregated effect of these retentions can put a significant strain on company balance sheets. In project financing situations, lenders will not always accept manufacturer balance sheets sitting behind warranties. Although currently difficult to come by warranty insurance can provide the security needed by lenders to make projects bankable.

Respondents viewed *Political Risks and Export Credit Insurance*, *Geothermal Exploration Risk* and *Catastrophe Bonds* all featuring on similar scales of 'medium' to 'low' commercial promise. Over 40% of respondents rated Political Risks / Export Credit Insurance as showing medium commercial promise for application in the RE sector. This type of coverage is particularly applicable to emerging economies and developing countries where projects, investments or contracts are more likely to be exposed to political action or inaction and low creditworthy counterparties which can cause financial loss. Again a few respondents (20%) viewed this as having no commercial promise and 20% did not know either way. This again may be explained by the fact that the respondents are not actively involved or familiar with this specialist niche line of business.

Measures that Could Help to Facilitate New Product Development

A significant number of respondents (84%) are of the view that *improved actuarial data* and *technical risk information* could help to facilitate new product development in the renewable energy sector.

This is supported by responses to questions concerning the greatest challenges to the insurance industry in underwriting renewable energy business where a lack of high-quality historical data and technical expertise was highlighted as issue in the underwriting process. The better the quality of data and technical risk information available the more effective the risk evaluation and pricing. Similarly, the more systematic and transparent the risk assessment the more efficient the underwriting process and potential for improvement and flexibility on terms and conditions. Over 57% of respondents also seem to acknowledge that *new risk based pricing methodologies* are needed in order to assess future loss potential in an emerging technology sector where it will be some time before adequate operating history is available.

47% of respondents raise the need for *development and improvement in institutional frameworks* in the context of product development. Whilst this is clearly very important in relation to *key barriers preventing business in developing countries* (as discussed earlier) in the context of product development this features less highly with 47% of respondents raising this as an issue. In most cases innovation and product development occurs in financial centres of the insurance industry where typically institutional frameworks are at their strongest.

Public sector coinsurance / risk pooling arrangements are not needed according to underwriters participating in the survey. This is further illustrated by Table 2 which shows sufficient insurance appetite and capacity is currently available for the renewable energy business. Such public sector arrangements are normally required where there is a lack of capacity or where risks are considered uninsurable. For example, public sector risk pooling arrangements have been made available in some countries for Sabotage and Terrorism risks where there is insufficient appetite and capacity to

write these risks.

A significant number of respondents (42%) also raise higher levels of risk allocation / retention by project participants as being helpful in the facilitating new product development. Although this should not directly influence innovation, this suggest where their net exposures are reduced freeing up capacity underwriters are more willing to considering new product development. 42% of respondents are also supportive of measures which improve premium income through bundling of project / risks. This may be a particularly useful measure to make small scale projects which typically attract flat minimum premiums to be more attractive and competitively priced.

Stakeholders Best Placed to Drive Innovation

The majority of respondents (50%) believe that a combination of brokers, insurers, project developers and financiers are best placed to drive innovation.

Brokers are identified as being the best placed individual stakeholder to drive innovation and product development (with 28% of votes).

Surprisingly the government and reinsurers were not selected at al

