

Financial risk management instruments such as insurance and reinsurance, alternative risk transfer, contingent capital and credit enhancement products, are an integral part of any commercial deal structuring in conventional energy and infrastructure projects; yet their application to the renewable energy sector to date has been limited especially in emerging and developing countries.



With funding from the Global Environment Facility (GEF), UNEP has been assessing existing and new financial risk management approaches for the renewable energy sector. This work carried out by the UNEP Renewable

Energy Finance Unit, with support from the Basel Agency for Sustainable Energy (BASE), focuses on a broad range of instruments and their specific application in GEF eligible countries.

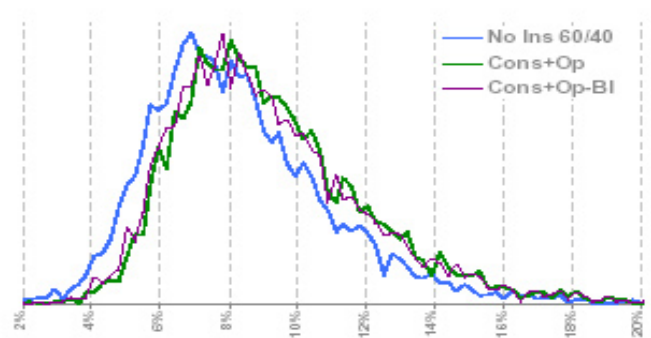
Expected results

- ⇒ **Identification and Assessment** of current risk management practices and promising modalities;
- ⇒ **Research and Development** of new financial risk management instruments and structures;
- ⇒ **Analysis of Public-Private** approaches to renewable energy financial risk management;
- ⇒ **Promotion of and Capacity building on** renewable energy financial risk management tools in GEF eligible countries;
- ⇒ **Greater engagement by private financial institutions** in the financing of renewable energy projects in emerging markets and developing countries.

Managing Risks, Improving Returns

By reducing downside risks, financial risk management instruments can have significant impact on project economics and reduce overall revenue volatility.

Fig1: Probability Distribution of Internal Rate of Return (IRR) on equity, with different levels of insurance, for a large scale wind farm in China



Average IRR:

No insurance: 8.2%

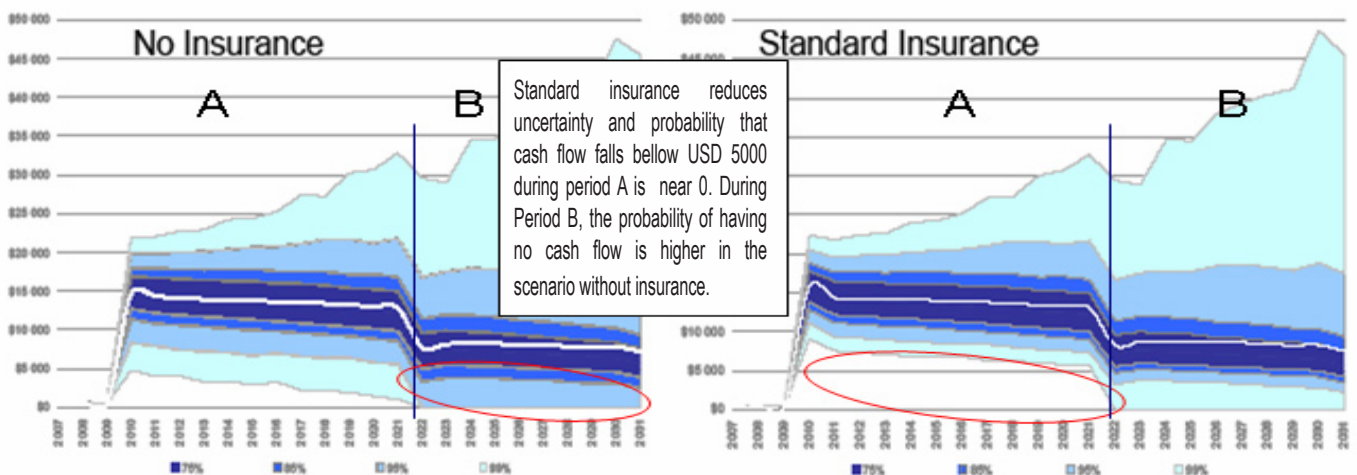
Standard Insurance without Business Interruption (BI): 9.0%

Full suite of standard insurance: 9.1%

However consideration needs to be given to the practical aspects of deploying these instruments in emerging and developing economies.

It is important that the insurance and capital markets begin to focus more effort on the renewable energy sector, its specific risk profiles and the sorts of instruments needed to address them. Fresh approaches and financial innovation are required.

Fig2: Probability of distribution of operating cash flow with and without standard insurance for a large scale wind farm in China



Source: Marsh

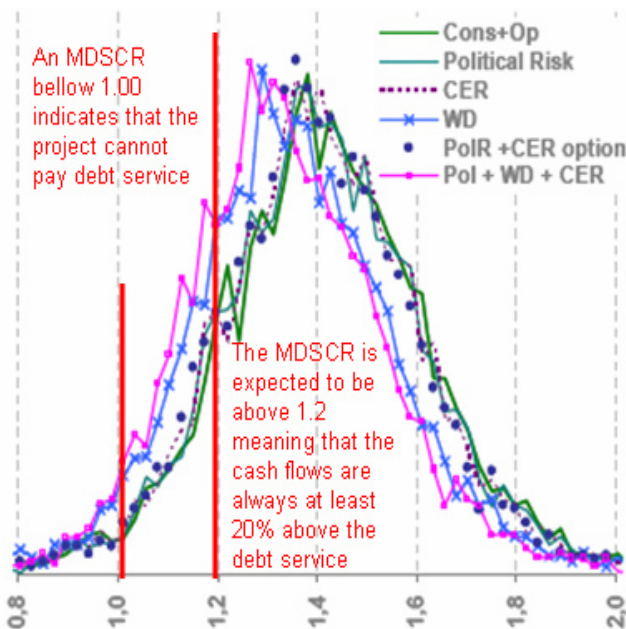
The risks and barriers that prevent a more rapid uptake of renewable energy technologies are diverse but interrelated. From an investment perspective, renewables can be difficult to finance due to the small scale of projects, technology immaturity, operational risks and regulatory uncertainty.

The main identified risks for renewable energy projects include:

- Construction risk
- Timing Risk
- Operational risk
- Fuel supply / Resource risk
- Technology risk
- Country / Political risk
- Regulatory risk
- Credit risk

Risks associated with emissions reductions delivery are also a new area of concern.

Fig4: Example of Probability distribution of Minimum Debt Service Coverage Ratio (MDSR): Lenders expect the MDSR to be above 20%



Cons+Op: Construction + Operation risk
 CER: Carbon Emission Reduction
 WD: Weather Derivatives
 PolR: Political Risk

Project sponsors must decide how best to manage these risks, some of which they will retain while others may be more cost-effectively transferred to insurers and other third parties.

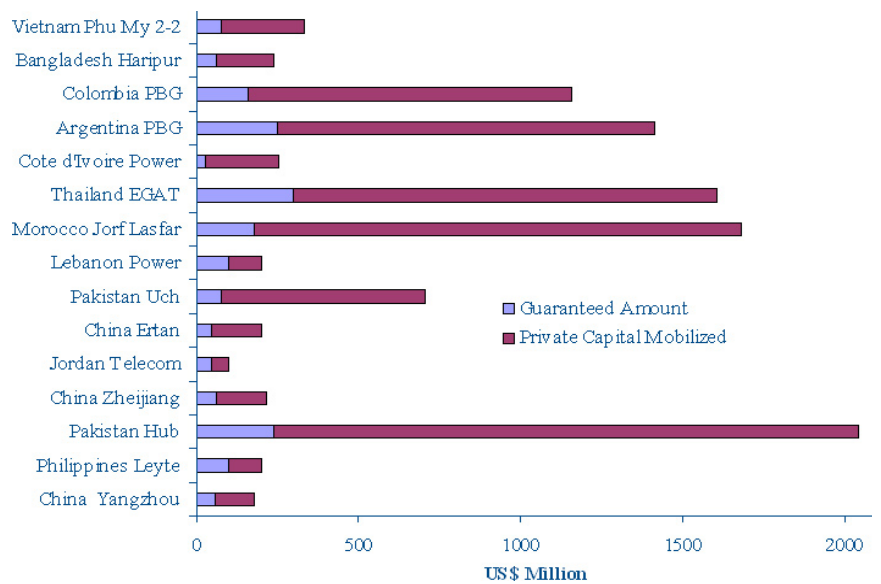


Fig3: Impact of Partial Risk Guarantees in mobilizing private capital in developing countries

A UNEP study conducted by Marsh showed how conventional insurance products impact on key financial and risk parameters in renewable energy projects. It looked at other instruments such as Political Risk Insurance, Partial Risk Guarantees (PRG) and Carbon Emission Reduction (CER) futures contracts and modelled their impact on default rates and debt rating.

Marsh's study "assessment of financial risk management instruments for renewable energy projects".

Commissioned by UNEP and based on existing large scale wind farms in China, India and Egypt and on a biomass project in India, the study uses typical parameters of financial robustness including, project Default Rate, Debt Service Cash Reserves (DSCR) and Net Present Value (NPV) of Cash Flows (CF), to measure the value of different conventional and new risk management approaches. The following Instruments were assessed:

- Traditional Project Insurance Policies (including Construction All Risks, Property Damage, Machinery Breakdown, Delay in Start Up, Business Interruption and Third Party Liabilities)
- Political Risks Insurance (PolR)
- Certified Emissions Reduction (CER) Futures Contracts (Put Option) (this instrument is at a conceptual stage)
- Credit Delivery Guarantee
- Weather Derivatives (WD)
- Turbine Warranty Insurance

Geothermal projects face an additional set of risks during the process of exploration. They are subject to uncertainties, which vary among different geothermal reservoirs. These risks are similar to those typically associated with oil and gas exploration and development. The geographic area and sustainable output can only be estimated and cannot be definitively established because of the geological complexities of geothermal reservoirs. A study commissioned by UNEP and led by the World Bank assessed the need for Partial Risk Guarantee (PRG) windows to address exploration risks of geothermal developments, as well as other Alternative Risk Transfer approaches.

GeoFund Partial Risk Guarantee (PRG) Windows

The GeoFund PRG is composed of two types of PRG coverage available, (1) a short-term cover for upfront geological exploration drilling risk, and (2) a medium and long-term cover for operational risk of geothermal wells. For each type of PRG, the guarantee coverage will be defined against the key parameters of the geothermal energy production, such as reservoir temperature, wellhead pressure, wellhead flow rate, geothermal fluid chemistry, etc. In developing the PRG coverage, which is linked with geothermal performance of the guaranteed production and/or injection well, a scoring model needs to be established based on the estimated and actual geothermal data. PRG windows should be designed to cover expected losses between 25% and 70%.

Recommended Financial Risk Management Instruments

Large Scale Renewables Projects

Non insurance instruments that could be used with large scale renewable energy projects include:

- ⇒ Special Purpose Underwriting Vehicles (SPUVs)
- ⇒ Political Risk Insurance
- ⇒ Credit Derivatives
- ⇒ Guarantees
- ⇒ GEF Contingent Risk Mechanisms

These products although conceptually promising face difficulties at the implementation/execution stage. Market barriers and deficiencies include:

- Lack of information and awareness regarding renewable energy and related projects' risk;
- Lack of facilitating risk management vehicles and/or limited availability of certain insurance and financial products and the breadth of coverage;
- Non-adapted or lack of underwriting skills;
- Regulatory restrictions on foreign insurers for certain services.

Special Purpose Vehicles (SPVs)

The development of a Project Portfolio Risk Financing Vehicle will consist of an SPV to act as the secondary layer and most significant insurance mechanism.

An SPV hedges its entire market risk via its parent company, while being legally separated, which means that its capital cannot be claimed. As a result SPVs are highly rated and considered stable and relatively safe means of investment.

By aggregating projects, an SPV facilitate an efficient flow of credits from the portfolio to enable a buffering mechanism and reduce overall risk exposure to underwriters. There are a variety of SPV structures including Special Underwriting Purpose Vehicles (SPUVs), which could be developed. The nature and the cover to be provided by the SPV determine the level of public support required to launch it. SPVs provide an attractive way for insurers, banks and other financial institutions to transfer credit risk on pools of loans or other assets without selling the assets. ESCOs often act as SPVs.

Small Scale Renewables Projects

While operating and construction risks are the main issues faced by large scale projects, security and end-user credit risks tend to be the largest barriers for smaller scale projects.

Recommended instruments include:

- ⇒ Loss reserves and first loss portfolio guarantees
- ⇒ Micro Finance Institutions guarantees
- ⇒ SME loan guarantees

Using portfolio approaches to credit enhancement could be an effective means of risk sharing between financial institutions, vendors, energy services companies (ESCOs) and supporting donor institutions.

Suggested Loss Reserve Mechanisms

Engaging a local financial institution to serve as guarantor can build local capacities and provide the basis for market delivery of on-going guarantee products as part of a programme's long-term commercialization strategy. The financial institution holds, manages, reinvests and disburses the loss reserve, serving as a fiduciary, trustee or escrow agent. Loss reserves could be funded by monies both from concessional sources, the partner financial institution, and also from vendors. A typical formula could start with a 15% loss reserve with 2/3 or 10% coming from the financial institution and a portion from the vendor. As payment performance history is established, the levels of loss reserve (or first loss coverage) can be diminished. Initially a large portion of loss reserve can come from concessional/donor sources. Overtime the loss reserve can derive from and be built into the financial and equipment transactions themselves, so that this mechanism becomes commercially free-standing.

In designing a program for a particular market, the full chain of financial intermediation must be defined and the associated risks distributed. Each actor in the value chain must have the technical capacity to assess these risks, and the tools to hedge and transfer them effectively.

Implementing financial risk management instruments and finance programmes requires developing and concluding agreements between the key parties. Such agreements include:

- Vendor Finance Agreements and related term sheets;
- Loan product term sheets;
- Requests for proposal (RFPs) or other approaches for qualifying and selecting vendors;
- Escrow Agreements and term sheets for loss reserve funds;
- Guarantee Agreements;
- Escrow Agents and/or guarantor RFP.

Geothermal Projects

Because of the exploration risks associated with Geothermal projects, their financial risks are being examined separately from other renewables projects. Although currently in use through the GeoFund, the overall implementation of PRG windows needs to be improved and expanded to other markets:

- There is a significant need to promote existing insurance products used by the geothermal industry;
- Insurers and reinsurers need to build risk management instruments that make sense for the geothermal technologies;
- Involving the insurance sector, e.g. progressive brokers, can help facilitate these changes.

Sample contract models and resource material will be made publicly available as the project progresses.

Selecting and Designing Financial Risk Management Instruments

The next steps of the project will consist in estimating the market prospects of selected financial risk management instruments in GEF eligible countries by conducting feasibility studies (F/S). RFPs on the F/S will be issued in due course.

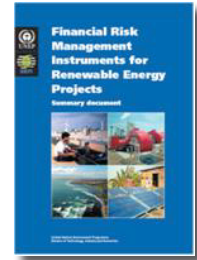
UNEP will also enhance partnership with reinsurers and insurers and address key considerations for the development of current and new insurance/underwriting methodologies through:

- Capacity building and transfer of risk management and underwriting expertise;
- Risk rating methodologies for project financing;
- Enhancing understanding of risk management in Renewable Technology Projects.

Reports and Publications

Project reports include:

- Scoping study on financial risk management instruments for RE projects (UNEP, January 2005)
- Survey of insurance availability for renewable energy projects (UNEP/MARSH, March 2006)
- Background study on financial risk management instruments for RE projects (UNEP/GEF, April 2006)
- Financial risk management instruments in geothermal projects (UNEP/GEF/WorldBank, December 2006)



Project publications include:

- Financial risk management instruments in renewable energy projects (UNEP/SEFI, June 2004)
- Assessment of financial risk management instruments in large scale projects: case study (UNEP/GEF/MARSH, July 2007)
- Financial risk management instruments in small and medium scale projects (UNEP/GEF/MacLean, July 2007)

About UNEP

As an innovating agency of the United Nations system working with the finance sector since the late 1990s, UNEP works with the private sector to identify new investment approaches, to reduce transaction costs and to manage related financial risks with renewable energy projects in emerging and developing countries. Through its Renewable Energy and Finance Unit, UNEP has implemented a variety of support programmes, including seed financing, enterprise development, credit enhancements and financial advisory support facilities. This work also involves the coordination with BASE of the Sustainable Energy Finance Initiative (SEFI). <http://www.sefi.unep.org>

About BASE

BASE is a non-profit foundation and UNEP collaborating centre. <http://www.energy-base.org/>

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