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Transforming On-Grid Renewable Energy Markets

A Review of UNDP-GEF Support for Feed-in Tariffs and Related Price and Market-Access Instruments

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United Nations Development Programme
304 East 45th Street, 9th Floorr
New York, NY 10017 USA
www.undp.org

Project Coordinator: Marcel Alers (UNDP-GEF)

Authors: Yannick Glemarec (UNDP-GEF), Wilson Rickerson (Meister Consultants Group Inc.) and Oliver Waissbein (UNDP-GEF)

Contributors: Lucas Black (Mauritius case study), Marina Olshanksaya (Kazakhstan case study), Oliver Page (Uruguay case study), Robert Kelly, Tobias S. Schmidt, Hande Bayraktar, Benoit Lebot, John O'Brien, Manuel Soriano, Malini Goel, Patrick Gilmartin, Summer Jackson and Melissa Hernandez.

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Editor: Eileen Travers

Design: Camilo J. Salomón (camilo.salomon@benedictodesign.com, www.benedictodesign.com)

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Acronyms

BoS	Balance of system
CREIA	Chinese Renewable Energy Industries Association
DINAMA	Dirección Nacional de Medio Ambiente
EITT	EEG Energy, Infrastructure, Transport and Technology team
FIT	Feed-in tariff
GDP	Gross Domestic Product
GHG	Greenhouse gas
GEF	Global Environment Facility
GET FIT	Global Energy Transfer Feed-in Tariffs
GW	Gigawatt
HA	Hectare
IEA	International Energy Agency
IRR	Internal rate of return
IPP	Independent power producer
KEGOC	Kazakhstan Electricity Grid Operating Company
KW	Kilowatt
KWH	Kilowatthour
LCOE	Levelized cost of electricity
MEMR	Ministry of Energy and Mineral Resources (Kazakhstan)
MINT	Ministry of Industry and New Technologies (Kazakhstan)
MW	Megawatt
MWH	Megawatthour
OECD	Organisation for Economic Co-operation and Development
OPEC	Organization of the Petroleum Exporting Countries
PPA	Power purchase agreement
PV	Photovoltaic
RE	Renewable energy
REL	Renewable Energy Law (China)
RES	Law on Support of Usage of Renewable Energy Sources (Kazakhstan)
TATEK	Taldykurgan National Energy Company (Kazakhstan)
UDELAR	Universidad de la República (Uruguay)
UN DESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UTE	Usinas y Trasmisiones Eléctricas (Uruguay)
UWEP	Uruguay Wind Energy Programme
WACC	Weighted average cost of capital

Foreword

Approximately 2.7 billion people do not have access to reliable energy services and 1.5 billion do not have access to electricity. The number of people without access to electricity in sub-Saharan Africa is expected to increase by 10%, from 585 million in 2009 to 645 million in 2030 under a business-as-usual scenario, as the rate of connections will not be able to keep pace with population growth. Globally, over 1 billion people will remain without access to electricity by 2030. At the same time, global greenhouse gas emissions are soaring. In the absence of a significant reduction in global emissions from current levels between now and 2050, global temperatures could rise by 4°C, and possibly 6°C, by 2100.

UN Secretary-General Ban Ki-moon is leading a global initiative on Sustainable Energy for All to mobilize action from all sectors of society in support of three interlinked objectives to be achieved by 2030: providing universal access to modern energy services; doubling the global rate of improvement in energy efficiency; and doubling the share of renewable energy in the global energy mix. Making sustainable energy for all a reality and de-carbonising the world economy in time to avoid unmanageable climate change will require a radical transformation of today's energy systems. According to the Global Energy Assessment (IIASA, 2012), global investment in energy efficiency and low carbon energy generation, such as renewable energy, currently amounting to approximately $ 1.3 trillion per year, will need to increase by 50 to 100% compared to present levels to meet these challenges over the coming decades.

The sums involved in this shift to a low-carbon economy are daunting but not impossible to achieve. Global capital markets, representing US $ 178 trillion in financial assets, have the size and depth to rise to the investment challenge. Rather than a problem of capital generation, the key challenge is to redirect existing and planned capital flows from traditional high-carbon investments to ones that are low-carbon and climate resilient.

A variety of renewable energy technologies are available and increasingly cost-competitive with traditional fossil fuel based sources. Most renewable energy projects can generate attractive returns, but typically face hurdles due to lock-in of conventional energies and substantial information, institutional, technological, behavioral and financial barriers in most markets. Thus, clean energy finance is not only about finance but also about externalities, and how public policies can help "internalize" these externalities. To this end, the Global Environment Facility (GEF) has played a critical role for two decades in piloting public and market-based instruments to shift investments from fossil fuels to more climate-friendly alternatives and in establishing enabling policy environments for their large scale adoption.

As a GEF founding implementing agency, UNDP has worked on over 230 GEF-supported clean energy projects in close to 100 developing countries since 1992. About 100 of these projects in 80 countries have focused on renewable energy, supported by approximately US $ 293 million in GEF funds and leveraging US $1.48 billion in associated co-financing from national governments, international organizations, the private sector and non-governmental organizations.

As part of UNDP efforts to codify and share lessons learnt from these initiatives, this report addresses how scarce public resources can be used to catalyze larger private financial flows for renewable energy. It provides an overview of UNDP-GEF's extensive work supporting development of national renewable energy policies such as feed-in tariffs. In these activities UNDP-GEF assists developing countries to assess key risks and barriers to technology diffusion and then to identify a mix of policy and financial de-risking measures to remove these barriers and drive investment. This approach is illustrated through three case studies in Uruguay, Mauritius and Kazakhstan. This report is complemented by a companion publication presenting an innovative UNDP financial modeling tool to assist policymakers in appraising different public instruments to promote clean energy.

As we look to the future, UNDP and GEF remain committed to removing barriers to investment in renewable energy, developing innovative policy and financial mechanisms, and engaging the private sector in building an inclusive and low-carbon future.

Rebeca Grynspan
Associate Administrator,
United Nations Development Programm

Naoko Ishii
CEO and Chairperson,
Global Environment Facility

Executive Summary

SHIFTING THE RISK-REWARD PROFILE OF RENEWABLE ENERGY INVESTMENT

The need to rapidly transition to more sustainable energy sources is clear. However, there remain major barriers to scaling up renewable energy, particularly in developing countries. Policymakers in developing countries face enormous challenges in the areas of education, health, social services, food and human security, disaster management and basic infrastructure; and are wary of potentially more expensive energy technologies. Attracting private capital can also be a challenge since energy investors are concerned about the risks associated with capital-intensive and long-term investments in developing economies. Utilities and electricity supply-chain actors tend to shy away from unproven technologies or businesses perceived to carry an above-average degree of risk. Consumers may also resist the prospect of tax or tariff increases and question the reliability of new energy technologies.

"A key challenge for policy makers is to create the conditions to make renewable energy attractive to investors and utilities without jeopardizing the attainment of other equally important development goals."

A key challenge for policymakers is to create the conditions to make renewable energy attractive to investors and utilities without jeopardizing the attainment of other equally important development goals or placing an inequitable share of the cost burdenon ratepayers. In order to achieve these objectives, policymakers in developing countries have been exploring a broad spectrum of different policies, incentives and support mechanisms. The common objective of these public instrumentsis to improve the risk-reward profile of renewable energy technologies, either through reducing risks (and hence lowering the cost of capital) or increasing rewards (for example, by providing premium prices, tax credits, etc.).

When it comes to promoting renewable energy investment through risk reduction, policymakers can utilize a range of different public measures. Broadly, these can be grouped into policy and financial derisking instruments:

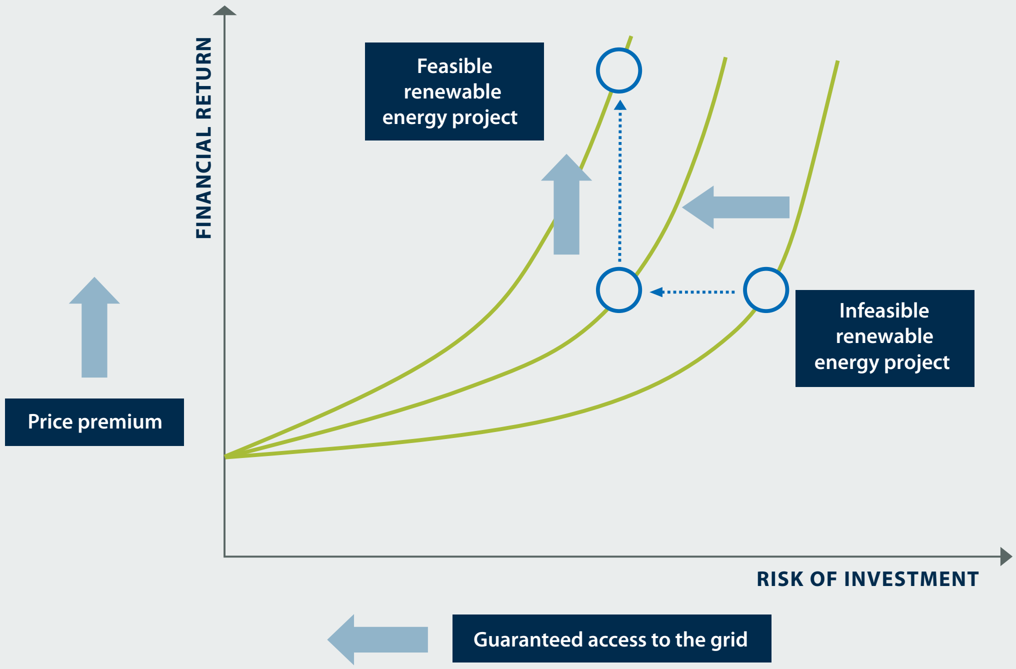
- **Policy derisking instruments** seek to remove the underlying barriers that are the root causes of risks. As the name implies, these instruments utilize policy and programmatic interventions to mitigate risk and include, for example, support for policy design, institutional capacity building, information campaigns and training programmes, among others.

- **Financial derisking instruments** do not seek to directly address the underlying barriers, but instead transfer the risks that investors face to public actors, such as development banks. These instruments can include, for example, loan guarantees, political risk insurance and public co-investments.

Recognizing that all risks cannot be eliminated through policy derisking or transferred through financial derisking, efforts to reduce risks can be complemented by additional financial incentives to compensate for any residual above-average risks and costs.

Figure 1 provides a conceptual illustration of the approach. It illustrates a shift from a commercially unattractive investment opportunity (right) to a commercially attractive one (top centre). This is achieved thorough two actions: first, reducing the risk of the activity, for example, through a regulatory policy, such as guaranteed access to the grid for independent power producers (IPPs); and, second, increasing the return on investment, for example, by creating financial incentives, such as a premium price for renewable energy.

Figure 1: Shifting the risk-reward profile of renewable energy projects



Source: Glemarec, 2011.

FEED-IN TARIFFS AND RELATED PRICE AND MARKET-ACCESS INSTRUMENTS

While policymakers can use a range of different instruments to address renewable energy investment risks and their underlying barriers, certain types of instruments have emerged more prominently than others. Mechanisms that provide renewable energy generators with a fixed long-term price for power and allow them guaranteed access to the electricity grid, for example, have rapidly diffused internationally. Such instruments are often referred to as FiTs because they enable generators to feed their power into the electricity system, whereas previously the domestic energy market structure may not have allowed this.

These instruments are popular with developers and investors because they can mitigate the specific risks associated with the financial profile of renewable energy projects (von Flowtow & Friebe, 2011; Bürer & Wüstenhagen, 2009). Approximately 75 percent of the lifetime total cost of wind energy is related to upfront costs for the wind turbine, foundations, grid connection and so on (Krohn et al, 2009). By establishing a secure future revenue stream, FiTs minimize the risk associated with long-term, fixed cost investments. As renewable energy generation is not exposed to variations in future fossil fuel prices, a FiT can thus dramatically improve the relative financial attractiveness of a renewable energy investment versus its conventional energy alternative.

“Mechanisms that provide renewable energy generators with a fixed long-term price for power and allow them guaranteed access to the electricity grid have rapidly diffused internationally.”

When necessary, FiTs can also include an above-market price in order to increase the return on investment. Thus, FiTs are both a policy derisking instrument (market access to the grid and must-take requirements) and a financial derisking instrument (guaranteed price over a period of 15 to 25 years) that can also act, when needed, as a financial incentive instrument (through a price premium), shifting the entire risk-reward profile of a renewable energy investment.

Since they address both price and market-access barriers, which can be critical impediments to clean energy investment, FiTs are often the cornerstone instrument in renewable energy market transformation efforts, around which complementary derisking instruments and financial incentives are deployed. As of early 2012, there were over 66 countries with FiTs in the world.[1] Alternative cornerstone instruments that can be structured to address price and market-access barriers, in a manner similar to FiTs, include tenders and quotas/renewable portfolio standards.

UNDP-GEF MARKET TRANSFORMATION PROJECTS

Since 1992, UNDP support and financing from the GEF have resulted in the implementation of over 230 clean energy projects in close to 100 developing countries, and involvement in a number of efforts to establish FiTs and related price and market-access instruments.

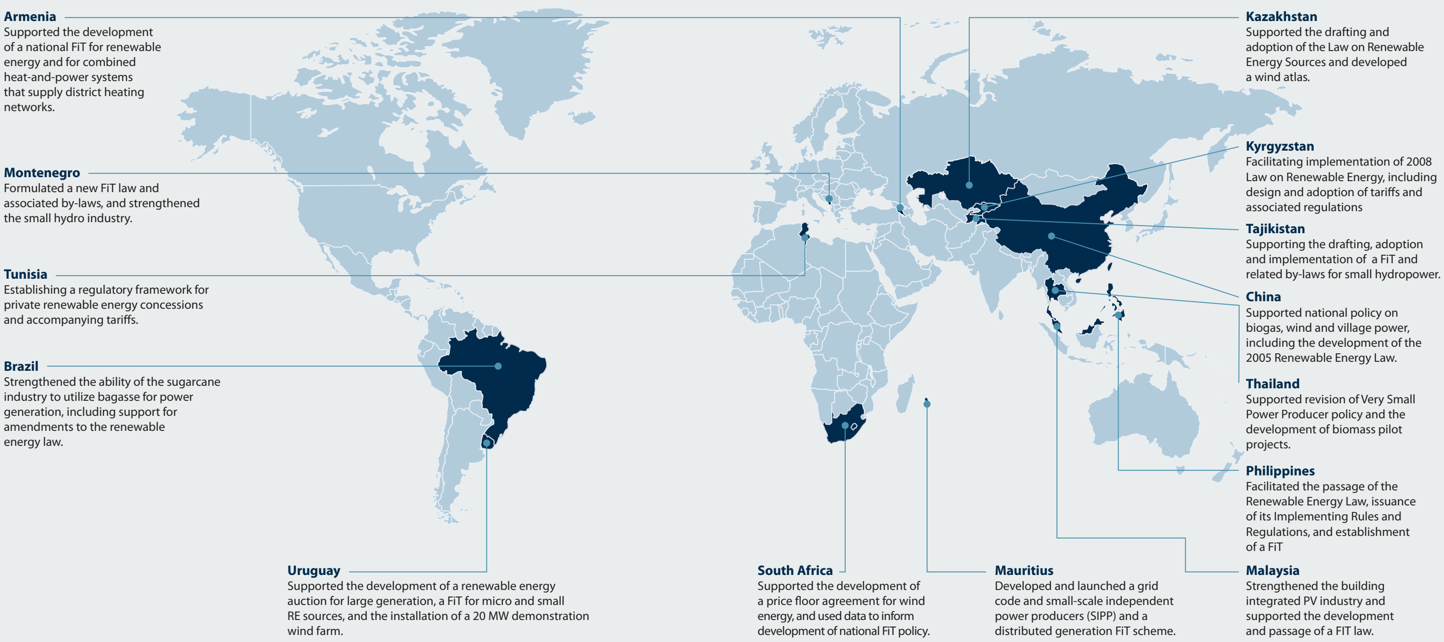
"UNDP-GEF market transformation projects enhance the capacity of policy makers to identify an appropriate mix of public instruments."

UNDP-GEF market transformation projects enhance the capacity of policymakers to identify an appropriate mix of public instruments to use scarce public funds to catalyse much larger private investment flows for clean energy development. Risk reduction is at the core of UNDP-GEF projects to promote renewable energy. The UNDP and GEF approach to reducing risk involves creating an enabling environment under which elements, such as a national policy framework for energy markets, financing channels, administrative procedures and domestic technical expertise, are strengthened and aligned to support renewable energy deployment. Recognizing that all risks cannot be eliminated through policy derisking measures, UNDP often partners with national, regional and multilateral banks to provide complementary financial derisking (loan guarantees, insurance, etc.). UNDP-GEF efforts also include advising governments on possible sources of innovative finance to provide additional financial incentives when required to compensate for any above-average residual risks.

This 20-year track record has created a unique base of institutional knowledge on transforming renewable energy markets in developing countries. As part of a continuous effort to share lessons learned from UNDP-GEF clean energy projects and to identify good practices, this report analyzes support to FiTs and related price and market-access instruments in 15 countries (See Figure 2.). Three countries were selected for in-depth case studies: Uruguay, Mauritius and Kazakhstan. These three countries were chosen because they are diverse in geography and renewable energy resources, as well as in energy market and investment conditions. The three projects employed comprehensive market transformation approaches, aiming to reduce renewable energy investment risks through providing a long-term price and guaranteed access to the electricity market. Uruguay chose to develop an auction programme for large renewable energy systems and a variation of a FiT/net metering hybrid for small- and micro-scale renewable energy systems. Mauritius developed a standard offer contract that is a hybrid between a FiT and net metering. Kazakhstan developed a FiT that establishes a different rate for each renewable energy generation project.

[1] REN21, 2012

Figure 2: UNDP-GEF projects involving FiTs and related price and market-access instruments



Source: UNDP-GEF.

URUGUAY

At the time the UNDP-GEF project began in 2007, Uruguay relied primarily on hydropower and fossil fuels to meet its domestic electricity demand. The $7 million project from 2007 to 2012 (GEF grant: $1 million; co-financing: $6 million) was designed around policy derisking measures to address a range of energy market, institutional, technology, connectivity and financial sector barriers. The project also originally included a plan to establish a 5 MW demonstration wind energy project by 2012. Uruguay has now exceeded this goal, with 40 MW of wind energy installed. In addition, based on the policies developed with the support of the UNDP-GEF project, Uruguay has to date awarded contracts for an additional 880 MW of wind energy, and Usinas y Trasmisiones Eléctricas (UTE) has announced it expects that 1 GW of wind will be online by the end of 2015 (i.e. approximately one quarter of total current national electricity consumption). This anticipated investment demonstrates that modest public funding focused on establishing an enabling policy environment can prove highly effective at catalyzing large financial flows for renewable energy development.

“Policy derisking instruments are an important foundation of any programme that uses public funds to transform renewable energy markets.”

Uruguay’s high projected investment leverage ratio (i.e. the cost of public instruments compared to the amount of capital consequently deployed) illustrates that policy derisking instruments are an important foundation of any programme that uses public funds to transform renewable energy markets. Policy derisking approaches address the underlying systemic conditions behind elevated levels of investment risk and can thus provide high leverage in terms of risk reduction per dollar of funding under the right energy market and investment conditions. Uruguay demonstrates that derisking can be sufficient to make wind energy competitive in countries with strong renewable energy resources and a good investment climate, and provides an example of an environment where additional incentives in the form of a high FiT payment do not appear to be necessary to catalyse investment.

MAURITIUS

Two back-to-back UNDP-GEF projects regarding FiTs to promote photovoltaic (PV) solar energy and wind/PV energy have been deployed in Mauritius. The first $12.5 million project (GEF grant: $0.9 million; co-financing $11.6 million), under implementation from 2007 to 2013, supports the development of a FiT for up to 5 MW of renewable energy systems smaller than 50 kW. A complementary $21 million project (GEF grant: $2 million; co-financing: $19 million), from 2011 to 2015, supports the deployment of PV systems over 50 kW in size through additional FiT policy support and also includes initial funding for direct incentive payments under the FiT. A key objective of the second PV project is to support the Maurice Île Durable (Mauritius Sustainable Island) strategic vision, launched by the Prime Minister in 2007. Fossil fuels have come to dominate the country’s electricity sector and coal, oil, and natural gas now comprise 79 percent of its generation portfolio. The goals of Maurice Île Durable include responding to climate change and achieving energy independence by obtaining 35 percent of national electricity from renewable sources by 2025 (up from 21 percent currently).

The FiT policy for systems smaller than 50 kW has been a success, attracting over 400 applications for residential and commercial systems (totalling 3.8 MW of capacity, overwhelmingly for PV systems) and over 80 applications from public, education, charity and religious organizations (totalling approximately 1 MW of capacity). Close to 1MW of capacity has already been installed and commissioned. This bodes well for the second project, which promotes the development of a FiT with proposed payment levels of approximately $0.37/kWh for systems over 50kW. Generators are able to receive the retail price of electricity, which is approximately $0.20/kWh, and hence the price premium would be $0.17/kWh.

Looking ahead, a key challenge will be to secure a credit-worthy source of funds to support this incentive payment. The FiT for PV systems smaller than 50 kW had been supported by a tax on fossil fuel generation, but the revenues from these taxes are not sufficient to additionally support the development of systems larger than 50 kW. While it is hoped that additional international and national climate finance can be mobilized to support the price premium for systems over 50 KW based on the direct incentive payment model piloted by the UNDP-GEF project, the capitalization of the incentive fund remains the main challenge to the sustainability and expansion of renewable energy generation in Mauritius in the medium term.

The experience in Mauritius shows that combining strong political will with a successful policy derisking strategy might not be sufficient to catalyse private investment in the absence of additional financial incentives in small markets. In order to further reduce the cost differential of solar PV and other renewable energy technologies, a range of local technology and management options, such as streamlining the development process and reducing the balance of system (BoS)[2] costs, could be pursued by future initiatives. However, the future of decentralized renewable energy systems in Mauritius will hinge on continued technical and financial support from both the national Government and the international community in the near- to medium-term.

"Combining strong political will with a successful policy derisking strategy might not be sufficient to catalyse private investment in the absence of additional financial incentives in small markets."

KAZAKHSTAN

Kazakhstan has abundant renewable energy resources that, with the exception of hydropower, have not thus far been utilized. Fossil fuels dominate the current electricity portfolio, with a total share of about 70 percent. However, Kazakhstan's voluntary commitment to the Kyoto Protocol will require further development of the country's renewable energy potential. The goal of the $7.6 million UNDP-GEF project (GEF grant: $2.9 million; co-financing $4.7 million), under implementation from 2004-2011, has been to facilitate the development of the wind energy market in Kazakhstan. A resource assessment carried out by the project has estimated the potential wind resource in the country to be in the region of 929 billion kWh per annum or 354 GW of installed capacity. This is over 10 times the projected power-generating capacity needed for Kazakhstan by 2030.

The UNDP-GEF project has made substantial progress in laying the groundwork for a wind energy market in Kazakhstan. It has led to the official adoption of a national wind energy target of 2,000 MW by 2030. A Kazakhstan Wind Atlas, as well as detailed wind resource assessment for 15 potential wind farm sites, have been developed and are freely available to potential investors online. Technical, commercial and environmental studies have been undertaken to demonstrate that there are no insurmountable obstacles to wind energy development in Kazakhstan. In particular, the grid study has estimated that meeting the 2030 target will not require any additional investment in transmission grid upgrade and enlargement.

One of the initial goals of the project was to support the installation of a 5 MW wind energy demonstration project. This proved infeasible due to the need to address regulatory gaps that emerged during the energy market's transition from a former state monopoly model to a more liberalized structure. The project evolved to focus more heavily on regulatory development and other policy derisking instruments and supported the development and adoption of the Law on Renewable Energy Sources and corresponding by-laws. The Law established guaranteed interconnection, purchase and priority dispatch requirements for renewable generators, and a standardized power purchase agreement (PPA).

Wind development has now begun in Kazakhstan, with the first 1.5 MW commercial wind project commissioned in December 2011, with plans to expand the project to 10 MW by 2014. Another 45 MW wind farm is currently under construction, and there are several other wind projects that are at advanced stages of development.

[2] In a PV system, the term balance of system (BoS) encompasses all components of the PV system other than the panels. This includes structures, enclosures, wiring, switches, support racks, charge controllers, batteries, and inverters. These components frequently account for half of the system cost and most of the system maintenance.

However, cost concerns are likely to remain a major impediment to developing wind energy in Kazakhstan. Given the investment conditions in Kazakhstan (available commercial loans have high interest rates and short tenors), and limited wind energy market growth to date, it has been estimated that a FiT with a payment level of $0.15/kWh would be necessary to attract investors. However, this FiTis about three times the current retail electricity price ($0.05/kWh). Although this retail price is artificially low, a FiT of $0.15/kWh is unlikely to be politically sustainable for a major scale-up of wind energy.

"The experience in Kazakhstan illustrates the importance of derisking wind power investment and of phasing out fossil fuel price subsidies to minimize the price premium required to make renewable energy attractive."

The experience in Kazakhstan illustrates the importance of derisking wind power investment to lower financing costs and of phasing out fossil fuel price subsidies in order to minimize the price premium required to make renewable energy attractive. Additional policy derisking efforts will most likely be required before the full potential of wind energy can be realized in Kazakhstan.

FINDINGS

Uruguay's experience demonstrates that relatively limited technical advisory support can be sufficient to establish an attractive clean energy investment environment. The case study in Mauritius, a relatively small market, illustrates that a successful policy derisking strategy may need to be supplemented by additional financial incentives. Market transformation efforts in Kazakhstan show that a generous price premium may not be enough to catalyse wind energy investment at scale in the absence of further systemic derisking efforts.

The different outcomes of renewable energy market transformation strategies in these three countries reinforce the observation that every country requires a customized and nationally-appropriate approach to removing barriers and reducing investment risk. Although the precise approach to deploying public sector resources will vary from country to country, there appear to be certain common principles that have been shown to be effective in attracting sustainable flows of private capital to the clean energy sector without placing an inequitable share of the cost burden on taxpayers or ratepayers.

"A FiT does not guarantee renewable energy scale-up. FiTs can only deal with a subset of the challenges facing energy sector market transformation."

The experience from the UNDP supported portfolio financed by GEF to date shows that a FiT does not guarantee renewable energy scale-up. FiTs and related price and market-access instruments can only deal with a subset of the challenges facing energy sector market transformation. For example, FiTs cannot address potentially severe issues such as high electricity losses, a lack of transmission infrastructure, sitting difficulties, fossil fuel and electricity subsidies, among others. In order to achieve renewable energy scale-up, it is often necessary to combine appropriate FiT design with a suite of targeted policy and financial derisking instruments in order to remove all key market barriers.

Policy-driven projects can take a long time and may need to be developed incrementally. The pre-existing energy market and technical regulations found in developing countries were formulated to accommodate fossil-fuel power generating technologies. A transition to the new market structures and technical modalities allowing for independent renewable power production is a significant undertaking, and may require a country to manage several significant paradigm shifts simultaneously. This means that FiTs and related price and market-access instruments may need to be continually and iteratively adjusted. As such, it is important to realize that policy development supported by UNDP and financed by GEF and other international organizations may necessarily represent steps along the way, rather than fully finished products.

Experience with UNDP-GEF efforts has also shown that renewable energy market transformation projects can generate multiple development wins: boosting economic growth, strengthening market institutions, reducing poverty, creating new jobs, improving local environment and heath conditions, and mitigating global environmental risks. For example, public measures supporting a FiT regime can often act as a change catalyst for better governance. An ancillary benefit of a policy derisking approach is that it can be instrumental in prying open an often closed energy market, and enabling a public discussion of barriers, as well as the solutions to remove these barriers.

However, efforts to scale-up renewable energy do not automatically produce multiple gains. Designing effective public measures to address all the key barriers to renewable energy and to optimize broader development benefits requires engineering and financial expertise, deep knowledge of the local economy and physical conditions, and a good understanding of successful international practices. No instrument or policy portfolio is inherently superior to another. Each public intervention will need to be regulatory reviewed to take into account evolving market conditions. A key finding of this report is that developing capacity in these areas and enabling a public discussion on barriers is a pre-condition for both a sustainable transformation of renewable energy markets and the achievement of broader development benefits.

CONCLUSIONS

An overall conclusion from the review of the UNDP-GEF portfolio of FiT-based renewable energy market transformation projects is that investing in policy derisking instruments, often in tandem with financial derisking instruments, appears to be cost-effective when measured against paying higher financial incentives to compensate investors for above-average risks . Rather than using scarce public funds to pay higher electricity tariffs, it can be advantageous to first reduce and manage the risks associated with underlying institutional, technological and financial barriers, and thereby sustainably change the fundamental risk-reward trade-off of renewable energy projects in a given country.

"Rather than using scarce public funds to pay higher electricity tariffs, it can be advantageous to first reduce and manage investment risks."

A corollary to this overall conclusion is that, for any particular developing country, there is no pre-set additional cost associated with new renewable energy capacity relative to the cost that would be associated with conventional fossil fuel energy. The need to provide incentive payments, as well as the required amount of these payments, can vary from location to location, depending on the geography, renewable resource endowment, country infrastructure, existing energy mix, present and future market sizes, selected technology options, and energy market structure.

The incremental cost of renewable energy will be deeply influenced by the policy and business environment and the ability of policymakers to address renewable energy barriers and generate development co-benefits. As a result, decisions on public interventions can ultimately lead to significant differences in the cost of a rapid transition to more sustainable energy sources and the distribution of this cost among stakeholders.

In order to better understand and more accurately communicate the impact of public instruments, new ways to quantify derisking interventions should be explored. To this end, a companion publication to this study, titled *Derisking Clean Energy Investment* builds on the lessons learned in this report and lays out a methodology for assessing the impact of derisking instruments based on a bottom-up, quantitative approach. This type of approach can contribute to more informed decision making and can therefore help to mitigate the risk of under or over-investment in a given set of public instruments.

Introduction

The need to rapidly transition to more sustainable energy sources is clear. The prices of fossil fuels are projected to rise (IEA, 2011b), the need to provide electricity to the 1.5 billion people that currently lack it will require significant new energy resources (Legros et al., 2009), and there is a narrow 7-10 year window remaining during which the energy sector must be decarbonized in order to avoid catastrophic climate change scenarios (Glemarec, 2011).[3]

"Public funds will need to be deployed catalytically in order to channel much larger private financial flows into sustainable energy investments."

The move to a low-carbon energy system will require a massive and worldwide scale-up in financing. National budgets are limited, however, and public funds will need to be deployed catalytically in order to channel much larger private financial flows into sustainable energy investments. A key challenge is how to optimize the mix of public measures in any given country. There are hundreds of sustainable energy public instruments, as well as a wide range of international resources, that can be deployed in different combinations. A major question for policymakers is how these instruments can be combined and sequenced to optimally derisk and incentivize the investment environment without placing an inequitable share of the cost burden on tax payers or rate payers.

UNDP has supported a portfolio of renewable energy deployment projects financed by GEF internationally for 20 years, and has a wealth of experience relating to how different instruments have been used in tandem. This paper reviews the UNDP-GEF project portfolio in order to explore how national policies and international support have been combined in different countries. The findings of this review will be used to inform subsequent quantitative efforts that examine the question of policy optimization in greater depth.

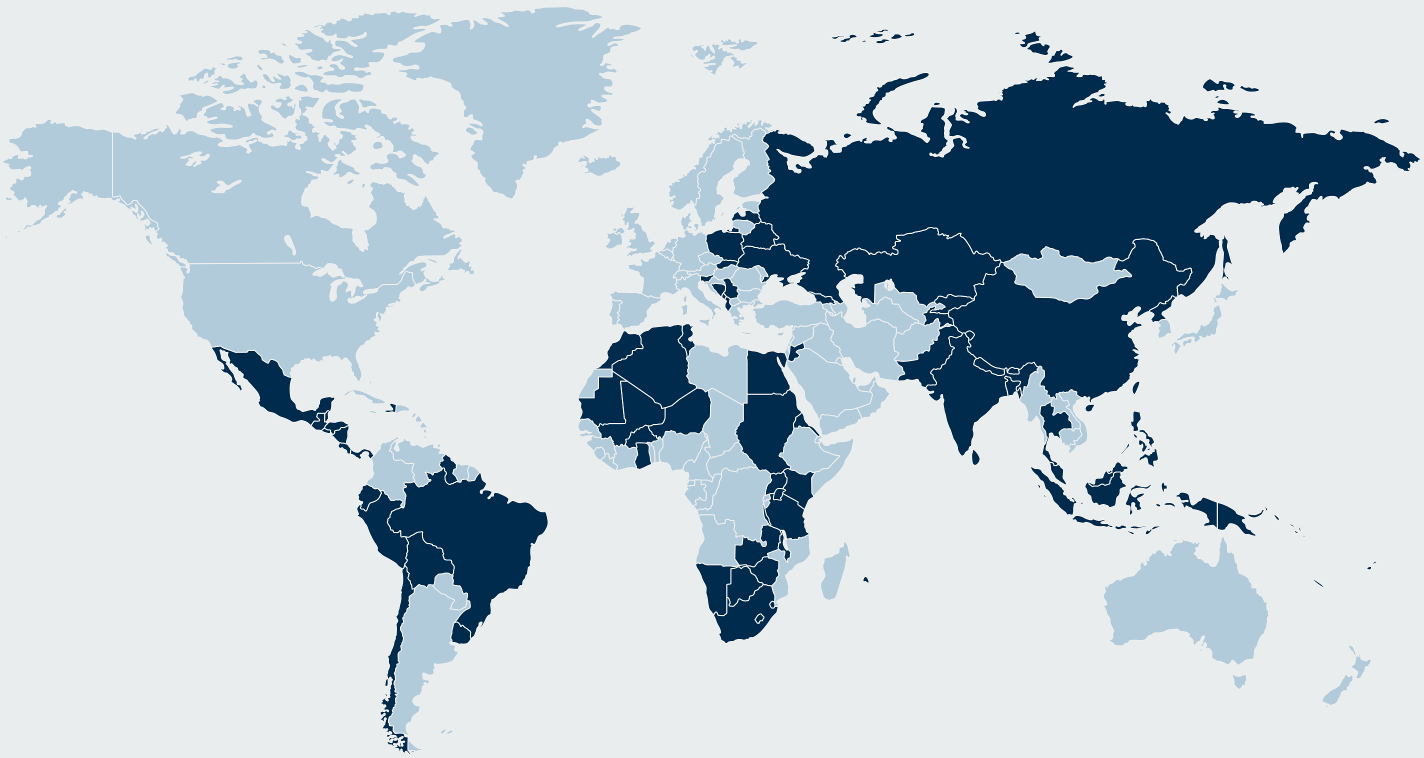
Since 1992, UNDP-GEF has implemented over 230 sustainable energy projects in close to 100 developing countries. Of these projects, over 100 projects in 80 countries have focused specifically on renewable energy (Figure 3). These renewable energy projects have deployed approximately $293 million in GEF funds and $1.48 billion in associated co-financing from national governments, international organizations, the private sector and NGOs.

A 20-year track record of UNDP-GEF sustainable energy projects and long-standing relationships with partner countries have created a unique base of institutional knowledge regarding the energy challenge in developing countries. In an effort to share lessons learned from its sustainable energy projects and identify best practices, UNDP and the GEF have published a series of reports that focus on its project portfolio. These have included reports focusing on the creation of sustainable district heating systems (Legro & Ballard-Tremeer, 2005), energy efficiency deployment in buildings (Schwarz, 2009), and strategies to promote wind power (Schwarz, 2008), among others.

UNDP-GEF has also drawn on its experiences to engage in broader discussions on how sustainable energy can be scaled-up globally. It is clear that public sector resources will need to be utilized to leverage private sector capital to finance sustainable energy at scale. UNDP has convened a series of discussions between international organizations and commercial financial institutions, such as Deutsche Bank, in order

[3] To achieve decarbonization, the 2007 UNDP Human Development Report recommends that developed countries cut GHG emissions by at least 80 percent by 2050, with 20–30 percent cuts by 2020. For major emitters among developing countries, it recommends aiming for an emission trajectory that would peak in 2020 with 20 percent cuts by 2050.

Figure 3: Countries with UNDP-GEF renewable energy projects (1992–2012)[4]



Source: UNDP/GEF

to explore how public and private financing can most effectively be deployed in parallel. One key outcome of this collaboration has been the *GET FiT Plus* study[5], which outlines approaches to using international resources to support renewable energy on a sector-wide, rather than on a project-by-project, basis. GET FiT Plus presents an overview of policy derisking instruments - for example, policy design and institutional strengthening - and analyzes the strengths and limitations of financial derisking instruments, such as guarantees, risk insurance and concessional loans (DB Climate Change Advisors & UNDP, 2011).

[4] Not pictured: Antigua and Barbuda, the Bahamas, Barbados, Belize, British Virgin Islands, Cuba, Dominica, Grenada, Guyana, Jamaica, St Kitts and Nevis, St Lucia, St Vincent and the Grenadines, Suriname, Trinidad and Tobago, and Turks and Caicos. Cook Islands, Fiji, Kiribati, Lesotho, Maldives, Marshall Islands, Mauritius, Nauru, Palau, Samoa, Seychelles, Solomon Islands, and Timor-Leste, Tonga, Tuvalu, and Vanuatu

[5] GET FiT- the Global Energy Transfer Feed-in Tariffs programme - is designed to support both renewable energy scale-up and energy access in the developing world through the creation of new international public-private partnerships (DB Climate Change Advisors, 2010). The GET FIT concept was initially developed in response to a request from the United Nations Secretary General's Advisory Group on Energy and Climate Change. A subsequent study, GET FIT Plus, expanded on the GET FIT concept by integrating feedback and input from a broad range of international organizations and development agencies.

These studies revealed that international approaches to renewable energy scale-up are becoming more sophisticated and innovative. They also revealed, however, that there is more work to be done in order to optimize the use of public sector funds to support renewable energy in developing countries. This report is part of a series that examines how public instruments can be selected and combined to promote large-scale investment. The goal of this report is to highlight lessons learned from UNDP supported global portfolio of GEF financed projects to demonstrate how international resources can be used to support national policy frameworks. A companion publication, *Derisking Clean Energy Investment*, presents an innovative UNDP financial modeling tool to assist policymakers in appraising different public instruments to promote clean energy.

This report is structured as follows:

- **Section 1** contains a high-level description of UNDP-GEF's approach to assisting developing countries to create enabling environments for renewable energy investment;

- **Section 2** provides an overview of UNDP-GEF work assisting the development of national renewable energy policies such as FiTs;

- **Section 3** presents case studies of projects in Uruguay, Mauritius and Kazakhstan;

- **Section 4** describes the key findings of the review of UNDP-GEF project portfolio and case studies.

Section 1

Creating Enabling Environments for Renewable Energy

- 1.1 UNDP Four-Step Methodology
- 1.2 Barriers, Risks and Public Instruments
  - 1.2.1 Barriers as the Roo Causes of Risk
  - 1.2.2 A Barrier and Risk Framework for Renewable Energy
  - 1.2.3 Policy and Financial Approaches to Derisking

Creating Enabling Environments for Renewable Energy

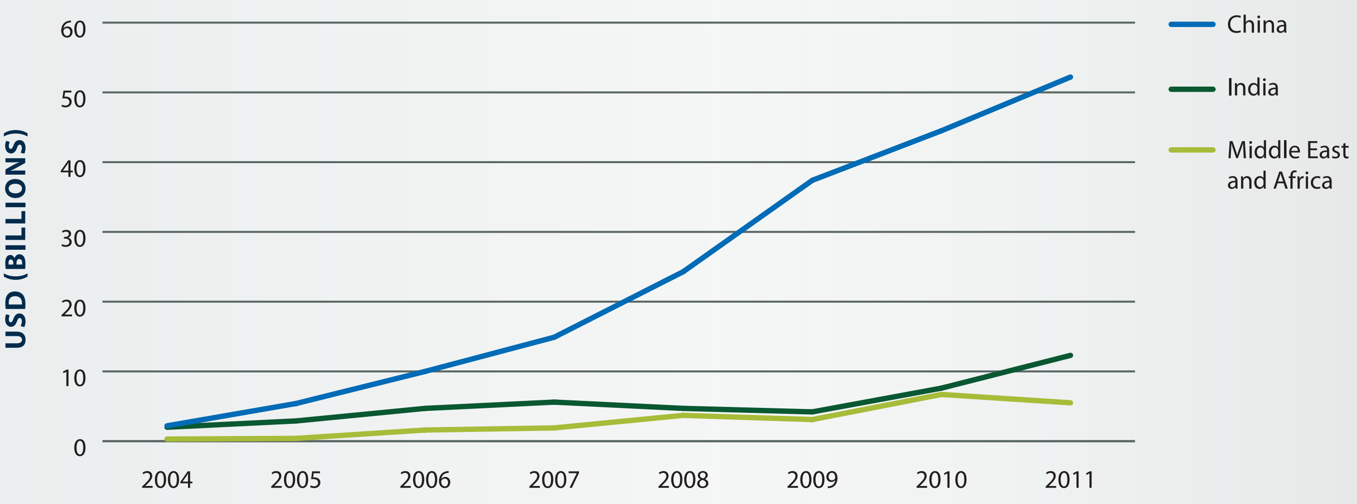
1

In 2011, close to $90 billion was invested in renewable energy in developing countries – or approximately 35 percent of the $257 billion invested globally in the renewable energy sector (Frankfurt School-UNEP & BNEF, 2012). Although significant, this level of investment will not be sufficient to achieve the large-scale energy transition that the United Nations Framework Convention on Climate Change (UNFCCC) (and other organizations) have concluded will be necessary to achieve climate stabilization. UN DESA, for example, has estimated that it would cost up to $250–$270 billion per year to shift developing countries to 20 percent renewable energy by 2025 (DeMartino & Le Blanc, 2010). According to the Global Energy Assessment (IIASA, 2012), global investment in energy efficiency and low carbon energy generation will need to increase to between $1.7–$2.2 trillion per year compared to present levels of about $1.3 trillion over the coming decades to meet the combined challenges of energy access, energy security and climate change.

In addition to increasing investment volumes, there is also a need to support investment in a broader range of countries. The $90 billion invested in 2011, for example, was heavily concentrated in major markets such as China and India. Figure 4 compares investments in China, India, and Africa and the Middle East. Each area is home to more than a billion people, but investment in China has in recent years significantly outpaced the other two. Also, while investment in India rose sharply in 2011, investments in Africa and the Middle East actually trended downward. In order to sustain and accelerate renewable market growth across all emerging economies, significant public financial resources from both national and international actors will be required.

"In addition to increasing investment volumes, there is also a need to support investment in a broader range of countries."

Figure 4: Investments in renewable energy in China, India, and Africa and the Middle East ($ billions)[6]



Source: Frankfurt School-UNEP & BNEF, 2012.

[6] This figure includes hydropower from 1 MW to 50 MW in size.

National and international support for renewable energy in developing countries has increased steadily over recent years. The amount of finance provided by multilateral and national development banks for renewable energy, for example, increased from $4 billion to $17 billion between 2007 and 2011. These amounts, however, are a small proportion of what is currently invested and what will be required in the future. The key question for policymakers is how limited public resources can most effectively be deployed in order to leverage the maximum amount of private sector investment.

Many renewable energy and energy efficiency projects can generate attractive returns, but typically require substantial upfront investment to do so. The shift from fossil fuel-based energy technologies to renewable energy technologies invariably involves higher upfront capital costs, offset by lower fuel and operating costs. The initial capital costs usually account for over 75 percent of the total costs of a renewable energy investment. As such, clean energy project developers typically need to secure large amounts of finance well in advance of the start of operations.

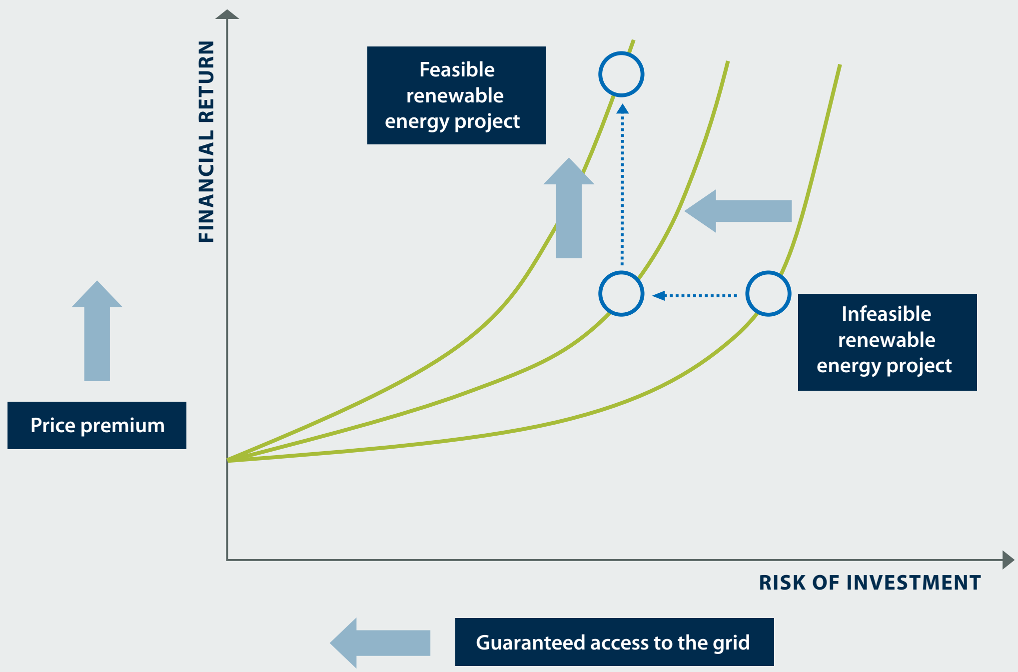
> "When evaluating opportunities that involve high perceived or actual risks, investors typically ask for higher returns…. this perception of above-average risk can lead to the rejection of potentially high-performing renewable energy projects."

Naturally, many investors are wary of long-term and capital-intensive projects, particularly when they involve the deployment of unfamiliar technologies in potentially unstable economies. When evaluating opportunities that involve high perceived or actual risks, investors typically ask for higher returns on equity or higher interest rates on debt with shorter loan tenors as compensation. As renewable energy investment is particularly sensitive to the cost of financing, this perception of above-average risk can lead to the rejection by investors of potentially high-performing renewable energy projects.

Risk reduction is at the core of UNDP-GEF projects to promote renewable energy. UNDP-GEF's approach to reducing risk involves creating an enabling environment under which elements such as the national policy framework for energy markets, financing channels, administrative procedures and domestic technical expertise are strengthened and aligned to support renewable energy deployment. Recognizing that all risks cannot be eliminated through public interventions, risk reduction measures can be complemented by additional financial incentives to compensate for residual costs or risks.

Figure 5 provides a conceptual illustration of the approach. The figure illustrates a shift from a commercially unattractive investment opportunity (right) to a commercially attractive one (top). This is achieved through two actions: first, reducing the risk of the activity, for example through a regulatory policy such as guaranteed access to the grid for independent power producers; and, second, increasing the return on investment, for example, by creating financial incentives such as a premium price for renewable energy. The methodology for creating an enabling environment is described in more detail below.

Figure 5: Shifting of the risk-reward profile of renewable energy projects



Source: Glemarec, 2011.

> "Recognizing that all risks cannot be eliminated through public interventions, risk reduction measures can be complemented by additional financial incentives to compensate for residual costs or risks."

1.1 UNDP'S FOUR-STEP METHODOLOGY

The creation of an effective enabling environment for renewable energy requires deploying public instruments that remove barriers, manage risks and build momentum for sector-wide market transformation. If not appropriately sequenced and structured, such interventions can fail to achieve meaningful results. UNDP has outlined a four-step methodology for identifying and selecting an optimal instrument mix in several recent publications (Glemarec, 2011; UNDP, 2011). These steps include:

Step 1. **Identify priority renewable energy technology options.** The most important factor in determining market transformation success is the alignment of proposed activities with national resources, priorities and needs. During this step, policymaker objectives and priorities are identified and assisted by resource mapping activities in order to identify technologies to be targeted for support.

Step 2. **Assess underlying barriers to technology diffusion.** An understanding of underlying barriers and risks is a prerequisite for developing sound sustainable energy strategies. When assessing underlying barriers and risks, it is important to take multiple stakeholder perspectives into account. Sustainable energy market development typically involves several main groups of stakeholders: investors, end-consumers, policymakers, utilities and the supply chain (i.e. local manufacturers, assemblers, shops and maintenance technicians), (Wörlen, 2011). This is discussed in greater detail in Section 1.2.1 below.

Step 3. **Determine an appropriate public instrument mix.** An appropriate combination of public instruments will be needed to address the barriers identified in Step 2 (Glemarec, 2011). This can include cornerstone instruments such as FiTs and renewable energy quotas, as well as a broad range of complementary instruments such as streamlined permitting, standardized interconnection, research and development initiatives, loan guarantees, public co-investments, political insurance, etc. The strategy for combining and introducing these different measures must be thoughtfully developed and sequenced.

Step 4. **Select funding options for the public instruments.** The fourth and final step is to identify and access appropriate international and domestic funding sources to support the selected instrument mix. The landscape for international climate and energy funding is highly complex and dynamic. New funding opportunities have been announced annually during the past several years even as the structure and availability of existing funding streams has continued to evolve. National governments can seek assistance from international partners to navigate this climate finance landscape.

Although it is standard practice that UNDP-GEF projects include elements of all of these steps, rather than focusing on just one of the four steps, the assessment of underlying barriers and risks - and the development of appropriate public instruments to address them - are often at the core of the UNDP-GEF projects.

"The assessment of underlying barriers and risks - and the development of appropriate public instruments to address them - are often at the core of the UNDP-GEF projects."

1.2 BARRIERS, RISKS AND PUBLIC INSTRUMENTS

Renewable energy investors encounter a range of different barriers and associated risks. In some developing countries, severe barriers and risks may prevent almost any private sector investment from being made. In other countries, there may still be investment, but with significantly increased capital costs (and therefore lower returns to power producers) and a limited number of active capital providers.

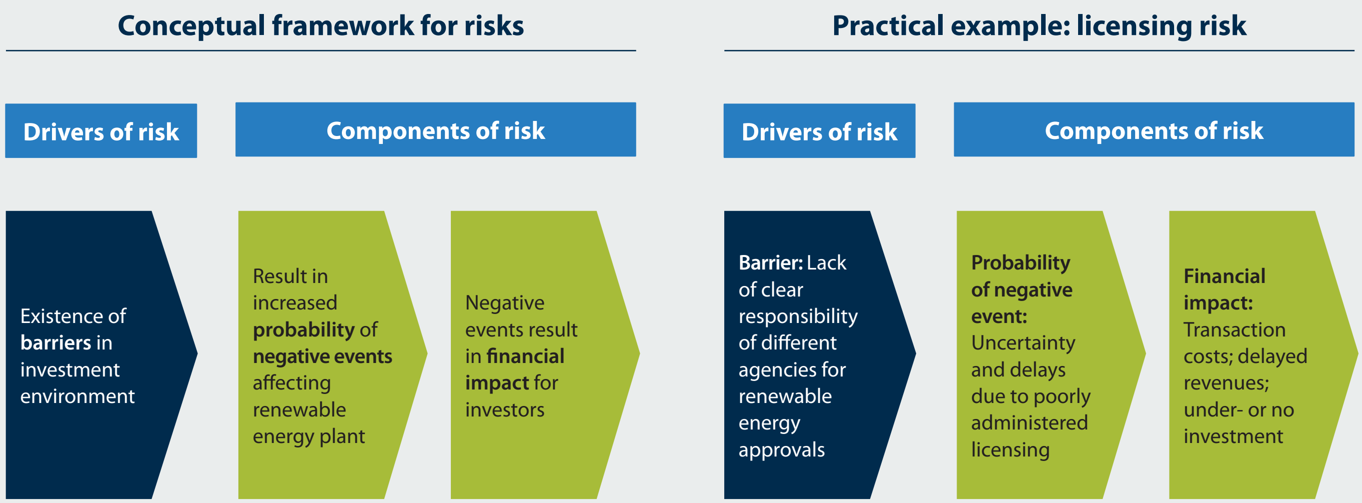
This Section explores the role of barriers as the root causes of risks, describes a barrier and risk framework for renewable energy, and explains how public derisking instruments can target specific barriers and risks either through policy and/or financial derisking.

1.2.1 Barriers as the Root Causes of Risk

In order to accurately assess the barriers and risks to renewable energy investment it is important to have a clear conceptual understanding of their interrelationship. As set out in Figure 6, barriers can be understood as the drivers, or the root causes, of risks. For example, an independent power producer considering a renewable energy investment may face barriers such as market distortions and externalities, overlapping institutional responsibilities, limited local supply of skills, lack of technical standards, limitations in a utility's credit quality, or domestic political instability, among others.

Conceptually, the existence of these barriers raises the probability that negative events affecting the renewable energy activities may occur, such as disruptions to construction or operations. If a negative event does occur, this translates to a financial impact for the independent power producer, such as higher capital costs and/or a loss of revenues. Risk can therefore be defined as the product of the probability of a negative event occurring and the potential financial impacts of such a negative event, should it occur. For example, lack of clear responsibilities of different agencies for renewable energy project licensing (the barrier) can lead to long delays in construction and commissioning (the negative event), which in turn results in higher transaction costs and delayed revenues (the financial impact).

Figure 6: Conceptual drivers of risk for renewable energy investment



Source: Waissbein *et al*., 2012.

"Renewable energy activities typically involve five common stakeholder groups: investors, end-consumers, policymakers, utilities, and the supply chain."

Given the critical role of accurately identifying barriers, it is important that barrier assessments be comprehensive. As touched on earlier, renewable energy activities typically involve five common stakeholder groups: investors, end-consumers, policymakers, utilities, and the supply chain. Each of these stakeholder groups can encounter a number of barriers that prevent them from using or supporting the renewable energy technology. Similarly, each renewable energy barrier can touch on several stakeholder groups. In short this means that addressing the barriers related to one stakeholder group cannot alone transform a market. Likewise, the support of a single stakeholder group is a necessary but not sufficient condition for scaling-up a given technology.

Mobilizing private sector investment is at the heart of scaling-up renewable energy, therefore, barrier assessments are typically performed from the viewpoint of investors and project developers. In order to avoid limiting the barrier assessment, it is important that the four other key stakeholder groups are also taken into consideration. For example, only addressing the barriers which affect investors will have little impact in the absence of strong consumer demand, local technology skills and a supportive regulatory environment. Taking multiple stakeholders into account opens the door to assessing the full spectrum of underlying barriers.

Table 1: Five key stakeholder groups for a renewable energy barrier assessment

STAKEHOLDER GROUP	DESCRIPTION/EXAMPLE BARRIERS
Project developers and investors	Project developers and investors (equity and debt) in renewable energy may encounter barriers such as a lack of track record on the performance of renewable energy technologies, uncertainties on the outlook for the local energy market, and uncertainties related to political instability
Consumers/end-users	Consumers encounter a range of barriers associated with the consumption of renewable energy, including a lack of awareness about renewable energy and the potential for alternatives, uncertainties that come from black-outs or brown-outs for mismanaged grids, or a lack of funds to afford cleaner energy technologies
Policymakers	This may include individuals charged with creating the rules and regulations that govern the energy industry, such as legislators and regulators. Policymakers may encounter barriers such as a lack of political or institutional incentives to support renewable energy, limited knowledge about the range of potential policies and their tradeoffs, and the prospect of prohibitively high policy costs
Utilities	Utilities include the entities that generate, transmit and/or distribute electricity. Utilities may encounter barriers such as a lack of experience in planning and managing intermittent renewable energy generation, a lack of knowledge about renewable energy technologies and their track record, and economic conflicts of interest (depending on the ownership model)
Supply chain	This includes companies that manufacture, distribute, install and maintain renewable energy technologies. Supply chain stakeholders may encounter barriers such as a lack of expertise in sustainable energy technologies, the availability of more profitable business opportunities in which to invest, and a lack of demand for renewable energy equipment

1.2.2 A Barrier and Risk Framework for Renewable Energy

Once identified, underlying barriers can be analyzed and mapped against a set of risk categories. UNDP-GEF has developed such a barrier and risk framework for on-grid renewable energy investment, which draws from multi-stakeholder barrier assessments that it has performed in the field. Table 2 below summarizes this framework, defining 21 underlying barriers, stakeholder groups typically affected by these barriers, and a set of 9 resulting risk categories.

The nine risk categories for on-grid renewable energy are: energy market risk, institutional risk, social acceptance risk, resource and technology risk, connectivity risk, counterparty risk, financial sector risk, political risk and macroeconomic risk. These risk categories can provide a helpful framework for decision makers in renewable energy. As set out earlier in Figure 6 in Section 1.2.1, risk is conceptually a richer measure than an underlying barrier, as risk not only captures the probability of a negative event occurring (driven by the underlying barrier), but also the financial impact of that negative event should it occur. In addition, risk categories typically embody the effects of several related underlying barriers.

Further information on how to conduct a barrier-to-risk mapping exercise can be found in *Derisking Clean Energy Investment* (Waissbein *et al*., 2012). This companion publication also describes how barrier and risk frameworks can subsequently be used to perform systematic analyses of the relationship between barriers, risk, public instruments and clean energy investment.

Table 2: A barrier and risk framework for on-grid renewable energy investment

BARRIERS	PRIMARY VIEWPOINT	MULTI-STAKEHOLDER VIEWPOINT				AGGREGATE BARRIERS	RISK CATEGORY	RISK DEFINITION
	IPP/ INVESTORS	PUBLIC/ END USER	POLICY-MAKERS	UTILITY/ GRID	SUPPLY CHAIN			
– *Market outlook*: lack of or uncertainty regarding governmental renewable energy strategy and targets	● High	● Medium	● High	● High	● High		1. Energy market risk	Risk arising from limitations and uncertainties in the energy market, and/or suboptimal regulations to address these limitations and promote renewable energy markets
– *Market access and prices*: limitations related to energy market liberalization; uncertainty related to priority dispatch, the competitive landscape and price outlook; lack of well-designed regulations, processes and standard contracts (e.g. PPAs)	● High	● Medium	● High	● High	● High			
– *Market distortions and externalities:* high fossil fuel subsidies	● High	● High	● High	● High	● Medium			
– Overlapping/lack of clear functional responsibility of different authorities for renewable energy project approvals	● High	○ Low	● High	● High	● High		2. Institutional risk	Risk arising from the public sector's inability to efficiently and transparently *administer* renewable energy-related regulations, for example in licensing.
– High levels of corruption; No clear recourse mechanisms.	● High	● High	● High	● High	● High			
– Lack of awareness on renewable energy amongst end users, local residents and policy makers	● High	● High	● High	● Medium	● High		3. Social acceptance risk	Risks arising from lack of awareness and resistence to renewable energy in communities and end-users
– Social and political resistance related to renewable energy NIMBY concerns, special interest groups	● High	● High	● High	● Medium	● High			
– *For resource assessment and supply:* inaccuracies in early-stage assessment of renewable energy resource; where applicable (e.g. bioenergy), uncertainties related to future supply and cost of resource	● High	○ Low	● High	● Medium	● High		4. Resource and Technology Risk	Risks arising from use of the renewable energy resource and technology (resource assessment; construction and operational use; hardware purchase and manufacturing)
– *For planning, construction, operations and maintenance:* uncertainties related to securing land; suboptimal plant design; lack of local firms offering construction, maintenance services; lack of skilled and experienced local staff; limitations in civic infrastructure (roads etc.)	● High	○ Low	● High	● Medium	● High			
– *For the purchase and, if applicable, local manufacture of hardware:* purchaser's lack of information on quality, reliability and cost of hardware; lack of local industrial presence and experience with hardware, including skilled and experienced local workforce	● High	○ Low	● High	● Medium	● High			

Source: Waissbein *et al.,* 2012.

LEGEND: ● High Effect ● Medium Effect ○ Low Effect

BARRIERS	PRIMARY VIEWPOINT	MULTI-STAKEHOLDER VIEWPOINT				AGGREGATE BARRIERS	RISK CATEGORY	RISK DEFINITION
	IPP/ INVESTORS	PUBLIC/ END USER	POLICY-MAKERS	UTILITY/ GRID	SUPPLY CHAIN			
– Lack of standards for the integration of intermittent, de-centralized renewable energy sources into the grid	●	◍	◍	●	●		5. Connectivity risk	Risks arising from limitations in grid infrastructure and transmissions in the particular country.
– Limited experience of utility/grid operator with intermittent sources e.g., grid stability, grid management	●	◍	◍	●	◍			
– Lack of readily available transmission lines from the renewable energy source to load centers; reliance on distribution company/government for timely completion and O&M of required transmission infrastructure	●	◍	●	●	●			
– Limitations in utility's credit quality and payment track record. Limitations in the utility's operational track record or outlook, management or corporate governance	●	◍	●	●	◍		6. Counterparty (PPA payment) risk	Risks arising from the utility's poor credit quality and an IPP's reliance on payments
– *Capital scarcity:* Limited general availability of local or international capital (equity and/or debt) in the particular country	●	○	◍	◍	●		7. Financial sector risk	Risks arising from an immature local financial sector for renewable energy, and from general scarcity of investor capital (debt and equity) in the particular country
– *Immaturity of local financial sector:* Lack of information, assessment skills and track record for renewable energy projects amongst investor community; lack of network effects (investors, investment opportunities) found in established markets	●	○	◍	◍	●			
– Uncertainty or impediments due to war, terrorism, and/or civil disturbance	●	●	●	●	●		8. Political risk	Risks arising from country-specific governance and legal characteristics
– Uncertainty due to high political instability; poor governance; poor rule of law and institutions	●	◍	●	●	●			
– Uncertainty or impediments due to government policy (currency restrictions, corporate taxes)	●	◍	◍	●	●			
– Uncertainty due to volatile local currency; unfavorable currency exchange rate movements	●	◍	●	●	●		9. Macro-economic risk	Risks arising from the country's macroeconomic performance
– Uncertainty around inflation, interest rate outlook due to an unstable macroeconomic environment	●	◍	●	●	●			

Source: Waissbein *et al.*, 2012.

LEGEND: ● High Effect ◍ Medium Effect ○ Low Effect

1.2.3 Policy and Financial Approaches to Derisking

Once a multi-stakeholder barrier assessment has been conducted, national policymakers and their international partners can utilize a range of different mechanisms to address these underlying barriers and risks. This will typically involve identifying a central cornerstone instrument, such as a FiT, around which a range of complementary derisking instruments can be deployed. Broadly, these risk reduction instruments can be grouped into policy and financial derisking measures

"Policy derisking instruments attempt to remove the underlying barriers that are the root causes of risks..."

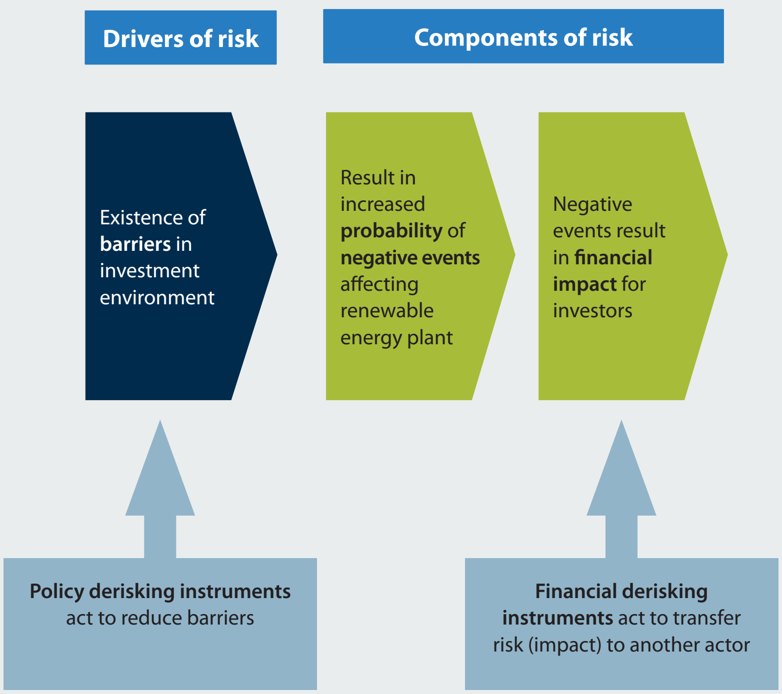
- Policy derisking instruments address and attempt to remove the underlying barriers that are the root causes of risks. As the name implies, these mechanisms utilize policy and programmatic interventions to mitigate risk. Policy derisking instruments include, for example, support for policy design, institutional strengthening, technical grid integration studies, capacity building for policy makers, investors, utilities and assemblers, and information campaigns, among others. The goal of policy derisking is to ensure that each instrument is customized to address specific renewable energy investment barriers. As mentioned earlier, unclear and overlapping institutional responsibilities related to renewable energy permitting can increase transaction costs, delay revenues, and discourage investment. Rather than paying high tariffs to support project development under such conditions, a policy derisking approach might involve working with governments to reduce cost and risk to developers by: streamlining the permitting and licensing process, clarifying and standardizing institutional responsibilities, reducing the number of process steps, and providing capacity building to programme administrators.

"...while financial derisking instruments seek to transfer the risks that investors face to public actors."

- Financial derisking instruments do not seek to directly address the underlying barrier, but instead function by transferring the risks that investors face to public actors, such as development banks. These instruments can include guarantees, hedging instruments, political risk insurance, and public co-investments. Different financial derisking instruments can be employed, but the instruments available may be limited depending on the specific risks that need to be addressed, the countries and donor organizations involved, and the magnitude of the risks. In addition to transferring risks, financial derisking instruments can also indirectly address certain underlying barriers through learning-by-doing and track-record effects. A full discussion of financial derisking mechanisms is beyond the scope of this report, but several recent research efforts, including UNDP and Deutsche Bank's GET FiT Plus publication, have attempted to catalogue and compare different mechanisms (DB Climate Change Advisors & UNDP, 2011; Global Climate Network, 2010; Mostert *et al.*, 2010).

Figure 7 illustrates conceptually how policy and financial derisking instruments address risk in a different manner. Policy derisking instruments directly address the risk driver (or root cause) by reducing the existence of the barrier and hence the barrier's likelihood of inducing negative events. Financial derisking instruments directly address the second component of risk, the financial impact, by transferring some or all of any financial impact, should it occur, to the public sector or other public/private structures.

Figure 7: Primary impacts of policy and financial derisking instruments on risk



Source: Waissbein *et al*., 2012.

Policy derisking instruments will often need to be used in tandem with financial derisking instruments, which can be applied to transfer some risks that policy-based instruments cannot initially resolve. For example, policy derisking instruments may address many of the underlying barriers in a given country, but may not be fundamentally able to address concerns associated with political instability. As a result, financial derisking instruments such as loan guarantees and political risk insurance may be necessary in order to enable the deployment of private capital. Both classes of derisking instruments therefore have a key role to play in promoting renewable energy in developing countries. Careful consideration must given to their sequencing. In some cases, a first set of policy reforms might be required for financial derisking instruments to effectively transfer risks and attract investment. Similarly, the availability of risk transfer instruments might be a prerequisite to further deepen policy change.

Section 2

Supporting Renewable Energy: Feed-in Tariffs and Related Price and Market-Access Instruments

- 2.1 Renewable Energy Policy Trends
- 2.2 UNDP-GEF Portfolio Survey Methodology
- 2.3 UNDP-GEF Renewable Energy Projects Overview

Supporting Renewable Energy: Feed-in Tariffs and Related Price and Market-Access Instruments

2

This section reviews UNDP-GEF's experience assisting countries in deploying public instruments to create enabling environments for renewable energy.

2.1 RENEWABLE ENERGY POLICY TRENDS

The pace of renewable energy policy development has accelerated dramatically in developing countries during recent years. According to REN21, for example, the total number of countries with renewable energy targets has increased from 45 in 2005 to 118 in 2012. The large majority of these targets (86) have been set by developing country governments during the past five years in order to achieve a broad range of different national goals, such as: meeting projected generation capacity shortfalls, moving away from oil as an energy source, attracting private and foreign investment into the power sector, establishing new industries to capture economic development opportunities, managing the risk of energy supply disruptions (for example, drought in countries that depend heavily on hydropower), and responding to national and international carbon reduction goals (REN21, 2012).

In order to achieve these objectives, policymakers in developing countries have been exploring a broad spectrum of public instruments. A wide diversity of public instruments exists and UNDP-GEF has compiled a catalogue of 150 distinct measures in its *Catalysing Climate Finance* report (Glemarec, 2012). Of these, however, there are three cornerstone instruments that have driven the commercial roll-out of renewable energy globally: feed-in tariffs, tenders and quotas/renewable portfolio standards.

"Three cornerstone instruments have driven the commercial roll-out of renewable energy globally: feed-in tariffs, tenders and quotas/renewable portfolio standards."

These cornerstone instruments, providing renewable energy generators with a long-term price for power and allowing them guaranteed access to the electricity grid, have rapidly diffused internationally. Such public instruments are often referred to as 'feed-in tariffs' because they enable generators to feed their power into the electricity system whereas previously they may have been prevented from doing so by utilities and grid operators.

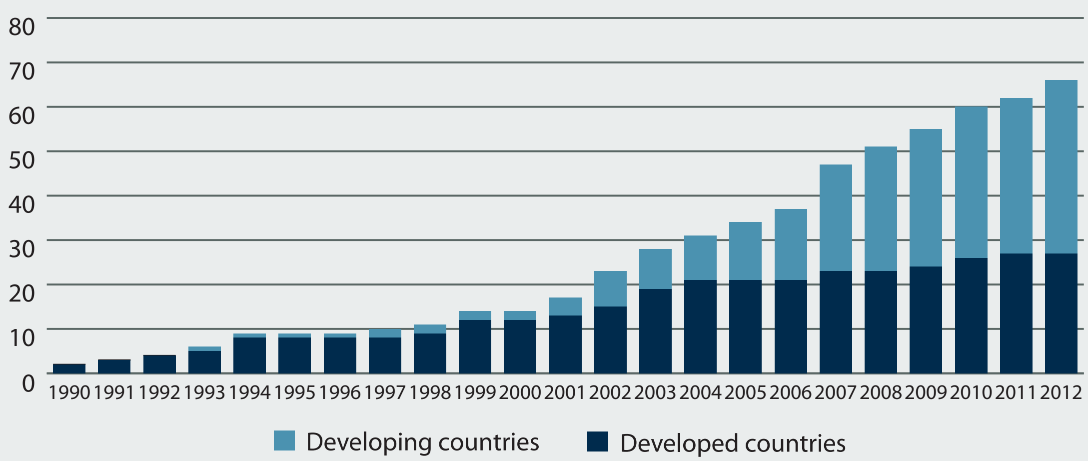
This report does not utilize a more detailed definition of FiTs because the diversity of instrument designs around the world makes precision difficult[7]. Annex A contains a discussion of FiT definitions and a table that contrasts the designs of several instruments that UNDP-GEF projects have supported.

[7] This study focuses on FiTs in order to have a common point of comparison, but refers frequently to 'FiTs and related price and market-access instruments' in acknowledgment of the fact that there are few clear dividing lines between FiTs and other instruments – such as quotas/renewable portfolio standards and tenders – that mark where FiTs begin and other instruments end. Ultimately, the goal of thisreport is not to highlight the strengths and weaknesses of different policy types, but rather to show how public derisking activities have been structured in response to requests for assistance with national renewable energy policy and market development.

FiT diffusion, similar to the spread of renewable energy targets, has been most rapid among developing countries during recent years. As of early 2012, there are over 66 countries with FiTs in the world. The majority of these are developing countries, and the number of developing countries with FiTs in place continues to expand. In early 2012, for example, Indonesia introduced new FiTs for biomass and waste-to-energy plants,[8] while Rwanda introduced FiTs for small hydropower.[9] As can be seen in Figure 8 below, the spread of FiTs in developing countries is a relatively new phenomenon that has occurred during the past decade. Prior to 2004, the majority of global FiT development was concentrated within developed countries and specifically within the European Union. Since 2004, however, the number of developing countries with FiTs has quadrupled, from 10 to 40. While this trend has created significant opportunities for best practice exchange between developing countries, it has also increased demand for public derisking instruments to support FiT frameworks.

To date, there have been numerous studies of FiTs in Europe, but there have been few studies which focus primarily on FiTs in developing countries.[10] One of the goals of this Section is to review UNDP-GEF's experience in supporting FiT-based regimes and examine the conditions under which UNDP support and GEF financing have provided assistance in this area. In addition to focusing on FiT designs, this report focuses on the broader suite of public derisking instruments that UNDP-GEF projects have deployed to enhance different countries' enabling environments for renewable energy development.

Figure 8: Number of developing and developed countries with FiT policies



Source: REN21, 2012; UNDP research.

[8] Ministry of Energy and Mineral Resources Regulation 4/2012.

[9] Rwanda Utilities Regulatory Agency Regulations No001/Energy/RURA/2012 of 09/02/2012 on Rwanda Renewable Energy Feed In Tariff.

[10] A notable exception has been the recent feed-in tariff law drafters' guide for policymakers in developing countries, which was published by UNEP (Rickerson, *et al.*, 2012).

UNDP support and GEF financing have assisted clean energy projects in almost all of the developing countries that currently have FiTs. In some cases, UNDP-GEF projects have been directly involved in the design and implementation of the FiTs and related price and market-access instruments. In other cases, UNDP-GEF projects have not been directly involved in FiT development, but have helped create an enabling environment through complementary derisking instruments acting in conjunction with the FiT.

2.2 UNDP-GEF PORTFOLIO SURVEY METHODOLOGY

In order to develop this section of the report, the full project portfolio of UNDP-GEF's Energy, Infrastructure, Technology and Transport (EITT) group was reviewed and the sustainable energy projects that have incorporated support for FiTs and related price and market-access instruments were identified. A geographically diverse subset of these countries was then selected for additional analysis in order to illustrate UNDP's experience and involvement with FiTs.

A review of relevant documents and websites for projects in fourteen countries was conducted, as were interviews with UNDP-GEF regional technical advisers, national project managers and in-country experts. Details of each project were gathered, including project size, timeline, objectives, barriers addressed, derisking instruments utilized and project outcomes. For each project, independent evaluations performed for UNDP-GEF of whether the projects achieved their stated outcomes and outputs were reviewed. This project survey was then used to draw broad lessons learned about the barriers faced in these countries and the nature of the derisking instruments deployed under UNDP-GEF projects.

From UNDP-GEF portfolio of FiT projects, three countries were selected for deeper analysis in order to compile illustrative case studies that explore lessons learned from UNDP-GEF's FiT experience in greater detail: Uruguay, Mauritius and Kazakhstan. The policy structures of the case study countries were also characterized using a standard set of design categories contained in Annex A.[11]

2.3 UNDP-GEF RENEWABLE ENERGY PROJECTS OVERVIEW

Figure 9 shows the locations of the 15 UNDP-GEF projects across 14 countries surveyed in this study and provides a high-level summary of how the projects supported national policy development. Details on the FiT design used in each of these projects can be found in Annex B. As can be seen in the figure, the projects are geographically widely distributed and include both large economies – such as China and Brazil – and smaller economies such as Montenegro and Mauritius. For the projects analyzed, UNDP-GEF deployed $54 million of GEF resources for policy and financial derisking support, which was accompanied by an

[11] Design categories were based on categories utilized in UNEP's law drafters' guide (Rickerson, *et al.*, 2012).

additional $370 million in co-financing - representing a project co-financing leverage ratio for international climate finance of seven to one[12]. The activities undertaken within each project vary widely, and the case studies in Section 3 describe in greater detail the different ways that GEF resources have been deployed. Several broad observations can, however, be made about the project portfolio:

"A lack of stakeholder technical capacity and insufficient information were common to the barriers of almost all the UNDP-GEF projects."

- **Barriers and risks.** The particular set of barriers and risks identified in each country were unique, but a lack of stakeholder technical capacity and insufficient information were common to almost all of the UNDP-GEF projects. Information and capacity barriers, for example, had introduced risks related to energy market policy and regulation in many of the countries in the study. Some countries had not developed a renewable energy policy framework because there was a lack of domestic expertise in renewable energy policy design. Other countries had passed legislation to create a broad policy framework, but had not established the associated by-laws or payment levels needed to enable the policy to function. Even if FiTs and related price and market-access instruments were 'on the books', so to speak, they did not necessarily work. The potential disconnect between what has been established as official policy and domestic capability to enforce the policy can be a critical regulatory risk that is often overlooked by broad surveys of renewable energy measures.

- **FiTs as cornerstone instruments.** The common aspect across each of the UNDP-GEF projects was the central role of FiTs, or related price and market-access instruments, as the cornerstone renewable energy instrument. The degree, type and evolution of UNDP-GEF support, however, varied from project to project. In some projects, such as in Tajikistan, Tunisia and Mauritius, the drafting of FiT regulations and by-laws in partnership with the Government was acknowledged as a central focus of the project. In other projects, such as in Kazakhstan and in Malaysia, the focus on the FiT emerged during the course of the project in response to evolving national priorities, but was not emphasized in initial project design. The activities in support of the FiTs included comparative surveys of international policies, developing quantitative financial and economic analyzes of proposed FiTs, drafting national legislation, calculating proposed FiT rates, and providing advice to national decision-makers. It is also important to note that the FiT and related price and market-access instruments supported by UNDP-GEF projects do not conform to a standard model of design. Instead, there is a wide diversity in design elements that reflect different national objectives, priorities and constraints. Finally, it is also useful to note that the policies have had different impacts and outcomes. In some cases, policy development was not completed during the course of the project, but the policy dialogue initiated by the project continued for years after the formal end of the project before the proposed legislation was eventually passed (See Box 1, Page 38).

[12] The project co-financing ratio can be distinguished from the investment leverage ratio for market transformation. The latter reflects the new and additional renewable energy financing that arises as a direct result of the enabling policy and business environment established by the public intervention

- **Policy derisking instruments.** Without exception, each of the UNDP-GEF projects deployed a broad range of policy derisking instruments to address renewable energy barriers. These included activities such as renewable resource assessments (for example, solar and wind mapping), outreach and information dissemination, training, industry development, institutional capacity building and technical demonstrations. Even if the projects were designed to target a specific sector, the policy derisking instruments utilized were typically targeted across different stakeholder groups. The primary focus of the project in Malaysia, for example, was to support the development of the PVindustry. The project supported work with photovoltaic businesses that included training technicians, strengthening industry associations and supporting technology development. At the same time, however, the project also focused on working with policymakers to raise awareness about renewable energy in general, and then to actively support the development of the national FiT.

- **Financial derisking instruments.** Whereas some of the projects focused exclusively on policy derisking instruments, several also incorporated financial derisking instruments. In the Philippines, for example, a UNDP-GEF project capitalized a partial loan guarantee fund for developers who might not otherwise have met the collateral requirements of lenders. In Thailand, GEF funds supported a risk guarantee facility for biomass pilot projects that covered fuel price, credit, currency, and technology risks. Although not all of the projects included financial derisking instruments, it is important to note that UNDP-GEF funds are often deployed in parallel with those of other international agencies, and that these other organizations may provide financial derisking mechanisms. In Mexico, for example, UNDP-GEF's policy derisking efforts focusing on wind energy were complemented by World Bank-GEF's use of financial derisking funds to support the La Venta III wind power project (World Bank, 2006).

Figure 9: UNDP-GEF projects with a focus on FiTs and related price and market-access instruments

Armenia
Supported the development of a national FiT for renewable energy and for combined heat-and-power systems that supply district heating networks.

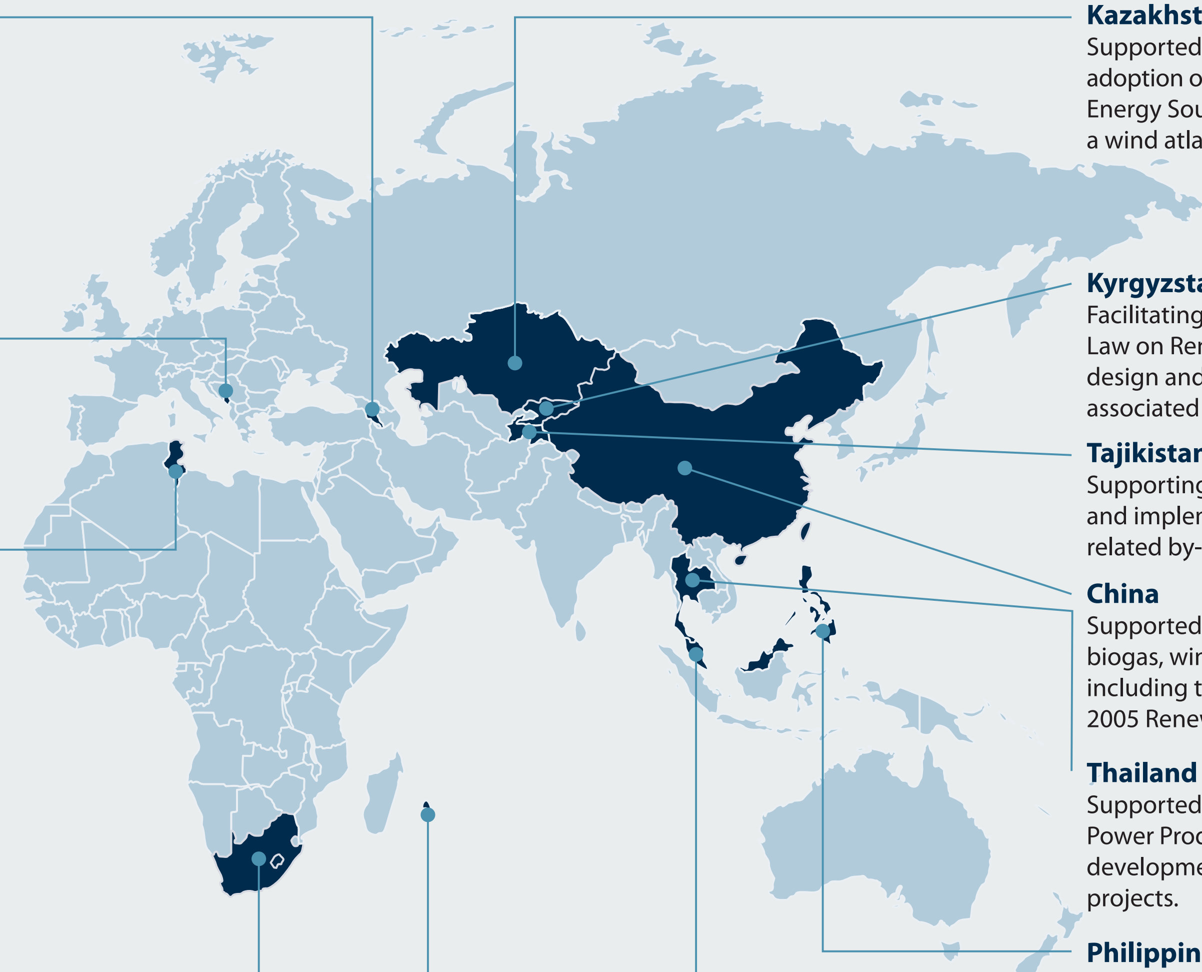
Montenegro
Formulated a new FiT law and associated by-laws, and strengthened the small hydro industry.

Tunisia
Establishing a regulatory framework for private renewable energy concessions and accompanying tariffs.

Brazil
Strengthened the ability of the sugarcane industry to utilize bagasse for power generation, including support for amendments to the renewable energy law.

Uruguay
Supported the development of a renewable energy auction for large generation, a FiT for micro and small RE sources, and the installation of a 20 MW demonstration wind farm.

Source: UNDP-GEF.



Kazakhstan
Supported the drafting and adoption of the Law on Renewable Energy Sources and developed a wind atlas.

Kyrgyzstan
Facilitating implementation of 2008 Law on Renewable Energy, including design and adoption of tariffs and associated regulations

Tajikistan
Supporting the drafting, adoption and implementation of a FiT and related by-laws for small hydropower.

China
Supported national policy on biogas, wind and village power, including the development of the 2005 Renewable Energy Law.

Thailand
Supported revision of Very Small Power Producer policy and the development of biomass pilot projects.

Philippines
Facilitated the passage of the Renewable Energy Law, issuance of its Implementing Rules and Regulations, and establishment of a FiT

South Africa
Supported the development of a price floor agreement for wind energy, and used data to inform development of national FiT policy.

Mauritius
Developed and launched a grid code and small-scale independent power producers (SIPP) and a distributed generation FiT scheme.

Malaysia
Strengthened the building integrated PV industry and supported the development and passage of a FIT law.

Box 1: UNDP-GEF assistance for the Renewable Energy Law in China

China has emerged as a world leader in renewable energy during the past several years, surging into a leadership position in the global wind energy market in the space of a few years. UNDP-GEF helped lay the foundation for China's rapid expansion through its *Capacity Building for the Rapid Commercialization of the renewable energy in China project (1999–2007).*

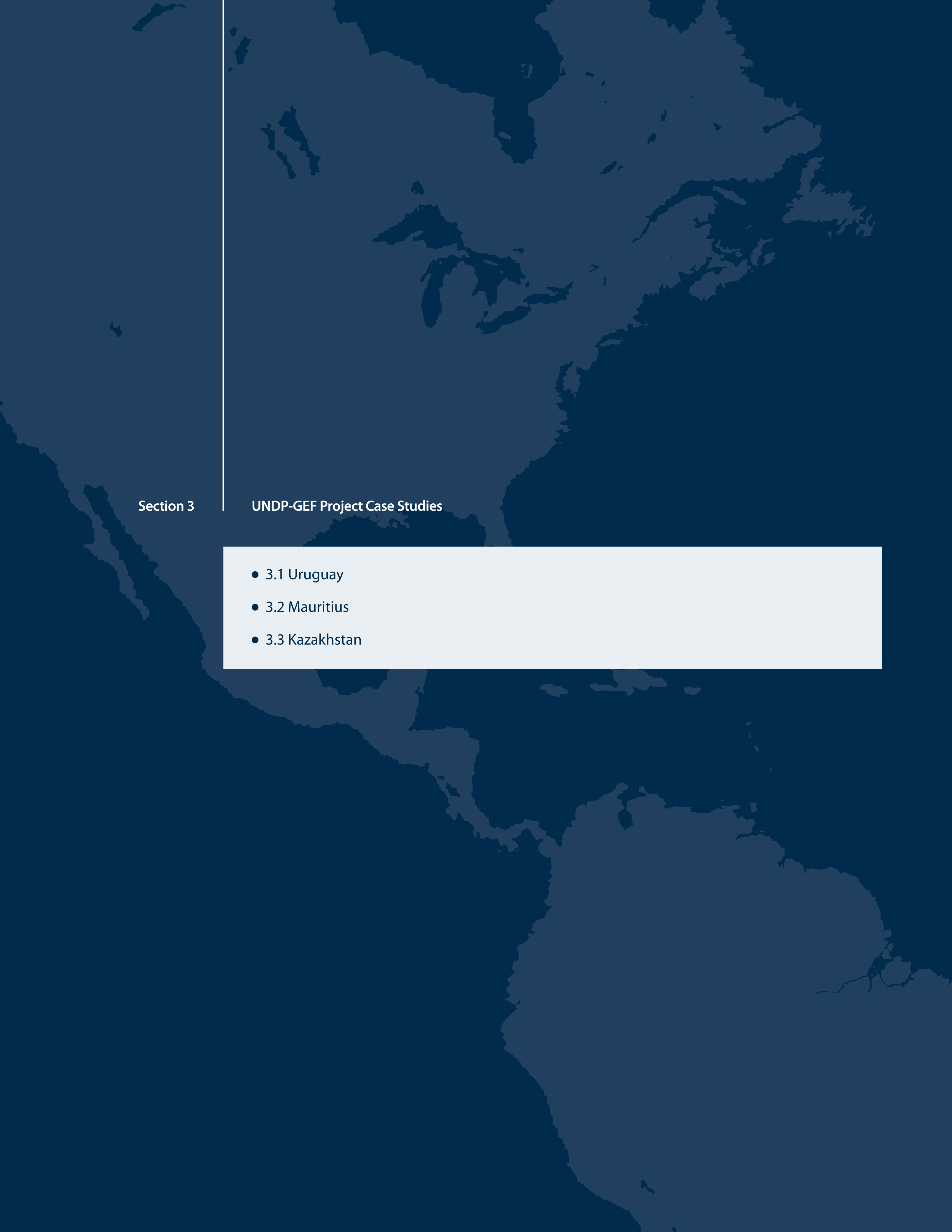
The goal of the project was to promote the widespread adoption of renewable energy by removing barriers and supporting the development of new policies. The project deployed a suite of policy derisking instruments to support specific technologies that included, for example: pilot projects and capacity building for industrial-scale biogas, the provision of training and equipment to conduct wind resource and site assessments, the demonstration of commercial models for village electrification using wind and solar hybrids, and support for the adoption of new solar thermal technical standards and certifications. The project also supported the creation of the Chinese Renewable Energy Industries Association (CREIA), which has emerged as an important industry voice both within China and internationally.

A major focus of the UNDP-GEF project was support for the development of a policy framework, and UNDP support and GEF financing contributed significantly to the development of the national Renewable Energy Law (REL). The Project's early research into comparative renewable energy policies, starting in 1999, raised awareness among senior policymakers and planners of the different options available. In 2003, UNDP-GEF staff facilitated the initial decision to start the legislative process to develop the law and subsequently provided both key personnel and secretariat services to support each stage of the REL's development.

The REL passed in 2005 and included aggressive targets for renewable energy sources, which China is on track to meet or exceed. The REL target of 30 GW for wind by 2020, for example, was met a decade ahead of schedule. The REL guarantees power purchase for renewable energy generators and creates a framework to provide investors with stable pricing. In the case of wind, the government initially used competitive bidding but then switched to standard offer prices in 2009. The rates are differentiated according to the wind quality in different regions. As a result of the REL and related polices, China has attracted an enormous amount of private sector interest and has led the world in terms of total renewable energy investment each year since 2009 (See Figure 4.).

The example of UNDP-GEF's involvement in China demonstrates the power of policy derisking instruments and the development of strong national policies. With $8 million, the UNDP-GEF project helped create the conditions to unlock billions of dollars in private sector investment. It is also important to note that the project lasted for eight years, which highlights the fact that policy derisking initiatives can require a sustained and long-term commitment in order to be successful.

Sources: Ailun, 2011; Liu & Xin, 2011; Weingart & Katsigris, 2007.



Section 3

UNDP-GEF Project Case Studies

- 3.1 Uruguay
- 3.2 Mauritius
- 3.3 Kazakhstan

UNDP-GEF Project Case Studies

3

Three countries from the UNDP-GEF project portfolio were selected for more detailed case studies: Uruguay, Mauritius and Kazakhstan. These three countries were chosen because they are diverse in geography, renewable resources, and energy market and investment conditions. The three projects have employed a common market transformation approach, aimed at reducing renewable energy investment risks through price and access to the electricity market. Uruguay chose to develop an auction for large systems and a variation of a FiT/net metering hybrid for small- and micro-scale systems. Mauritius developed a standard offer contract that is a hybrid between a FiT and net metering. Kazakhstan, meanwhile, developed a FiT that requires a different rate for each investment project.

Each of the three case studies includes an overview of the UNDP-GEF project and a brief background on the national energy system, a description of the project objectives, a summary of the barriers and risks identified, and the derisking instruments used to address them. Finally, each case study highlights project results and lessons learned.

3.1 URUGUAY

Uruguay Wind Energy Programme (UWEP)
Duration: 2007–2012
Project size: GEF funds: $1,000,000; co-financing: $6,010,000

Overview

This ongoing UNDP-GEF project has contributed to the scale-up of renewable energy generation in Uruguay. By supporting the development of an auction mechanism for large-scale renewable energy and a standard offer for small- and micro-scale systems, the UWEP programme addressed a number of energy market (regulatory), financial and administrative barriers to renewable energy deployment. In addition, efforts have been made to improve the technical capacity of the workforce. The project was originally designed to establish a 5 MW demonstration wind energy project. However, Uruguay has installed 40 MW to date, and has awarded contracts for an additional 880 MW of wind. The state utility now estimates that 1 GW of wind will be online by the end of 2015.

Background

Prior to the UWEP project, Uruguay primarily relied on hydropower and fossil fuels to meet its domestic electricity demand. Electricity production from non-hydro renewable sources accounted for only 1.5 percent of total production in 2007, the first year of the UWEP project. Over a 10-year period (1997–2007), Uruguay also saw its electricity production from hydropower decrease from over 90 percent of total production, to a little over 50 percent. Accompanying this relative fall in hydropower production was a steady increase in the use of imported fossil fuels for electricity production, which accounted for over a third of total generation by 2007.

"Uruguay's increasing reliance on fossil fuels meant that the country was exposed to steady fossil fuel price increases."

Uruguay's reliance on fossil fuels meant that the country was exposed to steady fossil fuel price increases. The rise in fossil fuel prices was compounded by further reductions in production from major hydropower plants and by fuel taxes imposed by trading partners, which required Uruguay to increase residential subsidies (Business News Americas, 2004).[13] Uruguay has also experienced steady growth in electricity consumption of 3 to 5 percent each year, punctuated by sharp increases, such as when demand growth in 2007 spiked at 9.1 percent as a result of heat waves.

Objectives

The main objective of UWEP was to remove the energy market, institutional, financial, technology and social barriers that were inhibiting the development of commercially-viable wind energy investments in the country. To achieve this objective, UWEP has pursued the following goals:

1. Establishing a 5 MW showcase wind farm and creating the conditions to support 30 MW of large-scale wind energy capacity by 2012;

2. Supporting policies and regulations that enable the private and public ownership of wind energy;

3. Conducting feasibility studies for wind projects and improving public awareness of the benefits of wind energy;

4. Improving the technical capacity of the state utility company, Usinas y Trasmisiones Eléctricas (UTE), and independent power producers to generate wind energy in the most efficient and cost-effective manner; and

5. Providing supporting technology, such as wind measuring equipment and data management systems, to industry stakeholders.

Barriers, Risks and Instruments

The barriers identified under the project fall into several risk categories: energy market access, institutional, social acceptance, resource/technology, connectivity and financial. To address the underlying barriers, the project relied on several policy derisking initiatives

- **Energy market access:** Uruguay did not have a national policy on renewable energy and the National Electricity Law granted UTE sole rights to the generation, transmission and distribution of electricity. The lack of a national policy framework constrained private investment in Uruguay's wind energy sector and limited market growth. UWEP worked closely with the Government of Uruguay to create a national policy that set a goal of at least 500 MW of wind energy by 2015.[14] UWEP also leveraged its legal and technical expertise to work with UTE and the Ministry of Energy in designing IPP regulations, grid access

[13] In 2008, Argentina implemented a tax increase on natural gas exports, which doubled the cost of gas from $7/MMBtu to $16/MMBtu. In order to ensure continued delivery to residential consumers, Uruguay provided subsidies for an additional 36,000 consumers.

[14] The original goal was 300 MW by 2015, but this goal was subsequently increased to 500 MW – with 200 MW developed publicly and 300 MW through the private sector.

and energy market structures that facilitate wind energy development.[15] The results of these efforts are two governmental decrees: Decree (159/011), which laid the groundwork for a new 150 MW auction of wind energy and established a 'must-take' requirement between UTE and IPPs, and Decree (173/010), which allowed small, onsite renewable generation to receive a standardized price for power under a 10-year contract with UTE (See Annex II.h.).[16] Decree 159/011 also included a provision to incentivize wind power generation by guaranteeing developers a bonus payment, to be determined by UTE, for auction winners that come online before a specified date (McGovern, 2012).[17] Finally, a series of stakeholder workshops coordinated by UWEP with Uruguayan farmers identified key land tenancy/ownership barriers and eventually led to reform of the wind easement law.[18]

- **Institutional:** There was a lack of institutional knowledge within the Government, its agencies and UTE regarding wind energy development. To address this barrier, UWEP contributed technical staff to UTE's Generation and Transmission Sector and the Department of National Energy and Nuclear Technology in order to increase their capacity to develop and implement wind energy projects.

- **Social acceptance:** Prior to UWEP, there was a lack of awareness among most stakeholders of wind energy and its potential benefits. In order to raise the profile of wind power within Uruguay, workshops and working groups were created by UWEP to: 1) identify opportunities for joint project investments between public and private investors; 2) create a permanent forum for sharing ideas between relevant stakeholders; and 3) promote national participation in developing wind power generation. As a result of these stakeholder initiatives, there is now a Uruguayan Wind Energy Association that convenes relevant stakeholders. Uruguay also now participates in 'Global Wind Day', during which nationwide events highlight the importance of wind energy and are given coverage in national media outlets.

- **Technology:** There were significant technological barriers to wind energy development, both in terms of infrastructure and equipment, and a lack of technical knowledge and expertise. To address these barriers, UWEP adopted a two-pronged approach. To address equipment and infrastructure shortfalls, UWEP installed seven wind-measuring stations and established a data collection system for knowledge management. This allowed additional wind energy generation sites to be identified. The Government also now requires that a minimum of 20 percent national components be used in any new wind farm, and UWEP has assisted industry developers in meeting this requirement by facilitating trade missions to Argentina and Brazil, as well as partnering with the Chamber of Industry to host regional manufacturers. To improve technical expertise, UWEP held multiple training workshops with relevant stakeholders,[19] assisted in the transition of UWEP wind energy experts to permanent positions within UTE, and developed a Renewable Energy Technology curriculum at Universidad de la República (UDELAR). By developing a technical post-graduate curriculum at UDELAR and then providing training to UTE staff, UWEP further contributed to UDELAR's capacity for technical education and helped ensure that wind professionals could be trained locally.

[15] Underpinning these legislative reforms was UWEP research on the profitability of large-scale wind farms and comparative analyses of global and regional best practices.

[16] While the Decree stipulates that IPP do not have to pay charges related to the use of the electricity network, they are responsible for the equipment necessary to interconnect to the grid and must pay a grid-connection fee.

[17] Depending on the tender and date of the signed PPA (McGovern, 2012).

[18] The results of this workshop were published in the UWEP report, Legal Aspects to Include Land Use in Wind Energy Farms in Uruguay.

[19] UWEP facilitated UTE staff attending trainings and training workshops in Spain (WindPro Software training), Denmark (Advanced WindPro Software training), Germany (Enercon Workshop on Wind Energy), and other regional locations in order to build regional capacity and stakeholder ownership.

- **Connectivity:** In recognition of the fact that there were few established protocols for the interconnection and integration of small-scale generators, UWEP published a report, Small Scale Wind Energy Systems Grid-Connected in Uruguay, which supported the implementation of Decree (173/010).

- **Financial sector:** Prior to UWEP, the state utility company UTE and private investors were unaware of the opportunities available in wind energy generation. To address this barrier, UWEP conducted workshops that utilized the project's wind assessment outcomes to highlight the financial benefits of wind investment.[20] Results from the wind energy assessments, as well as wind maps, were posted on the UWEP website to provide access to prospective investors and developers. UWEP also facilitated meetings between industry leaders, developers and financiers in order to promote market linkages between Uruguay-Brazil-Argentina, increase investment and discuss the potential for regional wind farms. These governmental delegations also shared lessons learned in terms of legal reform and incentive structures, which UWEP then published in a report.

Results

"UWEP's activities have surpassed expectations. Instead of a 5MW showcase, the state utility now estimates that 1 GW of wind will be online by the end of 2015."

UWEP set out to create one 5 MW wind farm that would be financed, built and operational by 2012. Given this limited mission, UWEP's activities have surpassed expectations. In 2009, UTE, with UWEP's technical support, built a 10 MW wind farm in Sierra de Caracoles. This wind farm has since doubled its capacity and has been producing 20 MW of electricity since June 2010.

With the support of UWEP, the Government utilized an auction process to solicit renewable energy bids. This process helped encourage competitive pricing, while giving developers the opportunity to receive the necessary minimum return on investment. The Government made an additional commitment to wind energy development by creating a special tariff rate for all wind power generated up to 31 December 2014. By allowing developers to take advantage of a time-sensitive higher rate (approximately $110/MWh), the Government incentivized rapid project development and construction (Sciaudone, 2012b).[21] The results of these bidding processes have been notable:

- As of 2012, there are over 43 MW of installed large-scale wind energy systems in Uruguay – with approximately 23 MW privately owned and 20 MW installed at the state-owned Sierra de Caracoles facility;

- Additionally, the August 2011 round of tenders resulted in proposals for over 700 MW of contracted capacity in the Florida, Maldonado, Tacuarembo, Flores, Canelones and Lavalleja regions of Uruguay. All of the proposed facilities are between 30-50 MW and will utilize between 20 to 40 percent national components (UTE, 2011); and

- Most recently, the Government and UTE have signed contracts and MOUs for an additional 300 MW of wind generation by private partners.[22]

[20] UWEP published the following reports on the financial benefits of wind generation, "Financial Opportunities for Wind Farms in Uruguay" (December 2009), "Profitability Analysis of the Large-Scale Wind Farms in Uruguay" (July 2010), and "Profitability Analysis of Small-Scale Grid-Tied Wind Turbines in Uruguay" (December 2010).

[21] There is some cause for concern, however, that issues with permitting will prevent many tendered contracts from being fulfilled on time. There is also a concern that many of the second-round contracts awarded in late 2011 will not be economically viable without the early generation bonus, as the auctioned price of approximately $65/MWh is below the cost of production.

[22] In April 2012, Grupo SAN JOSE signed a contract with UTE to produce 40 MW in the Maldonado region for the next 20 years at a fixed rate for each generated MW/h (Santamarta, 2012b). In May 2012, a global technology company, Gamesa, signed a contract with the government to produce wind turbines for a 50 MW wind farm in Peralta, Uruguay (Santamarta, 2012a). In June 2012, the Brazilian utility company, Electrobras, and Uruguay's UTE signed a memorandum of understanding for a 100 MW wind farm that will be jointly operated by both utility companies in Uruguay and is expected to be completed by 2013.

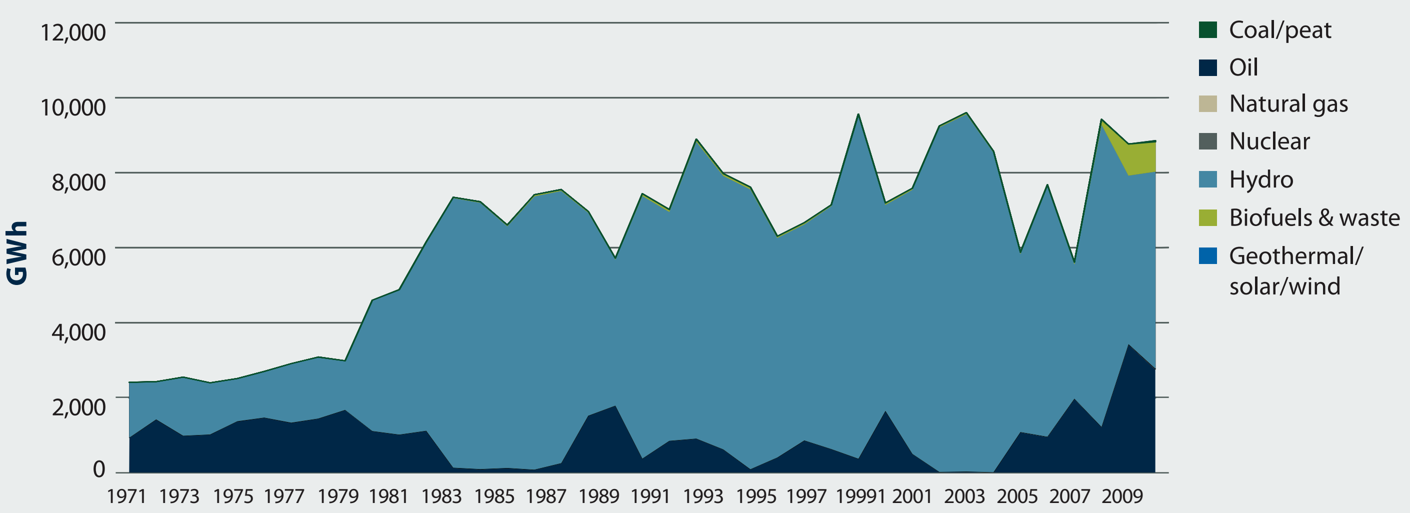
The work UWEP did with the Government and other stakeholders to produce a national renewable energy policy has created the conditions for significant amendments to the National Electricity Act, grid connection policies, and regulations that have set the stage for wind energy scale up.

The success of the auction process for wind power reflects the competitiveness of this energy source under the present energy market conditions in Uruguay. A study from the National Energy Directorate (June 2011) assessed investment returns (both IRR and NPV) for hypothetical wind parks in Uruguay. It concluded that wind investments were becoming attractive at prices around $80/MWh (assuming a cost of capital of approximately 10 percent). In the latest bidding round Uruguay set a fixed price of $110/MWh for wind generation until 31 December 2014 as an additional incentive for the projects to be built quickly (and thereby offset the major drawback of an auctioning system compared to a FiT). After that date the price drops to the price offered in the bids. The offered prices in the latest bidding process for wind range from approximately $65–$85/MWh. It is likely that an important factor in the financial viability of the lowest bidding projects has been the capacity to capitalize on the initial 110/MWh incentive to break even.

"The success of the auction process for wind power reflects the competitiveness of this energy source under the present energy market conditions in Uruguay."

These offered prices, and even the initial fixed price of $110/MWh,are significantly lower than current spot market prices, which hovered around $200–$250/MWh in 2011, as well as the average weekly electricity costs published by the state utility UTE.[23] In the context of Uruguay's energy shortages mostly being met by increasing fossil fuel generation and by purchasing imported energy, it seems that wind energy has become competitive in Uruguay now that barriers to market access have been removed. Figure 10 shows the electricity generation mix in Uruguay today. Wind power will displace the most expensive fossil fuel sources, and the predominance of hydropower in the energy mix should also lower the grid-balancing costs of wind power.

Figure 10: Energy generation mix in Uruguay

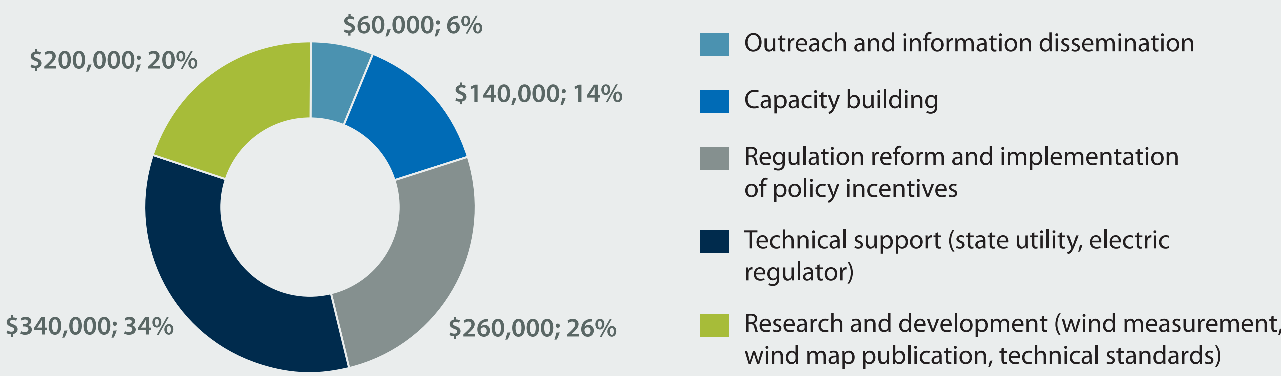


Source: IEA, 2011.

[23] See www.adme.com.uy/mmee/sancionado.php.

The bulk of the UNDP-GEF project budget was dedicated to policy support, with no allocation for a price premium, financial derisking instrument or technology demonstration. Figure 11 provides a schematic breakdown of the budget. This breakdown is consistent with the budget allocation anticipated in the initial project proposal and reflects the limited need for adaptive management during project implementation.

Figure 11: Total spending, by instrument, for the Renewable Energy Market Transformation Project in Uruguay



Source: UNDP-GEF.

Lessons Learned

- **Policy derisking as the foundation for market transformation.** Under the right market conditions, a modest public investment can prove highly effective at helping governments implement the necessary enabling environment–policies, legislation, institutions, and technical skills-to catalyse large financial flows and transform an entire industry. Uruguay is an investment grade country[24] and current indications are that project developers can access financing at attractive terms for robust wind proposals. With a limited initial investment (GEF grant: $1 million; co-financing: $6 million), the UNDP-GEF project was instrumental in laying the foundation for a substantial wind energy market. As mentioned earlier, UTE expects that 1 GW of wind will be online by the end of 2015.[25] Should this objective be met, the project will have been influential in catalyzing approximately $2 billion of private investment in renewable energy in less than 10 years. UWEP's potentially very high investment leverage ratio illustrates that policy derisking instruments are an important foundation of any programme that involves public funds to transform renewable energy markets. Policy derisking approaches address the underlying systemic conditions that lead to higher levels of investment risk and can thus provide high leverage in

[24] Moody's, June 2012.

[25] Experience shows that bids submitted in tenders can often be made at low price levels by companies with limited wind energy experience who have underestimated costs and/or overestimated wind resources. As a result, a high proportion of selected bids not proceeding to construction can often be observed (Schwarz, 2008). In the case of Uruguay, the additional financial incentives to install wind power generation by Dec 31 2014 should enable the government to closely monitor this risk.

terms of risk reduction per dollar of funding under the right energy market and investment conditions. Uruguay demonstrates that policy and financial derisking by itself[26] can be sufficient to make wind energy competitive, and provides an example of an environment where additional incentives in the form of a FiT premium do not appear to be necessary to catalyse investment.[27]

- **Utility engagement can be critical for market scale-up.** A significant focus of the project was building awareness of renewable energy sources and capacity to manage renewable energy development within both the national government and within the state-owned utility. Prior to the project, for example, UTE had no experience with commercial-scale intermittent generation. The process of working with the utility to procure, own, and operate the demonstration wind farm created useful opportunities for the utility to gain hands-on experience with the technology. The successful demonstration effectively opened the door to the broader renewable energy policies introduced by the Government in which private sector actors were able to participate in renewable energy development. The UWEP project demonstrated that policy derisking instruments and policy development efforts can be usefully grounded in real-world experience through the implementation of parallel pilot-scale projects.

- **A focus on development barriers and transaction costs is an appropriate complement to the development of cornerstone instruments.** While UWEP's activities have achieved notable success in generating interest and demand for wind generation electricity, there are still significant barriers in the permitting process that have prevented some contracted projects from going online. In April 2012, the Energy Minister had to ease Uruguay's environmental licensing requirements in order to ensure wind development projects currently in the pipeline can stay on track to meet the deadline. The current licensing requirements specify that wind turbines have to be 300 metres apart and that wind farms cannot be less than 3 km from the nearest residential area. Wind developers were finding it extremely difficult to satisfy these conditions, and the delay in granting the environmental permit meant some developers would not be able to take advantage of the guaranteed bonus payment of $110/MWh for farms that become operational before 2015. While the Government has implemented a temporary fix, a more long-term solution to the environmental licensing process needs to be explored in coordination with the Environment Ministry, Dinama (Dirección Nacional de MedioAmbiente) (Sciaudone, 2012a).

"There are still significant barriers in the permitting process that have prevented some contracted projects from going online."

- **Local content requirements may require outreach and capacity building efforts focusing on market participants.** Domestic content requirements have proven to be an effective – if sometimes controversial – means of encouraging local market development. The inclusion of a national content requirement in Uruguay's renewable energy procurement demonstrates the Government's commitment to capture additional economic development dividends from the new renewable energy policy. At the same time, however, the market for wind power is set to expand dramatically as Uruguay works to meet its goal of 1,000 MW by 2015. Given the rapid ramp-up, the requirement for domestic content may serve as a constraint if national industry players are unable to keep up. A lesson learned from the experience to date is that there are opportunities for greater outreach and engagement with domestic industry when domestic content policies are under consideration in order to prevent capacity bottlenecks. Unfortunately, experience shows that the development of renewable energy markets under favourable market conditions can be dramatically derailed by seemingly innocuous administrative or regulatory requirements.

[26] Complementary financial derisking instruments are likely to be required for individual asset financing.

[27] The floor price of $110/MWh is a short-term incentive for a rapid deployment of new wind power generation capacity and is not equivalent to a 15–25 year fixed price premium.

3.2 MAURITIUS

Removal of Barriers to Energy Efficiency and Energy conservation in buildings in Mauritius
Duration: 2007–2013
Project size: GEF funds: $910,000; co-financing: $11,625,000

Removal of Barriers to Solar PV Power Generation in Mauritius, Rodrigues and the Outer Islands
Duration: 2011–2015
Project size: GEF funds: $2,010,000; co-financing: $18,990,000

Overview

Two back-to-back UNDP-GEF projects focusing on FiTs have been deployed in Mauritius. The first, under implementation from 2007-2013, is the Removal of Barriers to Energy Efficiency and Energy Conservation in Buildings in Mauritius project, which has supported the development of a FiT for an initial scheme of up to 2 MW of renewable energy systems smaller than 50 kW or 200 installations. This was then expanded by the Government to 5 MW, following the success of the initial scheme The second project, from 2011–2015, Removal of Barriers to Solar PV Power Generation in Mauritius, Rodrigues and the Outer Islands, supports the deployment of PV systems over 50 kW in size through additional FiT support and through direct performance-based payments to FiT projects.

Background

The Republic of Mauritius has had a long history of utilizing renewable resources. The first hydropower plant was developed in 1906, with several more plants following in subsequent decades. Starting in the 1950s, the Government supported the development of bagasse cogeneration plants once it was realized that high-pressure steam from bagasse incineration could be used to generate electricity while the low-pressure steam could be used as heat for sugar processing (Kelly, 2009). Mauritius also established a type of FiT for bagasse independent power producers (IPPs) that supported both new and existing generators (Bristow, 2007). Despite its early start with renewables, however, fossil fuels have come to dominate Mauritius's electricity sector and coal oil, and natural gas now comprise 79 percent of its generation portfolio.

Objectives

A key project objective of the ongoing PV project is to conform with the *Maurice Île Durable* ("Mauritius Sustainable Island") strategic vision, launched by the Prime Minister of Mauritius in 2007. The goals of the initiative include responding to climate change and achieving energy independence by obtaining 35 percent of national electricity from renewable sources by 2025 (up from 21 percent currently). The objectives of the 2007–2013 GEF energy efficiency project in Mauritius is to reduce greenhouse gas emissions through supporting sustainable energy in buildings. Although FiTs were not originally envisioned, the project has been able to direct some of its resources to support FiT research and design while achieving its energy efficiency objectives in parallel (Larsen *et al.,* 2010). For that project, approximately $100,000 was set aside for the renewable energy component from UNDP funds ($50,000) and Government cost-sharing ($50,000), with 60 percent spent on grid code design and 40 percent on FiT design. Approximately 40 percent of the project manager's time over 1.5 years was allocated to supporting the FiT components.

The explicit objectives of the new 2011 UNDP-GEF project are to review the design and implementation of the FiT from the first project, build on its successes, and expand the framework to include support for PV systems larger than 50 kW. Another national priority is to democratize energy use and ensure that Mauritian citizens are able to more directly benefit from national renewable energy incentives, rather than using policy to exclusively support IPPs predominantly owned by overseas investors. As a result, Mauritius is focusing on distributed and decentralized systems, rather than large-scale central renewable energy plants. UNDP-GEF funds will be used to create a favourable legal, regulatory and market environment for PV, build institutional, administrative and technical capacities, and to provide complementary financial incentives to drive PV market growth. These interventions are intended to lay the foundation to achieve at least 2 percent of grid-connected electricity generation from PV by 2025. In coordination with the UNDP-GEF project, related government initiatives are also addressing other renewable energy technology above 50 kW, with the overall objective of creating a harmonized framework.

"A national priority is to democratize energy use and ensure that Mauritian citizens are able to more directly benefit from national renewable energy incentives."

Barriers, Risks and Instruments

The barriers identified under the projects fall into several risk categories: energy market access, institutional, social acceptance and technology. To address these various barriers, the more recently initiated project envisages implementation of both policy and financial derisking instruments.

- **Energy market access:** Even though the need to create a favourable legal framework for on-grid PV electricity generation is formally recognized in the country's Long Term Energy Strategy 2009–2025,[28] the by-laws, regulations and institutional structures to implement them are lacking or are inadequate. The existing FiT was only intended to support systems smaller than 50 kW.[29] Systems larger than 50 kW, however, require different interconnection protocols and standards. A significant component of the PV project is therefore to update the grid code and regulations for renewable energy installations larger than 50 kW that wish to connect to the medium-voltage network. In addition provision is also made for the review of the first scheme.

- **Institutional:** There are overlapping responsibilities between the Ministry of Energy and Public Utilities and the regulator that may constrain decision-making and programme implementation. This lack of clarity negatively impacts policymakers attempting to implement the policy, investors attempting to finance projects under the policy, and end users attempting to interface with the programme. Regulatory roles need to be clarified in order for both institutions to fulfil their respective mandates in an effective and complementary manner.

- **Social acceptance:** The primary underlying barrier to full social acceptance of PV technology in Mauritius is a lack of awareness among potential users. The private sector, in particular, was said at the onset of the project to be lacking appreciation for the technology, a problem that had indirect effects on policymakers and end-users alike. To address this barrier, a project component was dedicated to building public awareness of solar PV technology, with efforts including pamphlet distribution, media programme development, awareness-raising workshops and redesigned engineering university curricula stressing PV technologies. The dissemination of PV best practices is also a planned project activity.

[28] See www.gov.mu/portal/goc/mpu/file/finalLTES.pdf.

[29] The rationale for the 50kW size cap is that it reflects the transformer capacity on the low voltage network (415V).

- **Resource/Technology**
  - **Technology standards:** The barriers associated with resource and technology risk include equipment quality issues and data/informational issues. In order to protect the nascent industry in Mauritius from sub-standard equipment and improper installation, it is imperative that technical standards be adopted for all equipment imported into the country and that guidelines be established for their proper installation and operation. A technical assistance component of the project plans to do this. A lack of technical data and information is another underlying barrier to be overcome. To address this, the Mauritius Meteorological Service is updating solar radiation data in the country. However, the Service faces a lack of resources, resulting in a limited number of data collection points with mostly outdated equipment and data interpretation software. Thus, another project activity involves preparing a comprehensive solar insolation map of Mauritius to facilitate the future development of suitable sites. In addition, the project strives to create opportunities for technology transfer related to module assembly and balance of system components (i.e. mounting systems, wiring, etc.).
  - **Technology cost:** Perhaps the most significant underlying barrier faced by PV projects globally is the low financial returns compared with other generation technologies. The problem of low returns has a direct impact on investors, but indirectly affects all stakeholders. As stated in the Government's Long Term Energy Strategy 2009–2025document, "…the present cost of generating PV electricity is relatively high when compared with other conventional and renewable sources. In order to encourage use of solar energy incentive schemes would be implemented to enable long-term strategic goals to be achieved." The FiT for PV systems under 50 kW has been supported by a tax on fossil fuel generation, but the revenues from these taxes would not be sufficient to also support the development of systems larger than 50 kW. In order to address this barrier to PV, an incentive fund, capitalized in part with GEF funds, will be created for PV installations above 50 kW as part of the project.

"The present cost of generating PV electricity is relatively high when compared with other conventional and renewable sources."

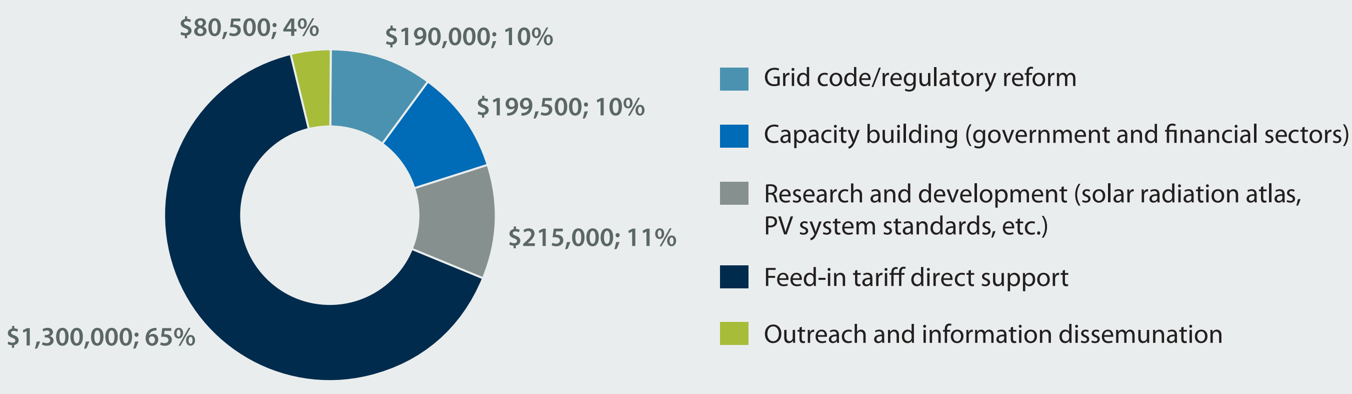
Results

Under the first UNDP-GEF project, energy efficiency legislation was successfully developed and passed in the 2010–2011 legislative programme, including the Energy Efficiency Act and the Building Control Act. At the same time, the project was also able to frame small-scale renewable energy within the broader scope of building energy retrofits and support renewable energy policy development. With support from the UNDP-GEF project, the Ministry of Energy and Public Utilities, together with the Central Electricity Board, developed a grid code governing the interconnection of small-scale independent power producers. The Government also developed a pilot FiT policy for grid-connected PV, wind and hydropower systems under 50 kW. The policy was designed to support up to 2 MW of renewable energy capacity or 200 applications (whichever came first) – but was subsequently expanded to 3 MW. This FiT policy has been a success, attracting 411 applications for residential and commercial systems (totalling 3.8 MW of capacity) and a further 81 applications from public, education, charity and religious organizations (totalling 0.93 MW of capacity). The overwhelming majority of these applications were for small photovoltaic systems, with 10 percent being submitted for wind/PV hybrids. Close to 1 MW of capacity has already been installed and commissioned.

Since the second, "Removal of Barriers to Solar PV Power Generation", project only launched in mid-2011, there are few results to report at present. However, the project's deployment of both policy derisking and financial derisking instruments will make it an interesting case study going forward. Significantly, in an innovative project design component, the UNDP-GEF project proposes to provide direct performance-based incentives to PV projects for their first two-and-a-half years of operation. Based on preliminary studies, a FiT of about MUR 11/kWh ($0.37/kWh) would enable the payback of utility-scale investment in a 10-year timeframe.

- The retail price of electricity is approximately MUR 6/kWh (US $0.20/kWh) and hence the price differential is $0.17/kWh.
- A GEF contribution of $0.11/kWh will represent 65 percent of the price differential.
- Thus, it is estimated that the $1.3 million GEF allocation will be used to top-up the FiT to be paid to investors for close to 11,800,000 kWh of solar power.
- To date, this project is one of the first to adopt the approach of providing $/kWh payments on a programmatic (rather than a project-specific) basis internationally, and as such should be closely monitored. Furthermore, it is also notable that the direct funding of the FiT premium commands a large share of the UNDP-GEF component of the project budget, at 65 percent of the roughly $2 million project GEF grant (See Figure 12.).

Figure 12: Total spending, by instrument, for the Renewable Energy Market Transformation Project in Mauritius (Projected)



Source: UNDP-GEF.

Lessons Learned

- **Small-scale renewable energy investments can create economic development opportunities.** Whereas some countries have chosen to focus only on large-scale renewable energy projects in order to capture economies of scale, Mauritius has focused explicitly on smaller-scale systems. This policy choice was made in order to ensure that a broad spectrum of its citizens can participate in, and benefit from, the incentive scheme. Although smaller-scale systems may cost more, they may create greater opportunities for the benefits of project ownership to be captured within the Mauritius economy (Rickerson et al., 2012).

- **Financial incentives can be required to supplement derisking strategies.** As discussed in Section 2, derisking activities are the most cost-effective way to deploy limited international funds. In the case of Mauritius, however, good progress has already been made in strengthening the enabling environment for small-scale renewable energy. Although an initial policy and legal framework is already in place, there remain price barriers to PV market acceleration and it was determined that utilizing UNDP support and GEF funds to pilot direct financial incentives to renewable energy would be an appropriate complement to derisking activities. Performance-based incentives were chosen over other financial incentives (such as investment tax rebates) because they can be fairly quickly deployed and it was important to the Government to maintain momentum in the small-scale renewable energy market following the success of the initial FiT.

- **Caps can alleviate cost concerns for FiTs during the pilot phase.** One of the major justifications for resistance to renewable energy policy, and to FiTs in particular, is the perceived incentive cost and the concern that ratepayers will bear an inequitable share of the cost burden. Unlike countries such as Germany, which has an uncapped FiT policy, most of the countries in the UNDP-GEF project portfolio have enacted some type of cap on the total amount of capacity supported by the FiT. In Mauritius, the use of a cap and the use of a tax on conventional generation to fund the FiT payments have meant that the ratepayer impact of the policy is minimal. Going forward, the direct financial incentives provided to renewable energy projects by the UNDP-GEF project will similarly insulate ratepayers from the above-market policy costs.

"The need to capitalize the incentive fund remains the main challenge to the sustainability and expansion of solar PV power generation in Mauritius in the near term."

- **There is an urgent need to secure a creditworthy source of funds to support incentive payments.** The direct funding from the UNDP-GEF project will only assist a limited amount of generation, and it remains unclear if a sustainable source of funding for larger-scale renewable energy projects can be found for the mid-term. The project is taking steps to further reduce the cost of capital and the need for a premium by exploring the use of financial derisking instruments such as production guarantees and insurance packages. Nonetheless, while it is hoped that additional international and national climate finance can be mobilized to support the incentive payments based on the model piloted by UNDP-GEF, the need to capitalize the incentive fund remains the main challenge to the sustainability and expansion of solar PV power generation in Mauritius in the near term.

- **Possible further steps to make PV cost competitive.** A range of local technology and management options to reduce the cost differential of solar PV could also be pursued in future initiatives, including the reduction of balance of system (BoS) costs. On average, component costs amount to roughly 50 percent of the cost of the final clean energy device, with the BoS accounting for the remaining 50 percent. Opportunities for near-term reductions of more than 50 percent in BoS by simply scaling-up and implementing best practices have been reported in some markets (Bony *et al.,* 2010). Many of these soft cost reductions in BoS can be implemented via smart policies that encourage standardization of equipment and eliminate inefficiencies in business practices, as well as development of the local supply of technical and managerial expertise.

3.3 KAZAKHSTAN

Wind Power Market Development Initiative
Duration: 2004–2011
Project size: GEF funds: $2,930,000; co-financing: $4,730,000

Overview

The goal of the Wind Power Market Development Initiative has been to facilitate the sustainable development of the wind energy market in Kazakhstan. A resource assessment carried out by the Project has estimated the potential wind resource in the country to be in the region of 9.9 billion kWh per annum or 354 GW of installed capacity. This is over 10 times the required power generating capacity for Kazakhstan by 2030.

The UNDP-GEF project has led to official adoption of the national wind energy target of 2,000 MW by 2030, a Kazakhstan Wind Atlas, as well as detailed wind resource assessment for 15 potential project sites at Djungar Gate. One of the initial goals of the project was to support the installation of a 5 MW wind energy demonstration project. This proved infeasible due to the need to address outstanding regulatory gaps that emerged during the energy market's transition from a former state monopoly model to a more liberalized structure. The project evolved to focus instead on regulatory development and other policy derisking instruments, and supported the development and adoption of the Law on Renewable Energy Sources and corresponding by-laws.

"Regulatory gaps emerged during the energy market's transition from a former state monopoly model to a more liberalized structure."

Background

Kazakhstan has abundant energy resources: it is the world's leading uranium producer, it has a coal resource of approximately 40 billion tonnes, and it has the third-largest oil reserves outside of OPEC member countries, with 40 billion barrels of proven oil reserves (Coronel et al., 2011). Kazakhstan also has one of the world's highest per capita carbon footprints: close to 85 percent of its electricity is produced by coal. The remainder of the country's electricity is supplied by hydropower and natural gas. Kazakhstan's peak load in 2010 was 12,400 MW and this is projected to double by 2030. When the retirement of aging coal plants is taken into account, it is estimated that the country will need close to 3,000 MW of new generating capacity by 2015 and 8,000 MW by 2030. In addition to its fossil fuel and nuclear resources, however, Kazakhstan also has vast and untapped wind resources that could account for 354 GW of capacity if fully developed.

"Kazakhstan's vast and untapped wind resources could account for 354 GW of capacity if fully developed."

Objectives

The broad objectives of the UNDP-GEF project include reducing Kazakhstan's greenhouse gas emissions by removing the existing barriers to grid-connected wind energy production and facilitating the sustainable development of the wind energy market.

Barriers, Risks and Instruments

The barriers identified under the project created several primary risks: energy market access, institutional, connectivity and financial sector. To address these barriers, the UNDP-GEF project proposed the implementation of various policy derisking measures and direct financial incentives in the form of capital grants.

- **Energy market access**

  - **Support for a liberalized wind-energy market.** At the start of the project, the2004 Power Industry Law introduced deregulation and privatization in Kazakhstan's power sector. Utility companies subsequently became highly focused on the profitability of their activities. Taldykurgan National Energy Company (TATEK), which had been identified to purchase the power from the pilot 5 MW wind Djungar Gate demonstration project, withdrew its interest in buying relatively costly wind power. Although investors had been lined up for the Djungar Gate farm, and even with a $1 million capital grant envisaged under UNDP-GEF project, the unit cost would have been significantly higher than TATEK was willing to pay.

    The UNDP-GEF project, therefore, evolved to focus more heavily on addressing the barriers related to the absence of enabling policies and regulations. Specifically, the project supported the development of the Law on Support of Usage of Renewable Energy Sources (RES)and its corresponding bylaws. The Law established guaranteed interconnection, guaranteed purchase and priority dispatch requirements for renewable energy generators, and laid the foundation for the creation of a standardized PPA.In parallel with the Law, the project also worked with the Ministry of Energy and Mineral Resources (MEMR) to develop a draft National Wind Energy Programme for Kazakhstan up to 2015 with a perspective until 2030. The Programme goal is to install 250 MW of wind by 2015 and 2,000 MW by 2030. The goals were officially adopted by the Government and included in Kazakhstan's Program of Energy Sector Development up to 2030.

  - **FiT design and incentive.** Most coal-fired power plants currently in operation in Kazakhstan have been inherited from Soviet times, for which no capital costs or future rehabilitation costs are accounted. This, combined with the increased competition in the power sector and the absence of environmental requirements for fuel gas cleaning, has led to artificially low electricity tariffs for coal-fired generated power. Currently, the tariffs are based on a production cost, reflecting the operation, but not the annualized investment cost. Even a two-fold increase in retail power prices from $0.023-$0.035/kWh in 2004 at the start of the project up to $0.05/kWh in 2011 was not sufficient to make investments in wind power commercially viable.

    As a result, the UNDP-GEF project team assisted the Government in including incentive approaches under the RES Law. In discussion with Government representatives, various measures were considered, including FiTs, a quota system, a bidding mechanism, fiscal measures and capital subsidies. The Government opted for a FiT-based incentive, with generators receiving a $/kWh payment for their power that is based on their generation costs. However, the payment level for each plant is determined on a case-by-case basis rather than a standard offer basis for all plants of a certain type (i.e. a fixed price available to all wind generators). A review of the RES Law was conducted in 2010 and recommendations were made to introduce a fixed $0.15/kWh FiT. There is now governmental acceptance that a fixed FiT for a fixed time-frame should be offered to developers instead of negotiated prices for each PPA based upon lengthy and costly feasibility studies. Corresponding amendments to the RES Law have been submitted to the parliament for approval.

> "Most of Kazakhstan's coal-fired power plants have been inherited from Soviet times, for which no capital costs or future rehabilitation costs are accounted, leading to artificially low electricity tariffs."

- **Institutional:** At the project onset, there was no institution dealing with wind and other renewable energy sources within the Government, nor were there governmental or non-governmental institutions that were serving as a point of contact or information hub for potential investors. During the course of the project, the UNDP-GEF project promoted and supported the establishment of a Renewable Energy Department within the MEMR, which was later transferred to the Ministry of Industry and Technologies. The project worked closely with the nominated staff of the Renewable Energy Department to build their capacity and assist with development and subsequent implementation of new RES policies and regulations.

- **Connectivity:** Power utilities and grid operators, such as the Kazakhstan Electricity Grid Operating Company (KEGOC), are, by nature, conservative organizations. They are tasked by their shareholders, customers and, in the case of KEGOC, by governmental actsto ensure a reliable, secure and uninterrupted supply of good quality electricity. KEGOC, in particular, exhibited significant scepticism and caution regarding the impact of wind power on the electricity system. Due to the lack of prior experience in connecting intermittent renewable energy generation to the grid, it was widely believed that the Kazakh grid would not be able to accommodate any substantial amount of wind power without additional investment and upgrade to guarantee grid stability.

  To address KEGOC's concerns and skepticism, an assessment of the power system was conducted by the project in order to determine the amount of intermittent wind generation that could be integrated without additional upgrades. The study demonstrated that wind generation would actually reduce technical losses to the grid in the near-term, and that the 2030 target of 2,000 MW of wind could be reached without posing a challenge to grid stability. The report did suggest that, in order to accommodate further wind power penetration (above 2,000 MW) a new Grid Code will have to be developed and that day-ahead forecasting will have to be implemented to facilitate planning and dispatch. These are, however, medium- to long-term issues.

- **Financial sector:** An early-identified barrier was the absence of reliable wind resource assessments and wind maps to aid investors in identifying potential project locations and assessing their feasibility in Kazakhstan. The Kazakhstan Wind Atlas has been created and disseminated online[30] in order to provide project developers with better access to information. The Atlas gives long-term average wind speeds at a level of 80 meters above ground at 9 km resolution for much of the country and at 100 meters resolution for 9areas of particular interest. In addition wind monitoring conducted in 15 perspective sites and feasibility studies were prepared to facilitate investment decisions. A report on the commercial viability of renewable energy sources in Kazakhstan was published and a practical guide for renewable energy investors was prepared.

  Further, support was provided to the Kazakhstan Electricity Association (KEA) to establish the Renewable Energy Committee, the body that represents the interests of a growing number of wind energy investors in Kazakhstan and also serves as a hub for wind energy information resources and outreach on an on-going basis.

[30] See www.atlas.windenergy.kz.

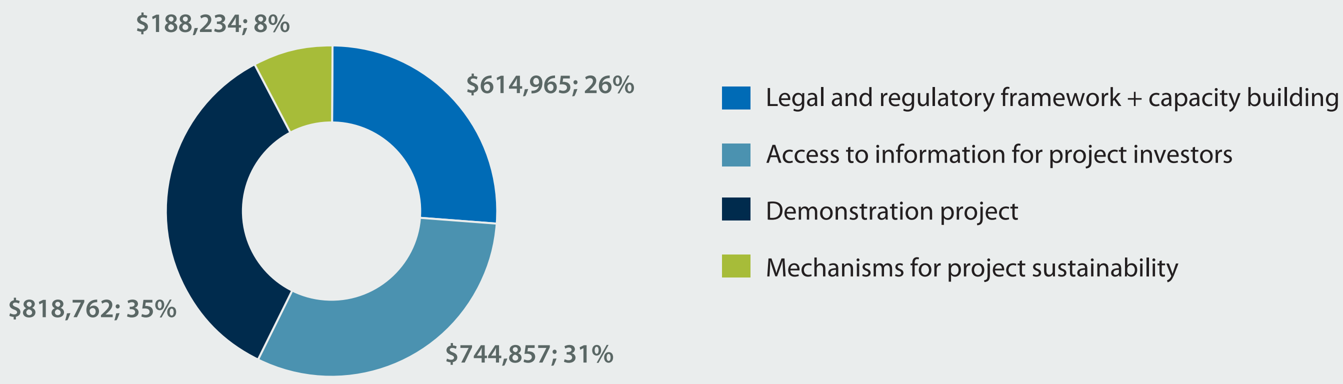
Results

Given the lack of support in place for wind energy generation when the project began, the project made substantial progress in laying the groundwork for a robust wind energy market in Kazakhstan. The passage of the RES law has opened the door to renewable energy development, while the completion of the wind atlas and the project feasibility studies has created a new set of transparent resources for prospective developers and investors. Finally, the focus on institutional capacity building within the Government and among external stakeholders has put wind energy on the map institutionally and enabled the development of new administrative functions and processes. Wind development has now begun in Kazakhstan, with the first 1.5 MW commercial wind project commissioned in December 2011, and there is a plan to expand the project to 10 MW by 2014. Another 45 MW wind farm is currently under construction, and there are several other wind projects at advanced stages of development. There remain barriers to renewable energy development that will need to be addressed through additional policy amendments, clarifications and capacity-building.

"The percentage of the budget spent on legal and regulatory framework development was six times more than originally planned."

As can be seen in Figure 13 below, 26 percent of the project budget was spent on legal and regulatory framework development, six times more than originally planned. The project also spent less than anticipated on demonstration project support.[31] These two statistics reflect the adaptive management approach adopted and the project's pivot from prioritizing the wind demonstration project to supporting the development of the National Wind Energy Plan, the 2009 legislation and the supporting studies (for example, grid integration).

Figure 13: Total spending, by instrument, for the Renewable Energy Market Transformation Project in Kazakhstan (actual)



Source: van den Akker & Druz, 2011

[31] The project development support consisted of feasibility studies, as well as technical assistance to project developers, but did not include capital subsidies for project construction.

Lessons Learned

- **The creation of a FiT framework does not in itself automatically create the conditions for near-term market growth.** The FiT policy introduced new procurement mechanisms and purchase and interconnection rules to Kazakhstan, but it has taken several years for development to begin. One of the possible reasons for this is that the price determination and negotiation mechanism has been critiqued for not being streamlined or clearly structured. Subsequent recommendations have been made to publish standard offer prices of $0.15/kWh under long-term contracts, rather than relying on project-by-project feasibility studies (Lettice, 2011).

- **Price premium and cost concerns.** Cost concerns have been a major barrier to a roll-out of the proposed FiT in Kazakhstan. Taking as a reference wind power generation cost in Germany for similar wind conditions (wind speed, capacity factor, technology, etc.), an economic analysis of wind energy development commissioned by the project estimated the theoretical costs of wind energy at about $0.075/kWh (Opitz, 2011). However, the actual wind costs in Kazakhstan are likely to be substantially higher due to the following factors: (i) overall investment conditions in Kazakhstan are defined by high interest rates for debt and short loan tenors; (ii) limited availability of project finance; and (ii) Kazakhstan's small market size and lack of economies of scale. Due to the substantial upfront capital required, renewable energy investment is particularly sensitive to interest rates for debt and, more broadly, the weighted average cost of capital (WACC). Over the lifetime of a wind investment, the sum of capital expenditures plus costs of financing are effectively doubled if the debt interest rate is 12 percent versus 6 percent. Hence, given the relatively high cost of financing for wind power in Kazakhstan (and its subsequent negative impact on the return of project developers), a FiT of $0.15/kWh compared to the referenced cost of $0.075/kWh, appears attractive as a reasonable first approximation (Opitz, 2011). However, this is about three times the current retail electricity price ($0.05/kWh), and such a price differential is unlikely to prove politically sustainable. Kazakhstan illustrates the importance of derisking wind power investment to bring about lower financing costs and remove price distortions to minimize the price premium required to make wind energy attractive. Additional derisking efforts will most likely be required before the significant potential of wind energy can be fully tapped in Kazakhstan.

- **Policy derisking efforts can take a long time to generate results and the work required may extend beyond the timelines of many GEF projects.** While the projects in Uruguay and Mauritius were able to transition relatively quickly from supporting policy development to supporting policy implementation, the timeline for policy development in Kazakhstan has moved along a longer track, similar to that of China (See Box 1.). A key take-away from the experience in Kazakhstan is that it is important not to underestimate the time and focus that resolving underlying barriers may require. In particular, in some countries with rich hydro-carbon resources, policy change can take considerably longer to accomplish.[32]

[32] By contrast, UNDP-GEF efforts in Central Asian countries that are dependent on energy imports – such as Tajikistan and Kyrgyzstan – have achieved policy adoption in a shorter timeframe.

"In Kazakhstan, approximately 3 percent of national GDP is spent on fossil fuel subsidies... If these subsidies were phased out, it is likely that renewable energy market growth would accelerate, especially given Kazakhstan's strong wind resources."

- **Energy subsidies can create barriers to renewable energy development.** Internationally, the International Energy Agency (IEA) estimates that $409 billion was spent on fossil fuel subsidies in 2010. These subsidies artificially suppress the prices of fossil fuels and make it more difficult for renewable energy to compete. In Kazakhstan, for example, approximately 3 percent of national GDP is spent on fossil fuel subsidies. This equates to approximately $269 per person in subsidy, which is significantly higher than the subsidization rates in other countries analyzed in this study. The Philippines, for example, has a subsidization rate of only $11.80 per person. The total subsidies in Kazakhstan amount to US $4.3 billion of which $1.7 billion (approximately 40 percent) went to electricity subsidies (IEA, 2011a). If these subsidies were phased out, it is likely that renewable energy market growth would accelerate, especially given Kazakhstan's strong wind resource.

- **It is sometimes difficult to measure and articulate the progress accomplished by policy derisking instruments.** By many measures, the wind project in Kazakhstan should be considered a success due to the establishment of regulatory, institutional and policy foundations during the project, which had previously been absent. The wind assessments, wind atlas and policy support, for example, have improved the overall investor framework in Kazakhstan. However, it is difficult to compare the costs of the policy derisking mechanisms utilized in Kazakhstan with their potential rewards in terms of reduced risks because so few wind investments have occurred in Kazakhstan to date.

- **Wind energy in Kazakhstan is likely to become increasingly competitive.** Despite the remaining barriers, there is a strong economic case for further investment in derisking wind power in Kazakhstan. Wind power generators will compete with new coal-fired power generation capacity as the old Soviet power generators are retired and the current capital cost advantage of coal-fired power generation steadily erodes. Furthermore, the roll-up of the new FiT regulations is likely to increase the confidence of investors and soften the financing terms offered to project developers. Last but not least, Kazakhstan's very large size and low population density mean that significant transmission losses (25 to 50 percent) can add $0.05/kWh to the cost of power supplied to remote consumers. In this context, wind power and other forms of distributed small-scale generation based on locally available renewable sources of energy represent an economically viable alternative to remote consumers, even in an economy endowed with major fossil fuel reserves.

Section 4 | Discussion

Discussion

4

As demonstrated by this review of UNDP support and GEF financing for FiTs and related price and market-access instruments, the precise approach to deploying public sector resources will vary from country to country. However, there appear to be certain common principles that have been shown to be effective in attracting sustainable flows of private capital to the renewable energy sector.

Feed-in Tariffs and Related Price and Market-Access Instruments

- **There is no single, ideal design for a FiT that can be applied internationally.** Different countries have different objectives and face different constraints, which ultimately dictate design. UNDP recognizes that there is no 'one size fits all' approach to national renewable energy policy and no set approach to FiT design. UNDP's practical experience working with different countries has borne this out. As can be seen from the summary of different FiT designs in Annex B and the case studies, UNDP-GEF projects have supported the development of markedly different policy designs in different countries. These projects have demonstrated that, while it is useful to have a set of best practice policy designs against which to benchmark, the actual design process must be flexible and responsive to the national context.

- **There have been a broad range of FiT designs assisted by UNDP support and GEF financed projects.** As shown in Section 3, UNDP-GEF FiT projects have supported a broad range of different types of FiTs and related price and market-access instruments, depending on national priorities. In some cases, national governments have opted to pursue other policies. In Georgia, for example, a FiT was among several options proposed for consideration, but the Government rejected the FiT concept because it viewed it as inconsistent with free market competition. In the Seychelles, the Government opted for a rebate instead of a FiT because the rebate was judged to be less administratively complex than the FiT. In countries that did choose to develop a FiT, the diversity of design choices reflects the different countries' priorities. Montenegro and Armenia, for example, opted to support natural gas co-generation in addition to renewable electricity, whereas other countries explicitly forbid fossil fuels from the FiT. The Philippines FiT is designed to support a broad range of technologies, whereas Tajikistan supports only small hydropower. Thailand utilizes adders[33] on top of the avoided cost of power, whereas Montenegro payments are all in and include the transfer of electricity and guarantees of origin. Tajikistan and Kazakhstan set their rates on a case-by-case basis, whereas the majority of the FiTs utilize a standard offer payment level for each class of eligible technologies.[34] In each case, UNDP-GEF projects have assisted with these designs rather than insisting that a strict design template be applied.

- **FiT designs appear to be diffusing and clustering regionally.** FiTs are diffusing in Central Asia (i.e. Kazakhstan, Tajikistan and Kyrgyzstan) whereas tenders have been diffusing in Latin America (i.e. Argentina, Peru, Brazil, and Uruguay). UNDP's presence in each region has meant that it is able to develop and broadcast lessons learned inter-regionally as the policies evolve. Tajikistan, for example, established a policy that includes case-by-case review similar to that in Kazakhstan, but Tajikistan has designed its review process to build on Kazakhstan's example, with a clearer set of guidelines, methodologies and deadlines for establishing pricing.

"While it is useful to have a set of best practice policy designs against which to benchmark, the actual design process must be flexible and responsive to the national context."

[33] An adder is an additional incentive on top of the price that generators receive when selling electricity. The amount of the adder may vary by technology.

[34] There is some debate as to whether policies that do not include standard offer rates are truly FITs. Kenya and Indonesia, for example, both have policies that set ceiling prices for renewables, rather than floor prices, and are sometimes excluded from international FiT lists as a result. The official name of Kenya's policy, however, is the 'feed-in tariff'.

The need for complementary public instruments to a FiT to achieve market transformation.

- **FiTs do not guarantee renewable energy scale-up.** UNDP has observed that FiTs in many countries have been successful at scaling-up renewable energy policies. At the same time, however, it is important to recognize the limitations of FiTs and related price and market-access instruments. It must be recognized that FiTs can only deal with a subset of the challenges facing energy sector market transformation. For example FiTs cannot address potentially severe issues such as high electricity losses, a lack of transmission infrastructure, citing difficulties, fossil fuel and electricity subsidies, etc. In order to achieve renewable energy scale-up, it is usually necessary to combine appropriate FiT design with a suite of targeted policy and financial derisking instruments in order to comprehensively remove underlying barriers and manage risks to investment.

"A transition to new market structures may require a country to manage several significant paradigm shifts simultaneously."

- **Market transformation projects can take time and may need to be developed incrementally.** As described in the case studies and in Annex I, renewable energy policies may require interventions that move beyond simple payment levels and also involve interconnection, pricing, purchasing, etc. The pre-existing energy market and technical regulations found in developing countries were formulated to accommodate fossil-fuel power generating technologies. A transition to new market structures and technical modalities allowing for independent renewable power production is a significant undertaking, and may require a country to manage several significant paradigm shifts simultaneously. This means that FiTs and related price and market-access instruments may not initially be perfect or fully functional at the conclusion of a project. In general, market transformation projects take a long time and full FiT development may last beyond the horizons of most UNDP-GEF projects. FiT development in Germany, for example, has been ongoing since 1991. The German FiT policy has been continually and iteratively adjusted and there continue to be significant and ongoing revisions to the policy, most recently with the new 2012 law (DB Climate Change Advisors, 2012). Similarly, it is important to realize that policy development assisted by UNDP-GEF and other international organizations may necessarily represent 'steps along the way', rather than fully-finished products.

Renewable energy market transformation efforts can be a pillar in a broader national sustainable development strategy.

- **It is critical to invest in capacity development for policymakers and other stakeholders.** UNDP-GEF's experience has also shown that renewable energy market transformation projects can generate multiple development wins, boost economic growth, reduce poverty, create new jobs, improve local environment and heath conditions, and mitigate global environmental risks. However, designing effective measures to address all the key barriers to renewable energy and to optimize broader development benefits requires engineering and financial expertise, deep knowledge of local economy and physical conditions, and a sound understanding of successful international practices. A key finding of this review is that developing capacity in these areas and enabling a public discussion on barriers is a pre-condition for a sustainable transformation of renewable energy markets and the achievement of broader development benefits.

- **Public measures supporting a FiT regime can also act as a change catalyst for better governance.** An ancillary benefit of policy derisking is that it can be instrumental in prying open a closed energy market and enabling a public discussion of barriers, as well as the solutions to remove these barriers. When the project in Uruguay began, for example, the Energy Secretariat was an understaffed unit with limited power. A significant strengthening and empowerment of the Energy Secretariat took place in parallel with the project, enabling it to lead a discussion on actual power generation costs and creating a fair playing field for both public and private wind generation. Initially, the resistance from the state utility was significant. This institutional transformation can be credited for part of the current wind boom in Uruguay. Similarly, the project in Kazakhstan initiated a discussion on the need to take future replacement costs of the older power plants into account in power pricing, as the current approach keeps retail prices for coal-fired power generation artificially low, making it difficult for renewable energy technologies to compete with existing plants.

- **The investment leverage ratio is a useful but insufficient indicator in assessing the effectiveness of a policy mix.** The investment leverage ratio (i.e. the ratio of public funds deployed to private investment catalysed) is increasingly becoming the key performance metric for a public sector intervention, similar to the role of the bottom line in the private sector. The wind transformation project in Uruguay is expected to result in a total investment of approximately $2 billion by 2015. The $7 million GEF intervention (GEF grant: $1 million; co-financing: $6 million) essentially relied on comparatively inexpensive policy derisking instruments and could ultimately achieve a very high investment leverage ratio.[35]

The relatively lower investment leverage ratios recorded by the two successful derisking interventions in Mauritius do not necessarily reflect a less optimal policy mix but rather an appropriate response to a different set of conditions and different national development goals. The focus on small-scale generators requires more costly incentive payments to be financially attractive. However, this selection of public instruments and technologies with a lower leveraging potential was driven by the nature of the barriers faced and the political priority to democratize energy use and ensure that Mauritian citizens are able to more directly benefit from national renewable energy incentives, rather than using policy to exclusively support IPPs predominantly owned by overseas investors. This choice might be a key reason for the success of the policy derisking strategy in Mauritius and the political support for a tax on fossil fuel generation to finance the price premium for systems smaller than 50 kW. The investment leverage ratio is a useful but insufficient indicator in assessing the effectiveness of a policy mix, and should be complemented by a range of indicators to better track national development co-benefits, including the impact of tariffs, employment creation, service reliability, energy security and GHG emissions. An exclusive reliance on the investment leverage ratio could bias policymakers in favour of sub-optimal public interventions.

[35] The exact investment leverage ratio will depend on the degree of public support for individual asset financing.

Conclusion

UNDP-GEF has established a significant track record of work with renewable energy development. This report has sought to explore UNDP-GEF's approach to renewable energy risk reduction by reviewing a portfolio of projects that have supported the development of FiTs and related price and market-access instruments. An overall conclusion from the review of UNDP-GEF projects is that investing in policy derisking instruments, often in tandem with financial derisking instruments, appears to be cost-effective when measured against paying higher financial incentives to compensate investors for above-average risks. Rather than using scarce public funds to pay higher electricity tariffs, it can be advantageous to first reduce and manage the risks associated with institutional, technological and financial barriers, and thereby change the fundamental risk-reward trade-off that energy investors face in a given country.

A corollary to this overall conclusion is that, for any particular developing country, there is no pre-set additional cost associated with new renewable energy capacity relative to the cost that would be associated with conventional fossil fuel energy. The need to provide incentive payments, as well as the required amount of these payments, can vary from location to location, depending on the geography, renewable resource endowment, country infrastructure, existing energy mix, present and future market sizes, selected technology options, and energy market structure.

"Decisions on public interventions can ultimately lead to significant differences in the cost of a rapid transition to more sustainable energy sources, as well as the distribution of this cost among all key stakeholders."

The incremental cost of renewable energy will also be deeply influenced by the policy and business environment and the ability of policymakers to simultaneously address renewable energy barriers and optimize development co-benefits. As a result, decisions on public interventions can ultimately lead to significant differences in the cost of a rapid transition to more sustainable energy sources, as well as the distribution of this cost among all key stakeholders. Further, as many of these parameters are likely to evolve rapidly, policymakers will need to regularly review their clean energy investment derisking strategies to strike a satisfactory balance across the diverging interests of all key stakeholders.

There is no single and fixed prescription that tells us how to select public instruments so that renewable projects are financed effectively. The findings from this review of UNDP-GEF projects can be useful in informing policymakers' discussions about how best to sequence and combine public sector resources to support sustainable energy – but they are inherently qualitative. In countries such as Mauritius, Montenegro and Uruguay, for example, UNDP-GEF projects have helped jumpstart renewable energy market growth. In each of these cases, project 'success' can be at least partially measured by the amount of new capacity installed as a result of project interventions but it is nonetheless difficult to attribute success to individual derisking instruments. Sometimes, as in China, several renewable energy market development efforts were undertaken by different agencies in parallel, and attributing success to a specific initiative is highly challenging.

Conversely, in other cases, it is clear that UNDP-GEF projects have made a significant contribution to policy reform and improving the enabling environment, but subsequent investment has remained limited because of an incomplete barrier analysis or the emergence of new barriers. In such cases, the contributions of the instruments deployed may be underestimated or misunderstood. If market growth occurs in the future, for example, the contributions of upstream investment in policy development and capacity building may be overlooked or discounted even though they may have laid the foundation for success.

At present, there are few established methodologies for establishing the value of a policy or a financial derisking instrument or articulating the leverage that they may create, for example from lower costs of capital resulting from risk reduction. In order to better understand and more accurately communicate the impact of public instruments, new ways to quantifying derisking interventions should be explored. To this end, a companion publication to this study, titled *Derisking Clean Energy Investment*, builds on the lessons learned in this report and lays out a methodology for assessing the impact of derisking instruments based on a bottom-up, quantitative approach. This can contribute to more informed decision making and thereby mitigate the risk of under- or over-investment in a given set of public instruments.

Annexes

ANNEX A. FIT DESIGN OPTIONS AND CONSIDERATIONS

Many studies have proposed specific definitions for feed-in tariff policies. As feed-in tariffs have diffused internationally, however, they have evolved to the point that an exception can be found to most design rules As a result, this study encompasses FiTs and related price and market-access instruments because the line separating FiTs and other cornerstone instruments is increasingly blurry. The main challenge related to defining FiTs is that FiTs are not a single policy type, but are instead a package of different regulations and incentives. These packages can be combined in a variety of different ways, depending on policymakers' goals and constraints and may include the following components:

POLICY ELEMENTS	
Pricing	FiT instruments typically specify price(s) that will be paid to renewable generators on a standard offer basis.
Interconnection	Interconnection regulations can include interconnection guarantees, streamlined or priority interconnection, and rules for how interconnection costs are allocated and recovered.
Purchasing, transmission and distribution	FiT instruments may require that utilities (or other entities) purchase renewable electricity. Related to, but distinct from, interconnection and purchasing requirements are requirements that utilities give priority to renewable electricity on the transmission and distribution systems.
Contracting	FiT instruments may specify details of the contracts that are to be signed with renewable generators. These include the terms of the contract, the extent to which the contract must be simplified and standardized, the contract currency, etc.

Source: (Rickerson *et al.,* 2012)

Each of these broad components can be broken down into sets of design issues and options. The major design issues and their associated options are summarized in the table below, which has been adapted from a recent FiT law drafting guide produced by UNEP (Rickerson *et al.,* 2012). Categorizing FiT policies on an issue-by-issue basis makes it easier to compare and contrast FiT policies with one another, as well as to compare them with other policy types. There has been a significant amount of recent discussion, for example, focusing on the comparisons between feed-in tariffs and auctions. It is rarely acknowledged, however, that such discussions are typically focused on comparative approaches to rate setting (i.e. the pricing element of FiT) and not on the interconnection, purchase, dispatch and contracting elements of a FiT.

FIT DESIGN ISSUE		DESIGN OPTIONS
Pricing issues	**Eligibility**	• All technologies • Only certain types of technologies, project sizes, and/or ownership models
	Tariff differentiation	• Highly differentiated by size, technology, application, etc. • One rate for all eligible technologies
	Payment based on	• Generation cost • Value (i.e. avoided cost rate or the value of avoided environmental damage)
	Payment duration	• Long-term (i.e. 15-20 years) • Medium-term (i.e. 10-14 years)
	Payment structure	• Fixed, flat payment • Premium payment on top of wholesale electricity price • Variable on an annual basis (i.e. indexed to inflation)
	Policy cost recovery	• Ratepayers • Taxpayers • Levies or taxes on other commodities (i.e. fossil fuels) • International sources (i.e. donor organizations or climate finance)
	Adjustment of the payment	• Based on a "trigger" mechanism (i.e. a certain amount of time elapsed or capacity installed) • Automatic adjustments (i.e. payment decreases by a certain amount or total amount of capacity is capped) • Periodic reviews
	Payment currency	• Paid in domestic currency • Denominated in or indexed to foreign currency
Interconnection issues	**Interconnection guarantee**	• Guaranteed interconnection • Priority interconnection
	Interconnection costs	• Generator pays for all interconnection costs • Ratepayers pay for grid upgrades, generator pays for interconnection • Ratepayers pay for all costs associated with grid connection
Purchasing and dispatch issues	**Purchase and dispatch requirements**	• Guaranteed purchase • Priority dispatch
	Amount purchased	• 100% purchase • Partial purchase (i.e. only generation not consumed onsite)
	Purchasing entity	• Utility or transmission system operator • Government entity
	Contract issues	• No contracts • Standard contracts • Contracts negotiated on a case-by-case basis

ANNEX B. FIT DESIGNS ASSISTED BY UNDP-GEF PROJECTS

In order to illustrate the range of designs that have been assisted by UNDP-GEF projects, this Annex summarizes the FiT designs from a sample of the countries: Armenia, Kazakhstan, Malaysia, Mauritius, Montenegro, Philippines, Tajikistan and Uruguay, utilizing the framework introduced in Annex A.

B.i. Armenia

FIT DESIGN ISSUE	ARMENIA
Integration with policy targets	FiTs contribute to the achievement of two national targets: • Small hydro: 135 MW by 2016, 265 MW by 2025; • Wind: 300 MW by 2016, 500 MW by 2025
Eligibility	• Small hydro (up to 30 MW) • Wind • Biomass • Co-generation (natural gas)
Tariff differentiation	• Small hydro (run of river): 18.274 AMD/kWh • Small hydro (irrigation systems): 12.182 AMD/kWh • Small hydro (drinking water system): 8.122 AMD/kWh • Wind: 35.0 AMD/kWh • Biomass 35,0 AMD/kWh • Co-generation (case-by-case) 26,926 – 36,369 AMD/kWh (current prices)
Payment based on	• Cost-based • For co-generation, value of heat off-take contract is assumed when rates are calculated; FiT is based on incremental cost required to add electricity generation to plant
Payment duration	15 years
Payment structure	• The payment is a flat tariff for electricity, rather than a premium payment on top of electricity. • The revenue paid to a generator is adjusted annually, however, based on inflation, the consumer price index, and the exchange rate between the Armenian dram and the USD • Natural gas co-generation plants can also apply to have the rate adjusted to reflect natural gas price changes every six (6) months, but price is capped at the rate paid to other thermal power plants
Cost recovery	• Ratepayers • Since co-generation payments are capped at price of marginal thermal power plants, no cost recovery is necessary
Interconnection guarantee	Guaranteed interconnection upon securing a license for operation from the Public Services Regulatory Commission
Interconnection costs	• Cost of interconnection: Generator • Cost of grid upgrade: Generator
Purchase and dispatch requirements	Guaranteed purchase upon securing a license of operation from the Public Services Regulatory Commission.
Amount purchased	100% purchase, except for parasitic load of generator
Purchasing entity	Single-buyer distribution company, "Electric Network of Armenia" or CJSC
Commodities purchased	• Electricity • CDM credits remain with the generator
Triggers and adjustments	• Tariff available to both new and existing plants is adjusted annually • Co-generation plants can apply for tariff changes every six (6) months
Contract issues	PPA with CJSC
Payment currency	• Renewable energy systems paid in AMD, but partially indexed to USD • Co-generation is paid in AMD

B.ii. Kazakhstan

FIT DESIGN ISSUE	KAZAKHSTAN
Integration with policy targets	• 1% RE by 2015 • 3% RE by 2020
Eligibility	• Wind • Solar • Biomass • Hydropower (35 MW) • Geothermal
Tariff differentiation	No differentiation – determined on a case-by-case basis according to the results of project feasibility studies
Payment based on	Cost-based
Payment duration	Set based on the feasibility study
Payment structure	Fixed price
Cost recovery	Ratepayers
Interconnection guarantee	Yes
Interconnection costs	The grid connection costs are integrated into the rate paid to generators
Purchase and dispatch requirements	• Guaranteed purchase • Priority dispatch
Amount purchased	100% purchase, but owners have the option to purchase with a right to consume output onsite
Purchasing entity	Transmission companies
Commodities purchased	Electricity; CDM credits remain with the generator
Triggers and adjustments	No adjustment mechanism; plants are evaluated on a case-by-case basis
Contract issues	Standard contract
Payment currency	KZT

B.iii. Malaysia

FIT DESIGN ISSUE	MALAYSIA			
Integration with policy targets	The Malaysian Government is planning to increase the percentage of renewable energy (RE) from less than 1 percent today to 5.5 percent by 2015.			
Eligibility	• PV	• Biogas	• Biogas	• Mini-hydro
Tariff differentiation	**Solar PV**	**USD/kWh**	**Biomass**	**USD/kWh**
	<4kW	0.40	<10MW	0.10
	>4kW<24kW	0.39	>10MW<30MW	0.09
	>24kW<72kW	0.38	**Biogas**	
	>72kW<1,000kW	0.37	<4MW<10MW	0.10
	>1MW<10MW	0.31	>10MW<30MW	0.09
	>10MW<30MW	0.27	**Mini-Hydro**	
	$0.01 adder for use of locally manufactured or assembled solar PV modules $0.0033 adder for use of locally manufactured or assembled solar inverters $0.0033 adder for use of locally manufactured or assembled gasification technology for Biomass $0.0033 adder for use of locally manufactured or assembled gas engine		<10MW	0.08
			>10MW<30MW	0.07
Payment based on	Cost-based			
Payment duration	16-21 years, depending on the technology			
Payment structure	Fixed price			
Cost recovery	Financed via a 1 percent increase of the retail electricity price. The revenues from this 1 percent price increase will go into a fund which will finance the tariff payments. The rate increase will not affect low income consumers (<200 kWh/month)			
Interconnection guarantee	Yes			
Interconnection costs	The grid connection costs are integrated into the FiT rates			
Purchase and dispatch requirements	Yes			
Amount purchased	Utility purchases power and Fund pays incentive			
Purchasing entity	Utility / Fund			
Commodities purchased	Electricity			
Triggers and adjustments	**Degression Rates**			
	Solar PV	8.0%	Biogas	0.5%
	Biomass	0.5%	Mini-Hydro	0%
Contract issues	Standard PPAs that vary by technology and plant size			
Payment currency	MYR			

B.iv. Mauritius

FIT DESIGN ISSUE	MAURITIUS
Integration with policy targets	• 35% by 2025 as per the Long Term Energy Strategy 2009-2025 • 17% from Bagasse • 2% from hydro • 4% from waste to energy • 8% from wind, 2% from Solar PV • 2% from Geothermal
Eligibility	• PV (< 50 kW) • Wind (< 50 kW) • Hydropower (< 50 kW)
Tariff differentiation	• PV (< 2.5 kW): 25 MUR/kWh • PV (2.5-10 kW): 20 MUR/kWh • PV (10-50 kW): 15 MUR/kWh
	• Wind (< 2.5 kW): 20 MUR/kWh • Wind (2.5-10 kW): 15 MUR/kWh • Wind (10-50 kW): 10 MUR/kWh
	• Hydro (< 2.5 kW): 15 MUR/kWh • Hydro (2.5-10 kW): 15 MUR/kWh • Hydro (10-50 kW): 10 MUR/kWh
Payment based on	Cost-based
Payment duration	15 years
Payment structure	Electricity consumed onsite offsets retail power; electricity exported to the grid receives the FiT payment. If the amount exported is more than 3 x higher than the amount consumed onsite, then the payment level is reduced by 30%
Cost recovery	The Maurice Ile Durable fund, which is funded through tax revenues
Interconnection guarantee	Generators must submit a report demonstrating that they comply with the technical requirements of the grid code
Interconnection costs	Generators must pay for the cost of interconnection and necessary grid upgrades
Purchase and dispatch requirements	Guaranteed purchase if technical requirements are met
Amount purchased	Only excess power not consumed onsite receives the FiT payment
Purchasing entity	Utility
Commodities purchased	Electricity only; generators retain rights to CDM
Triggers and adjustments	No adjustment planned for < 50 kW; over 50 kW system will be reviewed periodically
Contract issues	Standard contract
Payment currency	MUR

B.v. Montenegro

FIT DESIGN ISSUE	MONTENEGRO
Integration with policy targets	• 35% by 2025 as per the Long Term Energy Strategy 2009-2025 • 17% from Bagasse • 2% from hydro • 4% from waste to energy • 8% from wind, 2% from Solar PV • 2% from Geothermal
Eligibility	• PV (< 50 kW) • Wind (< 50 kW) • Hydropower (< 50 kW)
Tariff differentiation	• Biomass (forestry and agriculture): Euro 0.1371/kWh • Biomass (wood processing industry): Euro 0.1231/kWh • Solar energy: Euro 0.1500/kWh • Solar waste: Euro 0.0900/kWh • Waste gas: Euro 0.0800/kWh • Biogas: Euro 0.1500/kWh • Hydropower (up to 3 GWh): Euro 0.1044/kWh • Hydropower (3 to 15 GWh): Euro 0.0744/kWh • Hydropower (over 15 GWh): Euro 0.0504/kWh
Payment based on	Cost-based
Payment duration	30 years
Payment structure	• The payment is a flat tariff for electricity, rather than a premium payment on top of electricity. • The revenue paid to a generator is adjusted annually based on inflation
Cost recovery	Ratepayers
Interconnection guarantee	Interconnection is guaranteed if project design matches technical standards provided by utility; if interconnection does not match the standards at different stages of project development, the project will not receive a construction permit (at design) or permission to operate (following construction)
Interconnection costs	• **Cost of interconnection:** Generator • **Cost of grid upgrade:** Ratepayers
Purchase and dispatch requirements	• Guaranteed purchase • Guaranteed dispatch
Amount purchased	100% power purchase
Purchasing entity	Utility, via the electricity market operator
Commodities purchased	• Electricity • Guarantees of Origin
Triggers and adjustments	None
Contract issues	• Contract signed between generator and electricity market operator
Payment currency	EUR (local currency)

B.vi. Philippines

FIT DESIGN ISSUE	PHILIPPINES	
Integration with policy targets	Yes, integrated with national RPS target	
Eligibility	• Biomass • Run of river Hydro between 1MW and 10MW • Ground mounted Solar over 500kW capacity • Wind • Ocean	
Tariff differentiation	**Type**	**Php/kWh**
	Biomass	7.0
	Run of River Hydro	6.15
	Solar	17.95
	Wind	10.37
	Ocean	17.65
Payment based on	Cost-based	
Payment duration	20 years	
Payment structure	Fixed price	
Cost recovery	Ratepayers, but with low-income protection similar to Malaysia	
Interconnection guarantee	Yes	
Interconnection costs	The grid connection costs are integrated into the FiT rates	
Purchase and dispatch requirements	Yes – priority purchase and dispatch	
Amount purchased	100%	
Purchasing entity	Utility	
Commodities purchased	Electricity and RECs (for RPS)	
Triggers and adjustments	**Degression Rates**	
	Biomass	0.5% after 2nd year
	Run of the River Hydro	0.5% after 2nd year
	Solar	6% after 1st year
	Wind	0.5% after 2nd year
	Ocean	None
Contract issues	Standard Contract	
Payment currency	PHP, but indexed to foreign currency to mitigate currency risk	

B.vii. Tajikistan

FIT DESIGN ISSUE	TAJIKISTAN
Integration with policy targets	100 MW of small hydro by 2020
Eligibility	• All renewable energy sources • Small hydro (under 30 MW)
Tariff differentiation	No differentiation; payments determined on a case-by-case basis according to an official calculation methodology
Payment based on	Cost-based
Payment duration	15 years
Payment structure	Flat, fixed tariff with two components, electricity paid for by the utility and an incentive paid through the National Trust Fund
Cost recovery	National RES and EE Trust Fund
Interconnection guarantee	Guaranteed interconnection based on published interconnection standards; utility cannot refuse interconnection based on needs to upgrade grid
Interconnection costs	• **Cost of interconnection:** Generator • **Cost of grid upgrade:** Ratepayers
Purchase and dispatch requirements	• Guaranteed purchase • Priority dispatch ◦ 300 kW-10 MW must report forecast ◦ < 300 kW, no forecast requirement ◦ Costs of balancing electricity borne by ratepayersh
Amount purchased	Electricity is allowed to be used on-site by local community with excess volume to be fed into the grid
Purchasing entity	• Utility purchases the power • The National Trust provides the incentive payment to generators
Commodities purchased	• Electricity • CDM credits will be transferred to the National Trust Fund to cover the incentive
Triggers and adjustments	No adjustment mechanism; plants are evaluated on a case-by-case basis
Contract issues	Standard PPA signed between Borqi Tajik (national utility) and IPPs
Payment currency	TJS

B.viii. Uruguay (Small-Scale Standard Offer)

FIT DESIGN ISSUE	URUGUAY
Integration with policy targets	Target 1200 MW wind by 2015
Eligibility	Wind, solar, biomass, small hydro – low voltage distribution interconnections only
Tariff differentiation	No differentiation
Payment based on	Retail electricity price
Payment duration	10 years
Payment structure	Set to level of retail electricity price
Cost recovery	Ratepayer cross-subsidies
Interconnection guarantee	Guaranteed interconnection.
Interconnection costs	Interconnection costs are borne by the generator
Purchase and dispatch requirements	On-site consumption – no purchase guarantee; guaranteed dispatch for excess negotiated in contract
Amount purchased	Electricity consumed onsite; right to sell electricity above total onsite demand negotiated on a case-by-case basis
Purchasing entity	Utility – excess power is absorbed in local distribution network
Commodities purchased	Excess electricity; CDM credits remain with generators
Triggers and adjustments	No adjustment mechanism
Contract issues	Standard contract; negotiations occur if generation is above amount consumed onsite
Payment currency	UYU

ANNEX C. UNDP-GEF PROJECTS ANALYZED IN THIS STUDY

COUNTRY	PROJECT NAME	DURATION	GEF FUNDING ($)	TOTAL FUNDING ($) (GEF + CO-FINANCING)
Armenia	Improving the Energy Efficiency of Municipal Heat and Hot Water Supply in Armenia	2001 - present	3,160,120	12,030,120
Brazil	Energy Generation at Sugarcane Mills using Trash and Bagasse in Brazil	2005 - present	7,800,000	70,600,000
China	Capacity Building for the Rapid Commercialization of Renewable Energy	1999-2007	8,800,000	17,530,000
Kazakhstan	Wind Power Market Development Initiative	2004 - 2011	2,926,400	7,650,400
Kyrgyzstan	Small Hydropower Development	2009 to present	1,000,000	23,180,000
Malaysia	Malaysian Building Integrated Photovoltaic Project (MBIPV)	2002 - present	4,699,420	24,959,160
Mauritius	Removal of Barriers to Energy Efficiency and Conservation in Buildings	2007-2013	912,411	6,659,220
Mauritius	Removal of Barriers to Solar PV Power Generation in Mauritius, Rodrigues and the Outer Islands	2009 - present	2,005,000	20,993,000
Montenegro	Power Sector Policy Reform to Promote Small Hydropower Development in the Republic of Montenegro	2006 - present	978,393	4,448,393
Philippines	Capacity Building to Remove Barriers to Renewable Energy Development (CBRED)	2002 - present	5,448,000	14,063,000
South Africa	South Africa Wind Energy Programme (SAWEP)	2001 - present	4,615,000	10,316,000
Tajikistan	Technology Transfer and Market Development for Small Hydropower in Tajikistan	2009 - present	2,000,000	8,450,000
Thailand	Removal of Barriers to Biomass Co-Generation from Wood Residues in Thailand	2001 - present	6,805,000	99,314,671
Tunisia	Private Sector Led Development of On-Grid Wind Power in Tunisia	2003 - present	2,275,000	97,275,000
Uruguay	Uruguay Wind Energy Programme (UWEP)	2006 – present	1,000,000	7,010,000

ANNEX D. REFERENCES

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United Nations Development Programme
Bureau for Development Policy
Environment and Energy Group
304 East 45th Street, 9th Floor
New York, NY 10017 USA

www.undp.org.