United Nations Development Programme

Empowered lives.
Resilient nations.

Derisking Renewable Energy Investment

Key Concepts Note

INTRODUCTION

Across the world, developing country governments are seeking to rapidly scale-up investment in renewable energy. The financial sums required to achieve this are enormous; UN-DESA has estimated that it could cost up to USD 250–270 billion per year to shift developing countries to 20 percent renewable energy by 2025[1].

> "UNDP's report introduces an innovative framework, together with a financial tool, to assist policymakers to promote renewable energy in developing countries."

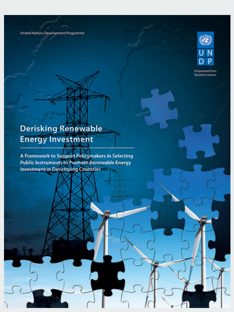
Private sector financing, backed by the international capital markets, will be key to meeting this investment challenge. However, the reality is that renewable energy project developers in developing countries often struggle to access the large quantities of financing they require and when available, the cost of financing is often high.

The need to make renewable energy investment financially attractive for the private sector has inspired the development of a wide variety of public instruments. These public instruments can come at a cost – to industry, to consumers or to the tax-payer. The challenge is to design packages of public instruments which can cost-effectively catalyse private investment.

To this end, the United Nations Development Programme (UNDP) recently issued *Derisking Renewable Energy Investment*, a report to assist policymakers to promote renewable energy investment in developing countries. The report introduces an innovative framework, with an accompanying financial tool, to quantitatively compare different public instruments and their cost-effectiveness.

This briefing note provides a brief summary of some key concepts from the report:

- The impact of high financing costs on renewable energy
- Identifying a public instrument mix
- The framework's waterfalls
- The frameworks performance metrics



MORE ON THE REPORT

The report is the work of UNDP's Energy, Infrastructure, Technology and Transport (EITT) unit. The full report, executive summary and financial tool can be downloaded at www.undp.org/DREI

For more information, please contact DREI@undp.org

This key concept note was first published in October 2013. This updated version dates from March 2014.

[1] DeMartino, S., Le Blanc, D. (2010). Estimating the Amount of a Global Feed-in Tariff for Renewable Electricity. UN DESA Working Paper No. 95. New York, NY: United Nations Department of Social Affairs

High financing costs for renewable energy

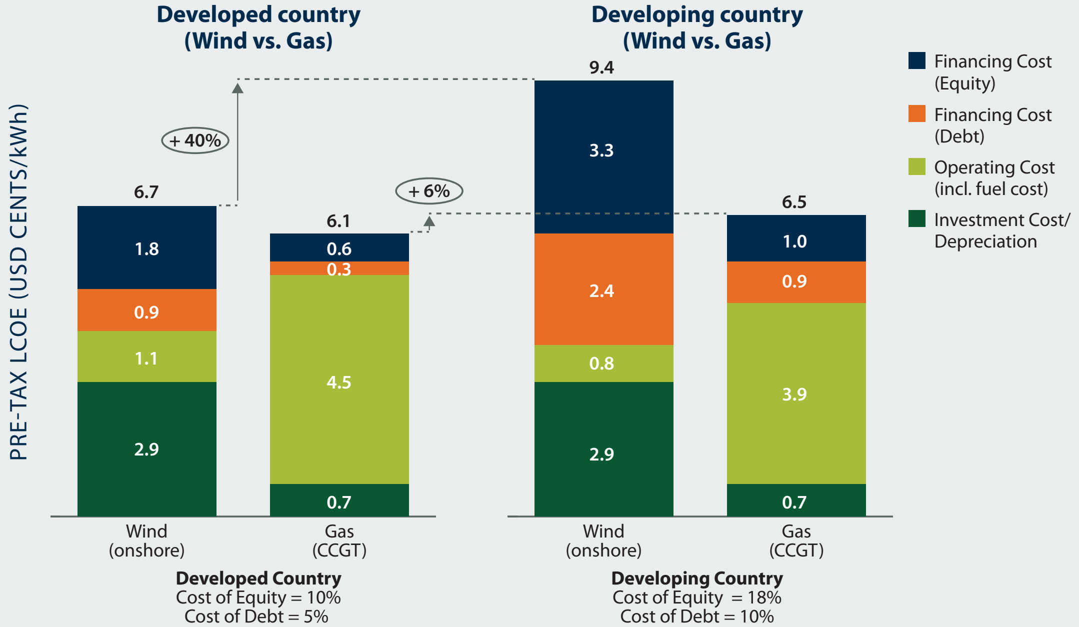
The technology costs of renewable energy have shown remarkably steady decreases over the past decades. For example, in the case of solar photovoltaic, module costs have experienced a near 98 percent reduction from 1979 to 2012[2].

Nonetheless, while technology costs have fallen, private sector investors in renewable energy in developing countries still face high financing costs (both for equity and debt). These high financing costs reflect a range of technical, regulatory, financial and informational barriers and their associated investment risks. Investors in early-stage renewable energy markets, such as those of many developing countries, require a high rate of return to compensate for these risks.

Figure 1, below, illustrates how these high financing costs can impact the competitiveness of renewable energy. The figure compares the levelised cost of electricity (LCOE) of onshore wind energy and combined-cycle gas in a developed and developing country. In a developed country benefiting from low financing costs, wind power can be almost cost-competitive with gas. In a developing country with higher financing costs, wind power generation cost becomes 40 percent more expensive than in a developed country. In contrast, gas only becomes 6 percent more expensive due to these higher financing costs. This is a function of the high upfront capital intensity of renewable energy. Simply put, high financing cost environments penalize renewable energy when compared to fossil-fuel based power generation.

"High financing costs in developing countries reflect a range of underlying investment risks. Renewable energy, given its upfront capital intensity, is penalized in high financing cost environments."

Figure 1: The Impact of financing costs on wind and gas power generation costs



Source: Derisking Renewable Energy Investment (2013)

All assumptions besides the financing costs are kept constant between the developed and developing country.

For technology assumptions, see inputs for wind energy and gas (CCGT) in Section A.3 (Annex A); a 70%/30% debt/equity capital structure is assumed; financing costs are based on data obtained in the four country case study (Chapter 3), assuming a non-investment grade developing country.

Operating costs appear as a lower contribution to LCOE in developing countries due to discounting effects from higher financing costs.

[2] IRENA. (2012). Renewable Power Generation Costs in 2012: An Overview. Abu Dhabi: International Renewable Energy Agency.

Faced with this challenge of high financing costs in developing countries, policymakers seeking to promote renewable energy have two broad options: first, to reduce the high financing costs of renewable energy through *derisking instruments*, by addressing the underlying investment risks that result in higher financing costs; secondly, to cover any incremental cost of renewable energy through direct incentives, typically by a market-based instrument, such as a PPA price premium.

The report examines this policy trade-off between derisking and direct incentives. Given the high sensitivity of renewable energy to financing costs, the report puts forward a theory of change that reducing high financing costs for renewable energy, and thereby making the generation costs of renewable energy competitive, is a key opportunity for policymakers acting in developing countries today.

Identifying a public instrument mix

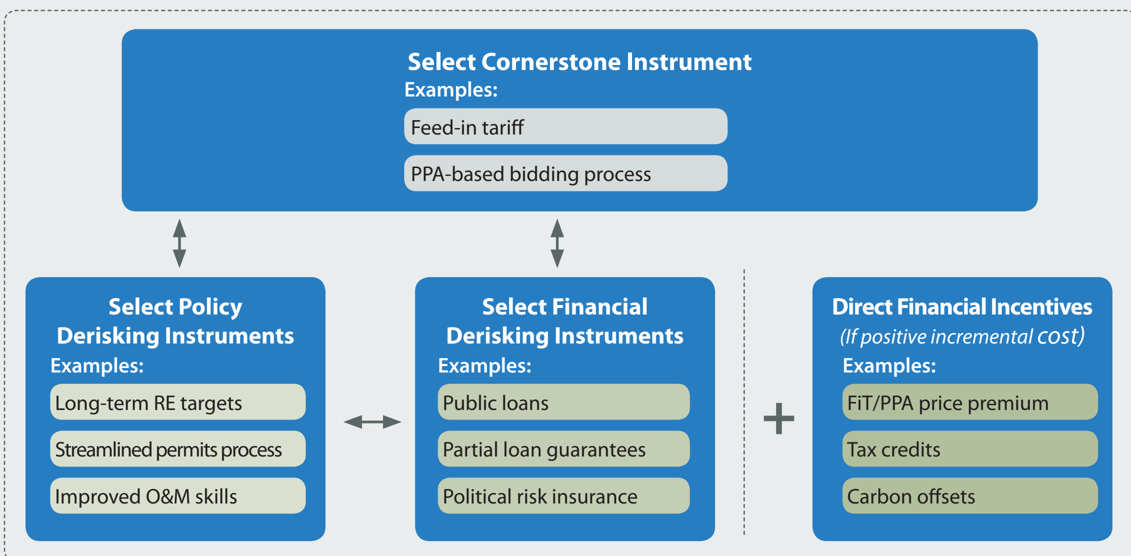
Figure 2, below, illustrates a typical public instrument package for large-scale renewable energy. This is composed of a cornerstone instrument, such as a feed-in-tariff (FiT), acting as the centrepiece public instrument, complemented by derisking instruments, and where necessary, direct financial incentives.

The report makes an important distinction between two groups of public derisking measures: *policy derisking instruments* and *financial derisking instruments*.

- **Policy derisking instruments** address and seek to remove the underlying barriers that are the root causes of investment risks. These instruments utilise policy and programmatic interventions to mitigate risk. For example, renewable energy projects typically involve obtaining a number of permits and approvals. A policy derisking approach might involve streamlining the permitting process, clarifying institutional responsibilities, reducing the number of process steps and providing capacity building to programme administrators.
- **Financial derisking instruments** do not seek to directly address the underlying barrier but, instead, function by transferring investment risks to public actors, such as development banks. These instruments can include public loans and guarantees, political risk insurance and public equity co-investments. For example, the credit worthiness of a power purchase agreement (PPA) may often be a concern to lenders. Partial loan guarantees can provide local banks with the security to lend to project developers, thereby kick-starting the local financial sector's involvement in renewable energy.

"Derisking can take two basic forms: measures which reduce risk (″policy derisking″) and measures which transfer risk (″financial derisking″)"

Figure 2: Public instrument selection for large-scale renewable energy



Source: Derisking Renewable Energy Investment (2013)

The framework's financing cost waterfalls

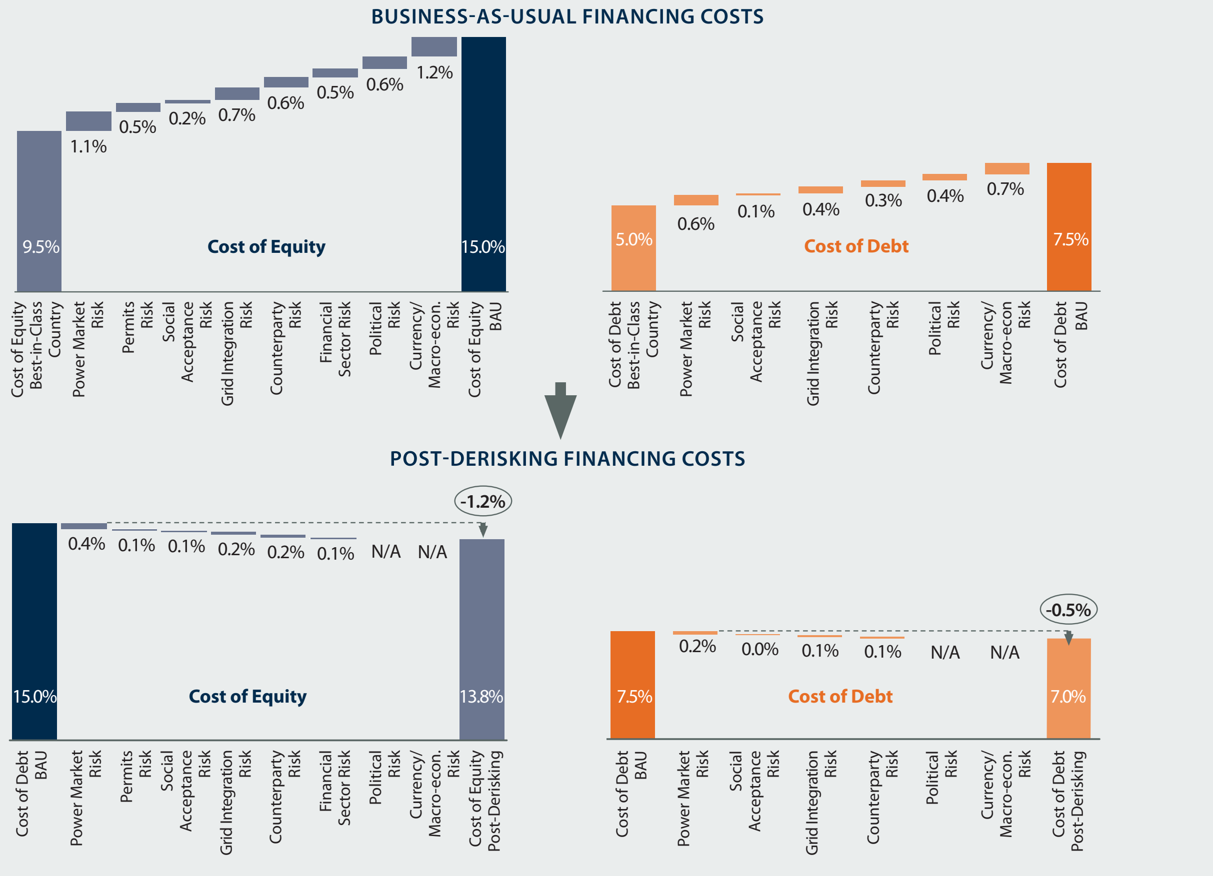
The report introduces a framework to assist policymakers to select and quantify the impacts of public instruments to promote renewable energy. In order to demonstrate how the framework can be applied in practice, the report includes illustrative modelling case studies in four developing countries: Kenya, Mongolia, Panama and South Africa.

One of the framework's key concepts is the financing cost waterfall, which quantifies how different categories of investment risks contribute to higher financing costs in the particular renewable energy market being studied.

Figure 3, below, shows the financing cost waterfalls generated in the report's illustrative case study in South Africa. The case study was performed for onshore wind energy, assuming a 20 year target of 8.4GW in installed capacity.

"Financing cost waterfalls quantify how different categories of investment risks contribute to higher financing costs."

Figure 3: Risk waterfalls from the illustrative South Africa case study (onshore wind, 8.4GW)



Source: Derisking Renewable Energy Investment (2013)
Data obtained from interviews with wind investors and developers. See Annex A of the report for full assumptions.
The post-derisking cost of debt and equity show the average impacts over a 20 year modelling period, assuming linear timing effects.

The underlying data for financing cost waterfalls is obtained from structured interviews with private sector equity and debt investors, where investors are asked to score the strength of various investment risks. The original concept for the financing cost waterfall comes from UNDP's research partnership with Deutsche Bank in the Deutsche Bank report, *GET FiT Plus*[3].

[3] DB Climate Change Advisors. (2011). GET FiT Plus: Derisking Clean Energy Business Models in a Developing Country Context. New York, NY: The Deutsche Bank Group.

The report's framework generates risk waterfalls in two scenarios:

- A *business-as-usual* scenario, which represents the current investment environment for the renewable energy in the particular country. This provides policymakers with an accessible analysis of the impediments to private sector investment, and can assist in prioritising or targeting the public instruments to address specific investment risks.
- A *post-derisking* scenario, after applying public derisking instruments to reduce investment risks. The scenario models how a particular package of public instruments can result in lower financing costs, which can then make renewable energy more competitive with fossil-fuel alternatives.

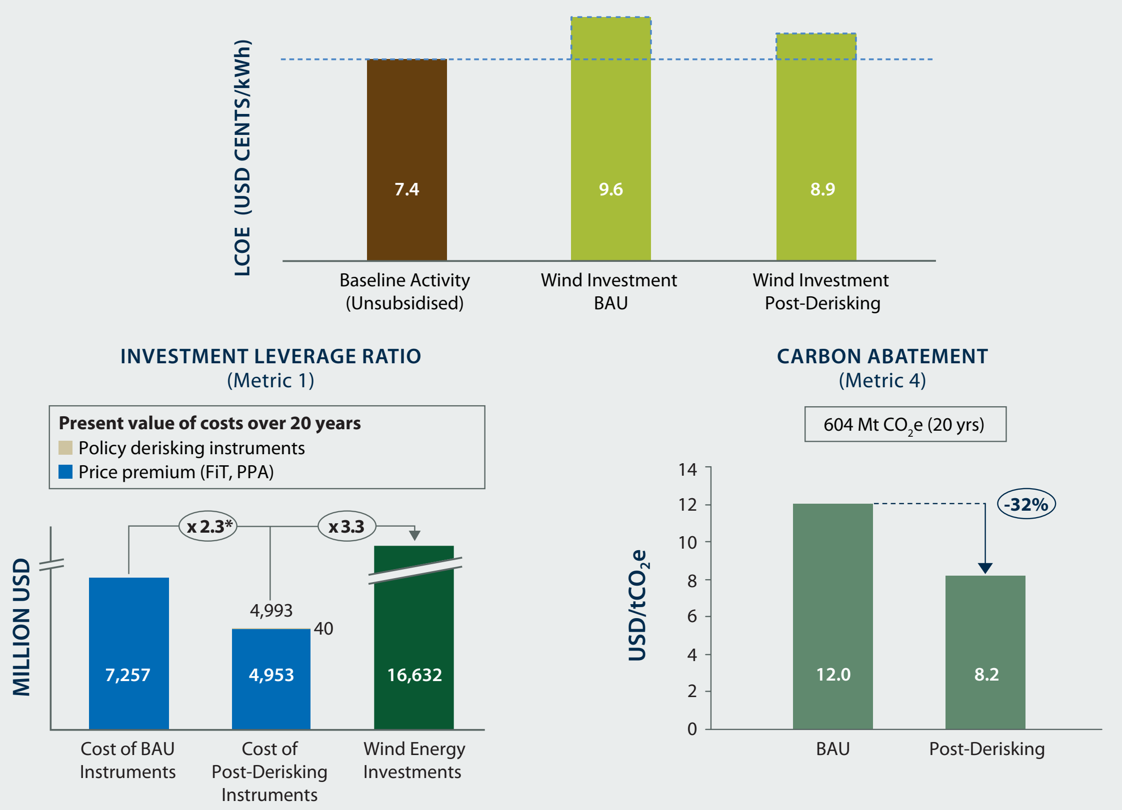
In the illustrative South Africa case study, the business-as-usual financing cost waterfalls identify a number of investment risks as large contributors to higher financing costs, including power market risk, grid integration risk, counterparty risk and currency risk. A package of derisking instruments, targeting the various investment risk categories identified and estimated at USD 40m over 20 years, results in the cost of equity for wind energy being reduced by 1.2% to 13.8%, and the cost of debt being lowered by 0.5% to 7.0%.

The framework's performance metrics

The framework then uses the data obtained from the financing cost waterfalls to assess the impact of the selected public instrument package to achieve the targeted investment in renewable energy. Figure 4, below, shows some of the results obtained in the illustrative case study for onshore wind energy in South Africa.

"In the South Africa case study, the LCOE for wind energy falls from 9.6 to 8.9 USD cents per kWh when derisking instruments are implemented."

Figure 4: Results from the illustrative South Africa case study (onshore wind, 8.4GW)



Source: Derisking Renewable Energy Investment (2013)
Data obtained from interviews with wind investors and developers. See Annex A of the report for full assumptions.
The post-derisking cost of debt and equity show the average impacts over a 20 year modelling period, assuming linear timing effects.

The top half of Figure 4 shows the South Africa case study's outputs for the levelised cost of electricity (LCOE). In South Africa, and with a generation mix currently dominated by coal, the case study calculates the LCOE for the energy baseline at 7.4 USD cents/kWh. Without a package of derisking instruments in place, wind energy is more costly than this baseline. However, with a package of derisking instruments in place, the LCOE falls from 9.6 USD cents per kWh for wind energy in the business-as-usual to 8.9 USD cents per kWh in the post-derisking scenario.

The lower half of Figure 4 shows two of the framework's four performance metrics, each of which examines the impacts of the selected public instrument package from a different perspective. These performance metrics are analysed over the entire 8.4GW 20 year target for wind energy in the South Africa case study.

- The first metric, *the investment leverage* ratio, examines the relationship between the cost of public instrument package and the resulting investment catalysed. These numbers illustrate that USD 40m in public derisking instruments can reduce the electricity tariff price premium (cumulative, real terms) for wind energy in South Africa from USD 7.3bn (business-as-usual scenario) to USD 5.0bn (post-derisking scenario).
- The second metric, *carbon abatement*, examines the cost of public instrument package from a climate change mitigation perspective. Here the numbers illustrate that investing in 8.4GW in wind energy will reduce carbon emissions by 604m tCO_2e over 20 years. In the business-as-usual scenario, the incremental cost of wind energy over the baseline equates to a cost of USD 12.0 per tCO_2e. With a package of derisking instruments in place, this cost is reduced to USD 8.2 per tCO_2e.

In this way, the South Africa case study demonstrates the positive impact of public derisking instruments. The other three case studies in the report show similarly promising results.

Conclusions

"The report's case studies quantify how well designed public interventions can reduce risk, lower financing costs and make renewable energy more affordable"

The report introduces a first version of the framework. UNDP welcomes feedback on the framework, and looks forward to working with its partners to further develop and refine it.

Overall, the intent of the framework is not to provide one definitive numerical result, but instead to facilitate a structured, transparent process, where key inputs and outputs can be checked, debated and strengthened by all relevant stakeholders. By enabling the modelling of alternative portfolios of instruments, and supporting their analysis through a set of performance metrics, the framework can build a shared technical and political understanding of the issues surrounding the promotion of renewable energy.

Two central findings emerge from the results of the report's four case studies:

- The first finding is that it is important for policymakers to address the risks to renewable energy investment in a systemic and integrated manner. In all four case study countries, the framework's financing cost waterfalls clearly demonstrate that a range of risks exist in the investment environment. Barriers to renewable energy investment can be numerous and are often deeply embedded, reflecting long-held practices centred on fossil fuels and monopolistic market structures. Any isolated, short-term effort focusing on a sub-set of risks and relying on a sub-set of instruments is unlikely to sustainably transform renewable energy markets. Each market transformation stage will usually require a mix of policy and financial derisking instruments, supplemented by direct financial incentives as required.
- The second finding is that investing in derisking measures, bringing down the financing costs of renewable energy, appears to be cost-effective when measured against paying direct financial incentives to compensate investors for higher risks. Instead of using scarce public funds to pay higher electricity tariffs, it can be advantageous to first reduce and manage typical renewable energy risks (for example, those associated with power markets, permits, and transmission) that energy investors face in a given country. Well-designed, stable policies are required by investors and can reduce risks, lower finance costs and benefit consumers.