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WORKING PAPER

LESSONS FROM OUTPUT-BASED AID FOR LEVERAGING FINANCE FOR CLEAN ENERGY

Mustafa Zakir Hussain
Catherine Etienne

September 2012

THE WORLD BANK

The Global Partnership on Output-Based Aid

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LESSONS FROM OUTPUT-BASED AID FOR LEVERAGING FINANCE FOR CLEAN ENERGY

In the context of an increased focus on results based approaches and the World Bank's new Program-for-Results instrument

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PREFACE

This working paper has been prepared as background documentation to support a number of efforts being undertaken by the World Bank and other multi-lateral and bi-lateral donors in middle- and low-income countries linking support to clean energy with the need to make such supports more effective at leveraging the private sector and more focused on delivering sustainable services to low income consumers. These efforts are linked to the delivery of grants, credits, loans, and partial risk guarantee instruments. Specific efforts include current development of financing modalities for the Program for Scaling-up Renewable Energy in Low Income Countries (SREP) under the Climate Investment Funds and the joint program on results based financing and renewable energy that has been launched by the Energy Sector Management Assistance Program (ESMAP) and the Global Partnership on Output Based Aid (GPOBA). Also, application of the new World Bank instrument: Program-for-Results. This working paper uses a combination of project experience, recent literature, and discussions with developers to substantiate its arguments.

SETTING EXPECTATIONS

This Working Paper does:

- Assume that significant investment is needed in clean energy generation infrastructure in middle- and low-income countries (irrespective of how much and whether it is due to the need to mitigate climate change, to promote green growth, or to promote the least cost local energy access solution).
- Assume that additional subsidy support (in one of a number of forms including feed-in tariffs) is required for a number of these investments (irrespective of whether carbon finance is available).
- Focus on delivery mechanisms for bilateral, multi-lateral, host government subsidy, and consumer cross-subsidy funding to enhance private sector investment. However, the specific source of funds is not deemed to be especially relevant for the purposes of this working paper.
- Focus on some of the useful characteristics of Output-Based Aid (OBA) experience to-date that may be relevant.
- Propose an option for how OBA experience could be used to deliver national and programmatic supports to projects in middle- and low-income countries in coordination with other Multi-lateral Development Bank instruments such as concessional loans and credits (such as from the Clean Technology Fund).

This Working Paper does not:

- Examine all the practical difficulties of investment in clean energy in middle- and low- income countries (including the various barriers linked to regulation, grid connection, etc.) or with the existing schemes that have sought to address the desire to accelerate clean energy investment.
- Specifically address strengths and weaknesses of the Clean Development Mechanism and only briefly touches on issues with using carbon finance in the current market.
- Carry out an assessment of experience with Feed-in tariffs or Advanced Market Commitments, or indeed other results-orientated schemes.
- Address in detail non-results based mechanisms for enhancing private sector investment in renewable energy.

ABBREVIATIONS

AEPC	Alternative Energy Promotion Center [of Nepal]
AMC	Advance Market Commitment
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
CFL	Compact fluorescent lamp
CIFs	Climate Investment Funds
CoP	Conference of the Parties
CSP	Concentrating Solar Power
CTF	Clean Technology Fund
DfID	Department for International Development [UK government]
EU ETS	European Union Emissions Trading Scheme
FIRR	Financial Internal Rate of Return
FiT	Feed-in Tariff
G-8	The Group of Eight [Governments including France, Germany, Italy, Japan, the United Kingdom, the United States, Canada, and Russia]
GEF	Global Environment Facility
GET-FiT	Global Energy Transfer Feed-in Tariffs for developing countries
GPOBA	Global Partnership on Output Based Aid
IDA	International Development Association
IDCOL	Infrastructure Development Company Limited [of Bangladesh]
IEA	International Energy Agency
IFI	International Financial Institution
IRR	Internal rate of return
IL	Investment Lending [World Bank instrument]
IVA	Independent Verification Agent
KfW	Kreditanstalt für Wiederaufbau [German Reconstruction Credit Institute]
MDB	Multilateral Development Bank
MFI	Micro-Finance Institution
MSC	Medium-term Service Contract
NAMA	Nationally Appropriate Mitigation Action
NGO	Non Governmental Organization
NOBA	[Philippines] National Output-based Aid Facility
OBA	Output Based Aid
OBD	Output Based Disbursement
PO	Participating Organization [in Bangladesh Rural electrification and renewable energy development project]
PPA	Power Purchase Agreement
PRG	Partial Risk Guarantee
PV	Photovoltaic [solar energy generation]
RBF	Results based financing
RBL	Results Based Lending [World Bank instrument]
RERED	Rural Electrification and Renewable Energy Development
SHS	Solar Home Systems
SIP	Solar Irrigation Pump
SME	Small- or medium-sized Enterprise
SREP	Program for Scaling-up Renewable Energy in Low Income Countries
SPUG	Small Power Utilities Group [of the Philippines]
TA	Technical Assistance
TTL	Task Team Leader
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
WBG	World Bank Group
WDR	World Development Report

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SUMMARY

At present, economically viable clean energy projects in developing countries are not being financed by the private sector in sufficient numbers to meet all energy access needs. Apart from the normal risks associated with investing in developing countries, the issue raised by investors is a perceived lack of financial viability of such projects for a number of reasons:

- The upfront financing requirements for clean energy projects are often more than those for conventional energy investments and therefore place higher demands on financing, including project financing (if relevant) and structuring.
  - The running costs of conventional energy faced by the operator, though typically higher than renewable energy investments, do not reflect the true economic costs. If the (negative) externality-related costs were fully added to the cost of conventional power generation, they would add to the operating costs. Without the inclusion of these externalities, the overall financial returns to a conventional energy project are often still higher than comparable renewable energy investments (even taking account of the need to transport fuel and face commodity price risk for conventional energy projects).
  - Renewable energy investments are typically perceived as significantly more risky than conventional energy investments for a variety of reasons relating to their site-specific nature, significant need for resource data, greater reliance on the regulatory and policy environment, technology, etc. To compensate for taking on more risk, investors look for (but often do not find) higher investment returns. An appropriate package of measures would look to raise returns (if appropriate) and reduce return expectations (perhaps by reducing perceived risk).
  - Where project scale is small, access to finance may be limited because investing in relatively small projects is not often cost effective to international lenders and the local financial markets may have limited capacity.
- It follows that the following actions may help address these problems:
  - **Disbursing subsidies** to increase clean energy project returns and address the financial viability gap in a secure manner, thereby making the projects bankable. Subsidies may also address consumer affordability gaps, especially when targeted.
  - **Maximizing cashflows** to clean energy projects—especially during projects' early years.
  - **Reducing the risks** associated with the project.
  - **Developing access to local finance institutions** – especially where project scale is small.
  - **Increasing capacity within local institutions**—especially financial institutions.
- In terms of solutions, there is an increasing interest from donors towards using results as a basis for disbursement of subsidy funds (known in some quarters as Results Based Financing or RBF). In such schemes, resources are disbursed not against individual expenditures or contracts on the input side, but against demonstrated and independently verified results that are largely within the control of the Service Provider. There is therefore risk transfer to the Service Provider. Output-based aid

(OBA) has pioneered this approach for delivering basic services to the poor (for water supply, sanitation, electricity, etc.).

- There is already significant experience in developing countries with OBA. Emerging evidence suggests that OBA has delivered some success relative to traditional (upfront) subsidy delivery mechanisms. OBA subsidies encourage efficiency through good targeting of subsidies and creating incentives for Service Providers to deliver in a timely manner and at lowest cost. If designed appropriately, OBA schemes can also address risks and institutional concerns that can block private investment. In particular, an OBA project can be designed to both help attract local finance (through offering low cost financing to catalyze local financing activity) and develop its capacity.
- The OBA experience highlights the merits of significant time being spent up front on project design. A large part of designing an OBA scheme concerns setting up the appropriate institutional relationships, incentives, targeting, independent verification and funds flow arrangements in middle- and low-income countries. These are important areas of experience applicable to supporting increased take up of clean energy in developing countries.
- This experience with OBA appears to be very relevant to developing a number of (institutional) aspects that are necessary to set up workable RBF schemes in developing countries. OBA schemes have generally focused on payments for making basic access affordable. These have in some cases included payment for generation capacity and outputs. Feed-in tariffs (FiTs), the traditional subsidy support for clean energy, have focused on supporting generation investment (by assuring payments for generated power). It would be sensible to combine the experience from both schemes in developing RBF projects. In particular, there appears to be a good case for results-based support for generation investment that goes beyond FiT payments and offers a more bespoke design for the project along the lines of design undertaken for delivering OBA projects to date.
- Going further and applying RBF experience (such as OBA) at scale—an RBF facility focusing on clean energy could be set-up as a government run national umbrella receptacle for international climate finance for a particular country. It would be a national level entity offering targeted subsidies/reimbursement after pre-agreed results have been independently verified. Contributors to the facility would effectively be purchasing results. These results could be broader than meter readings (which are the typical results under FiTs and which are the result of a number of intermediate steps). Subsidy payments could target bespoke intermediate steps in developing the projects (which may include targeting actions by project developers, financiers, and household consumers in turn). A number of different intermediate and final outputs could be incentivized and a variety of results could be crafted to act as triggers for disbursement. These could include financial closures for targeted technologies, project commissioning, generation of verified MWhs and working connections to consumers.
- In relation to commercial lending for projects, a partial risk guarantee issued by an MDB such as the World Bank could be used to back-stop host country credibility in the actions of such a national facility.
- Close scrutiny needs be given to how these lessons can be applied to use of funds from CTF, SREP, and general MDB lending—which are all increasingly under pressure to make use of results-based mechanisms for disbursement.

1 CONTEXT FOR THIS PAPER

The key messages of this section are summarized in the box below.

- Although there is significant investment taking place in clean energy, indications are that significantly more investment is needed to meet investment objectives whether linked to climate change, broader green growth objectives or as national/local least cost energy access solutions.
- (Limited) public funds need to focus on maximizing impact. In practical terms, this means ensuring that expenditure creates the right investment incentives for other stakeholders, especially co-investors from the private sector.
- There has also been a shift in development policy towards results based financing. Through the 2005 Paris Declaration on Aid Effectiveness, 90 countries signed up to the principle of results orientated aid, and in 2010, the UK Government announced its review of multilateral aid which aims to redirect funds in favor of results-based programs.
- Donor action to increase aid effectiveness, while critically important, is not going to address the funding gap in clean energy. More than anything else, donor funds need to be deployed in a form that maximizes private sector financing.

Background to the need for investment in clean energy from Climate Change policy perspective

The Policy Response being Requested by the Global Community Focuses on Modalities for Scaled up Investment and Results based Mechanisms.

Global investment in clean energy is increasing. However, by many measures, significantly more investment may be needed. If looked at purely from a climate change perspective, the World Development Report 2010 states that mitigation costs in developing countries could reach \$140–\$175 billion a year by 2030 with associated financing needs of \$265–\$565 billion.[1] Current flows of mitigation finance average some \$8 billion a year to 2012.

To address this requirement, the Conference of the Parties (CoP) through the United Nations Framework Convention on Climate Change (UNFCCC) and related legal instruments exist—with the aim to achieve stabilization of global greenhouse gas concentrations in the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system.

The thirteenth meeting of the CoP hosted by the Government of Indonesia in 2007 resulted in the Bali Action Plan,[2] which formalizes the need for action at the national level. It states that the CoP should implement enhanced national/international action on mitigation of climate change including "Nationally appropriate mitigation actions by developing country Parties in the context of sustainable development, supported and enabled by technology, financing and capacity-building, in a measurable, reportable and verifiable manner."

1 To limit global temperature increase to just under 2° Celsius.
2 UNFCCC 2007: 1.(b)(ii).

Significant funding has been pledged to support such actions. In September 2008, thirteen donor countries pledged over US$6.1 billion to finance the two Climate Investment Funds (CIFs) Trust Funds, the Clean Technology Fund (CTF) and Strategic Climate Fund (SCF).[3] The CTF has been developed to demonstrate new approaches and provide lessons to contribute to the negotiations under the Bali Action Plan. It promotes scaled-up financing for demonstration, deployment, and transfer of low-carbon technologies with significant potential for long-term greenhouse gas emissions savings. The CTF is financing programs in 15 to 20 (predominantly middle-income) countries or regions and may total in the region of US$5 billion in concessional funds to be lent together with MDB funds. The SCF provides support to three targeted programs to pilot new approaches with potential for scaled-up, transformational action aimed at a specific climate change challenge or sectoral response. One of these programs is the Program for Scaling-up Renewable Energy in Low Income Countries (SREP) which is to pilot and demonstrate, as a response to the challenges of climate change, the economic, social, and environmental viability of low carbon development pathways in the energy sector by creating new economic opportunities and increasing access to energy through the use of renewable energy. The program's size is approximately US$250m. The financing modalities documentation for the SREP includes results-based financing mechanisms.[4]

The CIFs were created through a consultative process that involved a series of multi-stakeholder design meetings held by the World Bank Group and which took account of extensive global climate change consultations (with potential recipients and donors, the United Nations family, other MDBs, civil society organizations, and the private sector). The funds are to be disbursed as grants, highly concessional loans, and/or risk mitigation instruments.

Thus MDBs have both lending capacity and access to concessional donor funds (i.e. funds that have more concessional terms than conventional MDB lending to middle-income countries) for use in developing greater investment in clean energy. They are able to combine the two and have significant opportunity to expand private sector investment.

Background from the Development Policy Perspective

Sustainable Development and Green Growth[5]

A number of recent international initiatives have sought to broaden the rationale for investing in clean energy from solely climate change (which has global benefits) to also green and inclusive growth, which has more localized benefits.

A recent report by the World Bank on Inclusive Green Growth (World Bank 2012) argues that what it refers to as "greening growth" is necessary, efficient, and affordable. Such growth is critical to achieving sustainable development and mostly amounts to good growth policies. Obstacles to such policies are political and behavioral inertia and a lack of financing instruments, not the cost of green policies as is commonly thought.

The UN Secretary General has launched a global initiative to achieve Sustainable Energy for All by 2030 (United Nations 2012). The initiative urges all stakeholders to take concrete action toward three critical objectives: (1) ensuring universal access to modern energy services; (2) doubling the global rate of improvement in energy efficiency; and (3) doubling the share of renewable energy in the global energy mix. Sectoral action areas for this initiative include large-scale renewable power and distributed electricity solutions. Enabling action areas

3 See www.worldbank.org/cif for more details.

4 Available at: http://www.climateinvestmentfunds.org/cif/node/2902.

5 "Green Growth" or promoting growth in an environmentally sustainable manner refers to promoting economic growth while reducing emissions, minimizing waste and inefficient use of natural resources and maintaining biodiversity (OECD definition accessible at http://www.oecd.org).

include finance and risk mitigation, referring to the need for approaches and instruments to mobilize the amount of capital required, to direct that capital to appropriate priority opportunities and—very importantly—***to reduce the risk of private investment in sustainable energy through targeted use of philanthropic and public capital and the engagement of local financial institutions.***

A Major Shift to Results-based Approaches

In developing programs under future funding efforts (such as those described above), MDBs are cognizant of a strong trend by donors towards using results as a basis for disbursement of funds. Actions such as the Paris Declaration on Aid Effectiveness, where 90 countries including the UK and France signed up to the principle of "Managing Aid for Results: results-orientated aid evaluation and notification frameworks to improve the decision making and monitoring process," are important to consider when designing policy.[6]

The World Bank's Global Partnership for Output Based Aid (GPOBA) is a partnership of donors and international organizations. Its mandate is to fund, design, demonstrate, and document OBA approaches to improve delivery of basic infrastructure and social services to the poor in developing countries. In May 2010, GPOBA donors agreed on expanding GPOBA's scope of technical assistance, and allocated a portion of GPOBA's budget for fiscal years 2011–13 to support selected World Bank country and sector teams in connection with the design of RBF schemes and projects. The purpose is to share GPOBA's experience on designing and implementing OBA schemes with project teams that are interested in results-based financing mechanisms but where OBA may or may not be the most appropriate RBF approach.

In 2010, the UK Government's Department for International Development (DfID), a major donor to multilateral organizations (IDA) and trust funds (GPOBA),[7] carried out a high profile review of multilateral aid. The review aims to ensure the UK gets the maximum value from its aid money by reviewing institutions' performance and redirecting funds to those that take a results-based approach to their programs and that can demonstrate their impact on the ground.[8]

Donor action to increase the effectiveness of aid, while critically important, is not going to address the funding gap in clean energy. A significant contribution is going to be required from the private sector to meet targets being discussed. More than anything, donor funds need to be deployed in a form that maximizes private sector financing.

6 Paris Declaration on Aid Effectiveness 2005.

7 DfID provides around £3 billion (US$4.5 billion) of funds to multilateral aid organisations and is a major donor to IDA and GPOBA, providing GBP 2.13 billion of funding to IDA over the three-year period, 2008–11. Source: DfID.

8 DfID 2010a.

2 UNDERSTANDING CONSTRAINTS TO INVESTMENT

The key messages of this section are summarized in the box below.

The Policy Maker's View

The rationale for public sector investment is linked to the test for economic viability.[9] By demonstrating that the overall benefits to society are expected to exceed the costs, the public investor can expect that society will be better off as a result of the investment.

Where there is more than one investment option (including different options based on the timing of the investment), calculation of the net economic benefits can be used to select the most economically beneficial option.

It is important to take into account all of the expected economic costs and benefits when evaluating a clean energy investment:

- Costs include the capital and operating costs of the investment as well as any non-financial economic costs of the project; and

[9] Conceptually, the rationale for public sector involvement is the presence of a market failure. In the case of clean energy investment projects, the market failure includes the failure of the market to monetize the impact of pollution and climate change. There are other market failures as well. These include local environmental impacts and for development projects, productivity benefits. Although identification of a market failure is in principle carried out at the start of the project, we have structured this section to talk about barriers to investment, including market failures, later on in this section.

- Apart from due to developing country political and off-taker credit worthiness related risks, clean energy projects fail to attract investment if they are not financially viable. Renewable energy projects tend to cost more and carry more risk than comparable conventional energy projects. A renewable project's cash flow may not fully price in the benefits of renewable energy, and may not offer sufficient additional compensation for the additional risk the investor must bear. Failure often occurs in the developmental stages of a project where relative costs and risks are particularly high.
- The timing of payments and cash flows can themselves be an additional barrier to investment. In the current climate especially, investors' preference for early returns makes renewable energy projects' combination of relatively high upfront capital costs and long pay-back periods potentially unattractive.
- A further barrier to investment concerns project scale. Small scale projects (below approximately US$20 million) face the problem that they are generally unattractive to international investors, yet the local finance infrastructure is often ill-equipped to supply the necessary finance.
- Any solution to attracting more private investment capital to clean energy projects must therefore be seeking to address one or more of the following issues:
  - Disbursing subsidies to co-finance projects and address the viability gap.
  - Maximizing cash flows to the project (especially in the early years).
  - Reducing risk to the project.
  - Developing access to local finance institutions, especially where project scale is small.

- Benefits take into account both financial revenues as well as the non-financial economic benefits (such as the avoided environmental costs of carbon and other emissions, health improvements and productivity benefits).

The Private Sector Investor's View

In considering whether or not to invest, a non-philanthropic private investor focuses on financial viability. Potential project financial returns are compared against a benchmark rate of return. The project's internal rate of return (IRR) is compared against a target IRR, or cost of capital. For a renewable energy investment, the target IRR may be the IRR of a comparable conventional energy investment.

Economically viable clean energy projects may fail to progress as gaps in financial viability are common for such projects. This relates to the concept of "additionality" associated with climate finance: that the project is not financially viable and would not be undertaken unless the (climate) financing is made available and that therefore the project is "additional" to business as usual. Figure 1 demonstrates the case for a number of real projects.

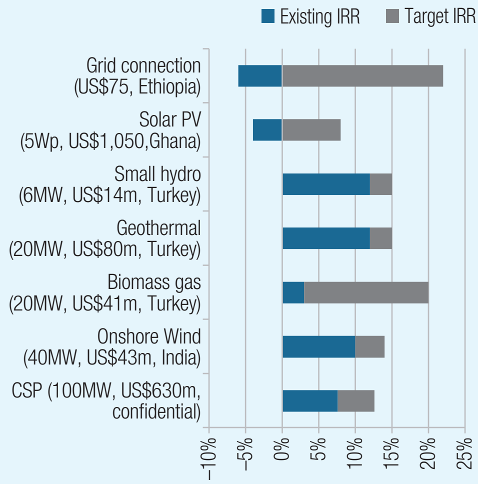
The financial viability gaps shown in Figure 1 above are created by one or both of the following:

- **Inadequate cash flows:** The market or regulatory regime's failure to account for significant economic benefits leading to low cash flows and low or negative project returns, demonstrated by the Ghana Solar PV project which exhibited negative financial rates of return; and/or
- **High project risks:** Investors requiring a high target rate of return to compensate for the high project risks, illustrated by the Turkey biomass gas project where investors were generally looking for return of 20 percent.

These potential deterrents are illustrated in Figure 2 below.

FIGURE 1 DEMONSTRATING THE VIABILITY GAP FOR RENEWABLE ENERGY PROJECTS

Technology (installed capacity if applicable, capital cost, country)



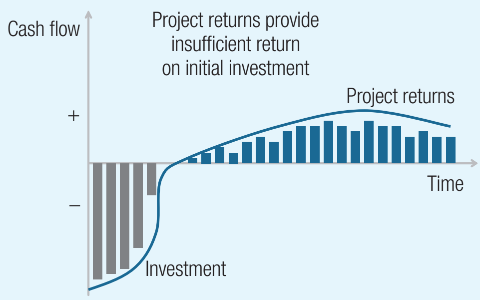
Source: World Bank Project data
Note: The project labeled "grid connection" in Ethiopia included the provision of CFL lamps and therefore could be considered a low carbon, mitigation, or green project due to its promotion of energy efficiency. For this project, the target IRR actually refers to the eventual IRR when a subsidy was added.

We discuss both of these investor deterrents, inadequate cash flows and high project risks, below.

Inadequate Cash Flows as a Deterrent to Private Investment

There are a number of costs and benefits associated with clean energy projects that are not normally priced by the market. The failure of markets to price all the benefits associated with clean energy investment may lead to low financial returns and a financial viability gap for an otherwise economically viable project. This difference is compounded by the relatively high upfront capital costs needing sufficient project cash flows. The major benefit not represented in the cash flows is the avoided carbon

FIGURE 2 THE CLASSIC CLEAN ENERGY PROBLEM: HIGH UPFRONT INVESTMENT CASH FLOWS AND INSUFFICIENT (AND UNCERTAIN) CASH FLOWS FROM PROJECT RETURNS



Source: Authors.

emissions from generating renewable energy.[10] Carbon emissions impose negative externalities because their costs (causing global warming) are not fully reflected as financial costs of the project. As a result, the high upfront capital costs associated with clean energy projects are often not sufficiently offset by the ongoing project cash flows to provide investors with a viable financial return (see Figure 2 above).

Mechanisms such as the Clean Development Mechanism (CDM) and the EU Emissions Trading Scheme (EU ETS) create supplementary carbon finance "assets." This puts a financial cost on emissions and a value on abatement. However, there are concerns that the market value of this cost is very volatile and the emissions are not sufficiently highly priced compared with the size of the negative externality to attract significant investment (Kossoy and Ambrosi 2010:5,7). The value of Certified Emissions Reductions (CERs) peaked at US$25/ton of avoided CO2 equivalent in July 2008 but fell to below US$8 in February 2009 and has remained below US$15 ever since (Kossoy and Ambrosi 2010:5). By way of illustration, DB Climate Change Advisors believe the CER value on average, but subject to case-by-case analysis, would cover less than 5 percent of the initial investment required for generation using photovoltaics (PV) and less than 10 percent for wind generation in developing countries.[11] It should be noted that this could be because PV and wind are not the cheapest forms of CO_2 reduction, not because the price of CO_2 is too low.[12]

In addition to the issues surrounding CER prices, according to Deutsche Bank (2010), CDM revenues can be limited because of the transaction costs of the CDM, and the comparatively small CER volumes generated by renewable generators. Transaction costs resulting from CDM procedures can consume 14–22 percent of CER revenues (Chafe and French 2008: 100) and the average CDM project can take three years to start to issue its first CERs (Kossoy and Ambrosi 2010). A practitioner in the field raises the broader issue of risk vs. reward in developing CDM projects. For transactions costs for CDM that can be of the order of $100,000 per project (which is a high proportion of total costs for small projects), the risk associated with the project being registered can be high, leading investors to discount CER revenue entirely from their financial analysis.

Francoz (2010) suggests that some clean energy projects could still manage to be financially profitable despite the omission of carbon pricing, and yet fail to attract investment. This suggests another force is at play. The following sub-section considers the role of project risk in explaining the financial viability gap.

10 This study focuses on the benefit of avoided carbon emissions that is realized by clean energy investment. Clean energy investments often result in further non-monetized benefits. These include local environmental impacts, health benefits and, particularly for development projects, productivity benefits.

11 Deutsche Bank 2010.

12 The percentages are a generalization. As well as the technology in question, the countries in question will be important. Countries with higher grid emission factors will lead to higher CER volumes and hence a greater contribution to capital expenditure coming from CER revenue as compared with countries with low grid emission factors.

Project Risk as a Deterrent to Private Investment

Risk is an important driver of a project's viability gap. This is particularly true for clean energy projects in developing countries where risks are perceived to be higher than in developed countries (Ritchie 2010).

Even if a project is profitable, it may still have difficulty attracting investment because of the investor's prime interest in the risk-reward ratio (Francoz 2010). In general, if an investor considers there to be a risk that a project will not deliver its expected return, it will demand a higher return as compensation.

Potential investors will want to assess the following three areas of project risk:[13]

- Construction risks;
- Operational risks; and
- Contract terms risks.

Construction Risks

The primary concern for investors is knowing when the construction phase of the project will be completed so the project can start to generate cash flows (the longer the construction phase the more heavily discounted future returns will be) and what the capital costs of the project will be (higher costs require higher and possibly earlier future returns). These may be uncertain because of a number of construction risks.

The first set of construction risks relates to preparation of the site (where environmental plans and resettlement frameworks may need to be complied with). Clean energy projects such as hydro-power and wind can be extremely site specific and this can lead to significant site related complications. The next set of risks relates to the physical construction of the generating equipment. Each project is unique and there is a risk that some stages of the construction process will not go as planned. Also, the more complex a project, the harder it will be to coordinate contractors. A delay with one contractor may force delays on all other parts of the project.

Operational Risks

Once the project infrastructure is built, the project is capable of generating cash flows. Investors need to be able to assess what these future cash flows will be. These are affected by operational risks: the risks that cover how much energy will be generated and the ongoing costs of generation.

There are four broad areas of operational risks:

- *Operations and maintenance risks* – where the reliability of the generating plant may be unknown, leading to uncertainty over the running costs of the plant.
- *Output quality risks* – uncertainty about the performance of the generating equipment (equipment is usually adapted from one project to another so it is unlikely to be fully tested, pre-project) and the local transmission equipment lead to uncertainties over the timing and quantity of energy that will be produced.
- *Environmental factor risks* – the characteristics of the local environment are unlikely to be fully known. Uncertainty over wind speeds and crop yields, for example, will create uncertainty over the ability of the project to generate energy and realize cash flows.

Contract Term Risks

Contract term risks affect a project's ability to generate cash flows as well as the ongoing transaction costs of the project.

There are three main types of contract term risks:

- *Currency risks* – the risk that the local currency may be devalued over the course of the project (reducing the value of cash flows outside the local economy) and the

[13] Note: financing risks that form part of the contract terms—for example promises of loans or payments by public institutions such as national governments or multi-lateral lenders—are covered under contract term risks.

ease with which the local currency can be converted into another and transferred internationally (increased transaction costs would lower project returns for investors from outside the local economy).

- *Force majeure events* – these are outside the control of investors and may lead to significantly lower cash flows, and/or higher project costs. This typically relates to naturally occurring events (such as floods and hurricanes which can damage capital equipment).
- *PPA/off-taker/regulatory/market rules/subsidy payment risks* – for grid (and mini-grid) projects, investors need a guarantee that the local utility company (or power consumer) will purchase the electricity they generate at the price and over the time period that allows them to recover their investment. In practice, local utilities' promises to pay may provide little guarantee. This may be because of weak finances or political demands over tariff setting.[14] For smaller off-grid projects, investors require promises of subsidy payments to be credible. In countries with new or nascent renewable energy policies, regulatory delays often stop projects in their tracks. Procedures around termination of contracts and ensuing compensation will also need to be clarified.

Additional Financing Barriers

There are further practical reasons why a project may fail to attract investment. These relate to:

- Development costs and investors' liquidity constraints; and
- Project scale.

These are discussed below.

Development Costs and Liquidity Constraints

The need for detailed information to assess financial viability and the high up-front capital costs of renewable energy projects raise a number of further issues that act as barriers:

- **Access to initial developmental finance:** Carrying out credible initial assessment, including the IRR calculation, requires considerable information, which can be costly to acquire. Obtaining initial finance for such early exploratory developmental phases is difficult yet crucial to a project attracting its equity and debt finance and achieving financial closure. A developer has described access to developmental/project preparation finance as one of the most significant project investment barriers. Estimates in the literature for project preparation costs range from 2–10 percent of construction costs (UNECA 2011).
- **High up-front capital costs and liquidity constraints:** Clean energy generation projects tend to have higher upfront costs than conventional energy projects (as projects are site specific and technologies have higher upfront costs). As well as this contributing to the problem of inadequate cash flows (discussed above), it causes another problem for investors who (in the current financial climate) face liquidity constraints. The project payback period (or the time period until the project can be refinanced) is important and investor appetite is strongly in favor of short payback periods. This means that larger projects with high upfront costs and longer payback periods are even more difficult to finance without support.

Project Scale

The discussion so far has focused upon factors that affect the financial viability of all types of clean energy projects, regardless of technology, geography, and scale. However small projects face a slightly different set of investment challenges to those of large projects, namely:

[14] Substantiated by financiers at the Africa Energy Forum 2010, Basel (see annex for list of contributors)

- Investors view small projects as relatively risky; and
- High due-diligence costs deter international investment and force small projects to access local finance.

Investors view small projects as relatively risky

Smaller scale projects are often delivered by relatively small organizations such as non-governmental organizations (NGOs). Investors tend to view these organizations as relatively high risk and so may not invest. The perception of high risk is driven by the overall high failure rate of small- and medium-sized organizations (SMEs) and the tendency of these organizations to have short track records on which to base an investment decision and little acceptable collateral (UNEP SEF Alliance 2010).

Due diligence costs and access to local finance

In addition to the higher risk that smaller projects represent, international investors are unlikely to consider investing in small- or medium-sized projects because of the fixed and sunk costs of doing so. Our conversations with a large financial organization suggested that projects with funding needs of under US$25 million would not be considered attractive.[15] This is substantiated in Chatham House (2010) where an international bank described a debt size of less than US$20 million as being difficult to finance.

The fixed and sunk costs relate to the project-specific due diligence process that must be undertaken by investors prior to investment. These can total between US$0.5 million and US$1 million per project, regardless of how small the project is.[16] Portfolio financing, which is used successfully in developed countries to overcome this problem, is less attractive in developing countries as it exposes the project to currency risk, which is difficult to protect against in countries without sophisticated financial markets.[17]

To overcome the scale problem, project developers need to be able to access local finance markets. But, this in itself can be problematic because finance markets in developing countries:

- Often lack a track record with renewable technologies and so are less well equipped to undertake due diligence and assess project risks;[18]
- Can charge high rates of interest—Chatham House (2010) provides the example of a 45 percent interest rate in Zambia; and
- Are unable to support long term loans due to the high risks of supporting these through their short term deposits[19] or indeed are unable to process anything other than a simple corporate loan.

The above assessment suggests that a number of factors will need to be adequately addressed as a prerequisite to making projects financeable. This may include the regulatory environment, site-specific issues, access to adequate transmission, and use of government and MDB guarantees. Fundamentally, however, the project may require subsidies to bridge the viability gap.

The challenge therefore is to find a way of disbursing subsidies to a project in a way that overcomes as many of the complications highlighted above as possible to attract investment. There is extensive literature comparing different funding mechanisms and their advantages (see for example, DfID 2009 and Frontier Economics 2009). The remainder of this paper focuses on RBF—an innovative form of payment—and its ability to bridge the gap and deliver greater investment.

The above discussion suggests that any solution to attracting more private investment capital to renewable energy projects must seek to address one or more of the following issues:

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[15] Interviews with financiers at the Africa Energy Forum 2010, Basel (see annex for list of contributors)
[16] Chatham House 2010.
[17] Deutsche Bank 2010.
[18] Interviews with financiers at the Africa Energy Forum 2010, Basel (see annex for list of contributors).
[19] Source: Chatham House 2010.

- Disbursing subsidies to co-finance projects and address the viability gap.
- Maximizing cash flows to the project (especially in the early years).
- Reducing risk to the project.
- Developing access to local finance institutions/local financing on appropriate terms where project scale is small.

3 INTRODUCING RBF, OBA AND ITS USE FOR CLEAN ENERGY

The key messages of this section are summarized in the box below.

Introduction

The previous sections have set the scene in terms of the need to increase private investment in clean energy and the barriers to delivering this investment. This section turns to potential solutions and in particular, RBF.

- Results-based financing (RBF) is an umbrella term for innovative mechanisms that disburse subsidies, generally after pre-agreed results have been verified. Resources are disbursed not against individual expenditures or contracts on the input side, but against demonstrated and independently verified results that are largely within the control of the Service Provider. There is therefore risk transfer to the Service Provider.
- Output Based Aid (OBA) has been used by the World Bank to deliver investment in developing countries. While OBA is generally used to deliver relatively small-scale investment, each project has had to deal with the issue of overcoming risks and developing local institutional arrangements in developing countries. The experience of using OBA to deliver investment in developing countries is therefore a valuable resource that can be drawn upon to adapt the design of efforts to deliver investment in low- and middle-income countries.

The discussion starts by defining RBF, before considering OBA in some detail.

Defining RBF

RBF can be defined as payments that are provided to businesses or households after measurable pre-agreed actions have been achieved and verified. The "financing" in results-based financing refers to a payment to address the gap in funding between costs and revenues—the so-called affordability or viability gap. The payment could, for example, be a subsidy to households so they can afford to pay the costs of connection to the electricity grid, or a cross-subsidy to a utility enabling it to purchase otherwise financially unviable energy from renewable (clean) energy sources.

The key difference from a traditional (upfront, non-performance related) subsidy is that with RBF, payments are made only *after* the Service Provider has delivered an adequate level of performance. The performance is normally (independently) verified before the payments are made. This means that the performance risk is transferred from the subsidy provider to the Service Provider. If an inappropriate investment is made, it is the Service Provider who is left unpaid.

The Service Provider is motivated to deliver these outputs by an agreement entered into before undertaking the investment setting out how much financial payment it will receive for delivering a set of defined outputs. This could be a payment per amount of electricity supplied or per household connected to the grid, for example.[20]

[20] In some cases, Service Providers may receive other benefits such as refinancing at attractive interest rates once the service has been verified. The International Development Association (IDA) funded component of the Bangladesh RERED SHS project is a good example of how this has been carried out in practice. See Box in Section 5 for a description of the Bangladesh project and how low cost loans were used.

Defining OBA

OBA refers to subsidy payments disbursed on the basis of pre-agreed and independently verified outputs such as the number of working consumer connections to a mini-grid. OBA focuses on delivering basic services (such as electricity and water supply) to low-income communities. OBA places great emphasis on ensuring good targeting of low-income recipients, independent verification of outputs, and robust institutional arrangements to ensure sustainability.

Table 1 below compares OBA with the traditional approach to disbursing subsidies.

Figure 3 shows how OBA subsidies tend to boost upfront project returns. In order to be sustainable, OBA subsidies have typically covered upfront connection-type costs, with ongoing costs paid by the consumer. However there are also examples of OBA transitional subsidies.

Figure 4 below illustrates the steps to disbursing subsidies for a typical OBA project. The process follows the numbering given against the arrows.

Figure 4 illustrates the following process:

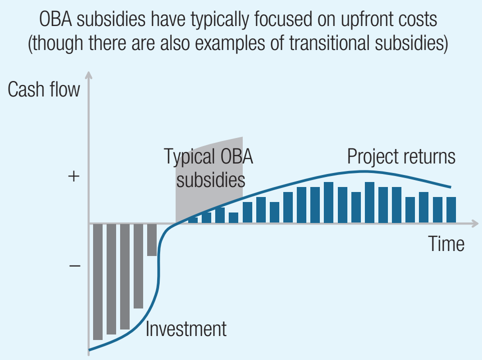
1. The Service Provider self-finances and delivers pre-defined outputs (for example, connections for off-grid households to the electricity grid, and in some cases affordable credit to households to finance capital costs).
2. To receive these subsidy payments, the results must be verified. First the Service Provider reports on the outputs it has delivered to an Independent Verification Agent (IVA).
3. These results may be checked by the IVA. Checks usually focus on whether appropriate connections have been made. In the case where the results relate to the delivery of energy this verification process could simply consist of meter readings. Checks may be scheduled over a number of months to ensure sustainability of outcomes.
4. The IVA reports back to the funding bodies on the actual quantity of outputs delivered.
5. Based on the verification reports, the funding bodies release funds to the Implementing Agency.

Table 1 Comparison of traditional subsidy and OBA instrument

	"Traditional" subsidy	OBA
Timing of payments	Upfront – before capital costs are incurred	One-off, transitional or ongoing depending upon funding and administrative capacity, nature of outputs and Service Provider preferences
Ex-ante size		Size of subsidy based on difference between cost (of technology) and ability/willingness to pay by consumer
Ex-ante assessment of institutional capability		Review of institutions and determination of most appropriate incentive structure
Ex-ante definition of funds flow		Contractual arrangement for funds flow
Basis for payments		Physical verification that agreed outputs have been delivered (not necessarily 100% sampling) and verification of billing records to ensure ongoing services are delivered
Efficiency incentive?	No – payments typically on costs incurred	Yes – subsidy level pre-determined therefore Service Provider incentivized to minimize its costs
Targeting of recipients	Counterparty	Geographic, self selection, means-based or other
Independent verification of results		Verification agent (usually independent)

Source: Authors.
Note: We use the term "traditional subsidy" to describe subsidies that are (usually) delivered on the basis of input costs rather than efficient output services, for instance, an upfront, fixed capital subsidy.

FIGURE 3 TYPICAL OBA SUBSIDIES FOCUS ON ONE OFF AND UPFRONT COSTS



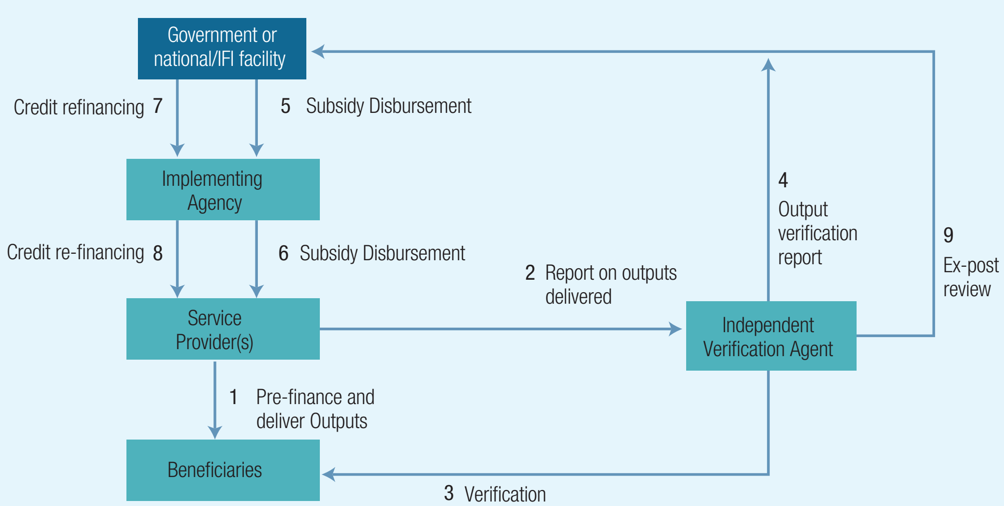
Source: Authors.

6. The Implementing Agency then releases these funds as subsidy payments to the Service Provider.
7. The OBA project may also provide incentives to Service Providers in the form of low-cost refinancing of credit. In these cases the World Bank/IFIs provide low cost loans to the Implementing Agency.[21]
8. The Implementing Agency then uses these loans to offer low cost loans to the Service Providers. These loans are typically used to finance household credit, the profits of which are used to finance Service Providers' working capital.
9. The IVA gathers information on output delivery throughout the course of the project and delivers an ex-post evaluation review to the funding bodies at its close.

While OBA is generally used to deliver relatively small-scale investment, each project has had to deal with the issue of overcoming risks and developing local institutional arrangements in low- and middle-income countries. The experience of using OBA to deliver clean energy investment in particular countries is

[21] Low cost refinancing is an important aspect of clean energy OBA projects where access to local finance is a significant investment barrier. The next section of this paper (section 5), provides more explanation and uses the experience of the Bangladesh RERED SHS phase I project to illustrate how low cost loans have been delivered in practice.

FIGURE 4 THE OBA PROCESS



Source: Authors.

therefore a resource that could be drawn upon to adapt the design of schemes to better deliver investment in clean energy in low- and middle-income countries.

The next section discusses the OBA experience in more detail. The sections after that focus on the lessons learned from the OBA projects and how these lessons can provide insights to deliver scaled up clean energy investment.

4 FOCUS ON OUTPUT BASED AID EXPERIENCE

The World Bank has considerable experience with using OBA to deliver investment in low- and middle-income countries. There are lessons to be learned from the OBA projects for delivering scaled up investment in clean energy. This section introduces the World Bank clean energy projects that have been funded through the multi-donor trust fund, Global Partnership on Output based Aid (GPOBA).[22]

The key messages of this section are summarized in the box below.

- There is significant experience with using OBA to deliver investment in developing countries. The World Bank has worked on 116 projects that incorporate OBA design features since 2002. Emerging evidence suggests that OBA has delivered some success relative to traditional (upfront) subsidy delivery mechanisms.
- The World Bank is currently using OBA to deliver six clean energy projects through its GPOBA program. These cover a wide range of technologies (SHS, mini-grid, grid access with CFL and biogas), geographies (Asia, Africa and South America) and use different levels of subsidy according to a case by case analysis of what is required (from 11 percent to 52 percent).
- The portfolio of OBA projects provide us with a useful evidence base from which to consider how RBF schemes could be designed to overcome some of the risks and institutional issues that are currently preventing investors from funding renewable energy projects on a larger scale.

OBA Clean Energy Projects

OBA has a significant track record of delivering investment in low- and middle-income countries.[23] Since the creation of the OBA approach in 2002, the World Bank has funded 116 OBA projects worldwide. GPOBA has 33 of these in its portfolio.[24] Some recent research (presented below) suggests that on average, World Bank OBA funded projects have been delivered more effectively than projects that have employed traditional "up-front" subsidies.

The results in Figure 5 relate to projects in all sectors. Focusing now on clean energy, the World Bank is involved in the delivery of 19 OBA clean energy projects. Six of these are funded by GPOBA and details of these projects (and, where relevant, their predecessors) are provided in Table 2 (please see Annex 2 for details of all 19 World Bank OBA clean energy projects).[25]

Each OBA project is designed on a case-by-case basis and considerable time is typically spent on this project design phase. The table

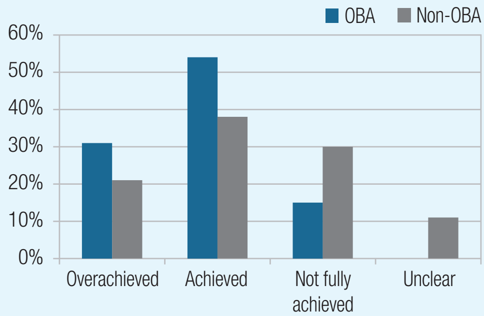
[22] GPOBA is a multi-donor trust fund set up jointly by the World Bank and Dfid. It is funded by Dfid, AusAid, SIDA, DGIS and the International Finance Corporation. For more information, visit www.gpoba.org.

[23] See Mumssen et al. 2010 for a fuller account of OBA experience to date.

[24] GPOBA was established in 2003 to test the OBA approach with the aim of mainstreaming OBA within the International Development Association (IDA) and other World Bank development partners (Source: Mumssen et al. 2010).

[25] Source: Mumssen et al. 2010, including technical support projects.

FIGURE 5 COMPARING THE PERFORMANCE OF OBA AND TRADITIONAL PROJECTS



Source: Mumssen et al. 2010.
Note: Analysis based on a comparison of 37 completed non- OBA World Bank funded projects with 13 completed OBA World Bank funded projects in the energy, health and water sectors.

illustrates the diversity of technologies and countries receiving funding and the different levels of subsidy being provided within any given technology, for example, SHS subsidies range from 11 percent (Bangladesh RERED Phase II) to 52 percent (Ghana Solar PV systems).

Box 1 provides short write-ups of examples of how the OBA process (which was illustrated in Figure 4) is being applied to GPOBA funded clean energy projects—delivering transitional subsidies to support off-grid electricity supply in the Philippines, the Nepal Biogas Support Program IV and the Bangladesh RERED Minigrid project.

The remainder of this paper looks more closely at the GPOBA projects to illustrate the experience of using OBA compared with traditional subsidies and also in particular

Table 2 Summary of the GPOBA funded renewable energy OBA projects (including previous non-GPOBA phases where applicable)

Project Name	Technology	OBA Subsidy (% total capital costs)	Start date
Bangladesh RERED Phase I (not GPOBA funded)	SHS 20–85Wp	21% (average at start) 12% (average at close)	2003
Bangladesh RERED Phase II (SHS)	SHS 20–85Wp	11% (50 Wp system)	2010
Bangladesh RERED Phase II (mini grid)	Renewable energy mini-grids 10kW–500kW and Solar Irrigation Pumps (SIPs)	40% (average)	2010
Bolivia – decentralized infrastructure for rural transformation (not GPOBA funded)	SHS installations 10–100Wp	33% (50 Wp system)	2003
Bolivia – decentralized electricity for universal access	SHS Pico-PV & 30–75Wp	50% (average)	2007
Ethiopia – rural energy access	Grid access and CFLs	43% (average)	2008
Solar PV systems for rural poor in Ghana	Large SHS (over 50Wp) Medium System (approximately 30–50Wp) Small SHS (under 30Wp) Solar lanterns Pico-system	52% (50Wp system)	2008
Nepal Biogas Support Program I,II,III (not GPOBA funded)	Biogas 4–20m^3	35% (2005 average)	1992
Nepal Biogas Support Program IV	Biogas 4–10m^3 GPOBA funding up to 8m^3	22% (8m^3 hill) 37% (4m^3 remote hill)	2007

Sources: World Bank analysis based on data from GPOBA database; GPOBA 2006b, 2007, 2008a, 2009, 2010a, 2010b, 2010c; Bajgain and Shakya 2005; and World Bank 2002:15, 2003.

BOX 1 APPLYING OBA – THE PHILIPPINES RURAL NON-GRID, AND GPOBA NEPAL BIOGAS AND BANGLADESH MINIGRID PROJECTS

Philippines rural non-grid power supply project

The Philippines rural non-grid support program aims to deliver electricity services to 360,000 households. These households are located on three of the many islands that make up the Philippines where connection to the main electricity supply grid is considered to be financially unviable. The program delivers ongoing transitional subsidies to a competitively selected local consortium of New Power Providers (NPPs) to address the problem of relatively high costs of (off-grid) generation coupled with lower household affordability. Payments are made to the NPPs on the basis of the number of verified kWhs delivered to households in each billing period. The subsidy amount is set by reference to the total 'true' cost of electricity generation (taking into account upfront capital expenditure) relative to the maximum affordable tariff to households. The subsidy is expected to decrease over time, in line with increasing household affordability and decreasing electricity generation costs.

Initial projects being financed include 12MW, 2MW and 6MW hybrid of bunker and wind projects with about 30 percent provided by the wind component. This initial pilot phase has been a success. Electricity supply costs are expected to halve (compared with supply from the previous incumbent supplier), requiring subsidy amounts to reduce and dependable capacity is expected to increase from 15MW to almost 25 MW. As a result the project is being rolled out to serve a second missionary area.

Nepal Biogas Support Program IV

The GPOBA Nepal Biogas Support Program IV closed in April 2012 and delivered biogas plants to about 261,100 rural beneficiaries. The total program cost is approximately $77m and it received $21.5m of funding from GPOBA, the Government of Nepal, the Netherlands Development Organization (SNV), the German Development Bank (KfW) together with carbon finance revenue from the World Bank-managed Community Development Carbon Fund (CDCF).

The OBA process for the project worked as follows: Biogas companies signed installation contracts with households. The installation includes a guarantee on pipes, fitting and appliances for one year and a three year guarantee on performance of the concrete structure of the plant. The OBA subsidy payment is made by the Alternative Energy Promotion Center (AEPC) on receipt of a plant completion report. The IVA provides certification on plant installation and usage to GPOBA and AEPC in parallel triggering disbursement from GPOBA to AEPC.

Bangladesh RERED Mini-grid project

The objective of the GPOBA RERED project is to provide output-based grants to the developers of renewable energy sub-projects through mini-grids and to the operators of solar irrigation pumps (SIPs) in off-grid areas to support access to electricity to households, farmers, market shops, and small and medium enterprises. The project relies on proposals submitted by sponsors of sub-projects.

(Continued on next page)

BOX 1 (*Continued*)

IDCOL has received considerable interest from sponsors of SIPs. The SIPs aim to replace diesel-run pumps with solar pumps contributing to increased access to renewable electricity to farmers while helping to reduce environmental pollution and savings in the foreign currency reserves resulting from reduced petroleum imports. For the SIPs, without GPOBA support, the tariff (cost per kWh electricity) is US$0.65. With GPOBA support, the cost is reduced to US$0.47 per kWh, a rate comparable to that paid by farmers using diesel pumps. Without grant support, operators will have to charge an unaffordable rate to farmers.

Source: GPOBA2006b, GPOBA 2007, GPOBA 2009, GPOBA 2012 and International Finance Corporation and Castalia 2007.

how OBA could overcome the risks and institutional barriers that are currently preventing scaled up investment from occurring. It then considers how these lessons apply to other RBF instruments, to scale up clean energy investment in developing countries.

5 LESSONS FROM OBA FOR USING RBF TO DEVELOP INVESTMENT IN CLEAN ENERGY

The previous sections have highlighted the potential for GPOBA's experience delivering OBA clean energy projects to be used to adapt other RBF instruments to deliver large scale investment in developing countries. To date, RBF has not been widely applied in developing countries and there are concerns about how to overcome the chief investor concerns of risk and local institutional arrangements.

This section examines how OBA can deliver clean energy projects effectively. It also considers how OBA has been used to reduce the risks and institutional barriers that can deter investment.

The key messages of this section are summarized in the box below.

Introduction

OBA has been used since 2002 by the World Bank as a way of disbursing subsidies to projects. This section focuses on the GPOBA clean

- OBA subsidies can be extremely efficient in part because a direct link is set between pre-agreed payments (not actual costs) and outputs. This has four important effects:
  - Subsidies can be set at the efficient level;
  - Subsidy recipients can be well targeted;
  - Service Providers are incentivized to deliver projects quickly and efficiently; and
  - OBA projects can be continually monitored and regularly improved upon.
- OBA can help to reduce the three main areas of risk that can deter investment:
  - Construction and delivery risks – Outputs are clearly defined and by linking subsidy payments to these outputs, contractors are incentivized to quickly deliver the defined outputs. Cost overruns may also be avoided because the subsidy amount is fixed and therefore does not cover additional costs.
  - Operations risks – subsidy payments can be staggered to reflect the various project milestones and provide an incentive for these to be delivered as a basis for payment.
  - Risks linked to contract terms – OBA projects place considerable emphasis on specifying the institutional conditions right at the start of a project. The presence of national entities to make payments based on independently verified results keeps all stakeholders focused on delivering results, helping to address some (counterparty and other) risks.
- OBA can also improve access to local finance institutions by demonstrating a project's financial viability through the pre-set subsidy; reducing the perceived credit risk of local service providers through a formal contract from a credible national body to provide subsidy payments (with the potential for providing further credit cover, as required, as a potential addition to the project); reducing perceptions of performance risk by defining outputs clearly and incentivizing their delivery; and by removing lending capacity constraints at financial institutions through low cost refinancing options to re-finance local lenders—thereby allowing them to re-invest any profits into expanding their renewable energy financing business.

energy projects to answer some of the questions that have been raised in the preceding chapters:

- Why might an OBA subsidy be more effective than a traditional subsidy?
- Which aspects of OBA may make it possible to overcome the risks and institutional barriers that are currently preventing scaled up investment in renewable energy from occurring?

While the GPOBA projects are all in progress and their experiences to date are informative, the most useful source of evidence to date comes from the previous (completed) phases of two of the GPOBA projects: Bangladesh RERED SHS; and Nepal Biogas Support I, II, III. As a result a number of experiences from these two projects serve to inform the analysis herein. For the remaining projects, as their pilot status infers, significant efforts have been required in project planning and design relating to the adequacy of local finance infrastructure before output delivery can begin (experience has shown that a project can take around 18 months or more to deliver outputs). In a few cases, unforeseen events such as political upheaval and a grid-connection moratorium have temporarily halted progress. Annex 3 provides a more detailed account of each of the GPOBA project's progress.

Why Might an OBA Subsidy be more Effective than a Traditional Subsidy?

OBA subsidies may be more efficient than traditional subsidies in part because a direct link is set between pre-agreed payments (not actual costs) and project outputs. This has four important effects:

- Subsidies can be set at the *efficient* level;
- Subsidy recipients can be well targeted;
- Service Providers are incentivized to deliver projects quickly and efficiently; and
- OBA projects can be continually monitored and regularly improved upon.

Subsidies can be set at the Efficient level

Traditional upfront subsidies, where payments are typically made prior to or as expenditure occurs, create little incentive to independently pre-determine what the efficient cost of service, willingness-to-pay and therefore level of subsidy—should actually be. With OBA projects, there is significant emphasis on project design at the start. The quantity of subsidy to be paid out for a given output is (contractually) pre-agreed with emphasis on setting the *right* level of subsidy.

The process of determining the efficient level of subsidy is a three-step process

- **Defining the outputs**: Defining the outputs is a critically important part of the OBA design process. Outputs should focus on the desired service, should capture how reliable the service delivery should be and be measurable and verifiable.
- **Establishing unit costs:** Once the output has been defined, a unit cost approach is typically used. The efficient cost of supplying the required service is arrived at based on input from (independent) experts. Depending on the context, industry associations and stakeholder consultations processes may form part of the process of reaching agreement upon the appropriate efficient level of subsidy for given outputs. Efficient cost levels may also be arrived at by building competitive bidding into the process of determining the cost.
- **Determining the level of subsidy support:** To make a renewable technology competitive with non-renewable technologies, the difference in cost relative to the least cost non-renewable energy project may be used to indicate the level of subsidy required. Any consumer willingness to pay for the additional costs of clean energy (for instance through green tariffs) would result in a reduction of the size of the subsidy required. OBA projects have generally been designed to overcome affordability issues

and in these cases, an affordability assessment at the household level is required to estimate how much subsidy support should be provided to each household.

BOX 2 SETTING SUBSIDIES AT THE EFFICIENT LEVEL TO DELIVER SHS INVESTMENT IN GHANA

The Ghana Solar PV systems project aimed to deliver solar generated electricity to poor households. Average per capita daily income is around $1 and the upfront capital cost of the SHS unit is many times this at US$1,050. The project therefore needed to establish the level of subsidy that would make the SHS technology affordable to households.

An IRR analysis was carried out for the project, which considered the costs of the SHS technology and compared this with the financial benefits of households switching from traditional fuel sources to solar generation, that is, not having to purchase kerosene fuel or replacement dry cell batteries. The analysis showed that, without a subsidy, households would receive a negative return from a SHS unit.

The IRR analysis was then repeated, but this time including different levels of subsidies, until the project could be shown to give households a reasonable level of return.

Conducting this detailed analysis has therefore enabled the Ghana SHS project to set its subsidies at the minimum required level to deliver investment in SHS. By defining the subsidy on a per household basis, the project disburses its subsidies in a targeted and efficient manner.

Source: GPOBA 2008c.

Box 2 illustrates how this was done for the GPOBA funded Ghana SHS project.

Subsidy Recipients can be well Targeted

Subsidies that reach their intended target are more effective. For a traditional (up front) subsidy, there is often no certainty that the desired outcome will be achieved and no certainty that the subsidy will benefit those that it is intended for. OBA on the other hand has more control over what and whom it benefits.

A specific step in OBA project design involves setting the appropriate target for the subsidy. For GPOBA-supported OBA projects the target is low-income consumers. Targeting can be achieved through a variety of approaches. The simplest has proven to be geographic targeting. This works by setting a clear geographic boundary within which all residents are eligible. This can be effective, for instance, where there is a clear boundary to a slum. Eligible residents in the Shivajinagar slum in Mumbai could be defined using clear geographic landmarks set out in a map included in the project's operations manual. Other low-income proxies include possession of ration cards and subsidizing only those goods and services that are demanded by low-income groups. The following examples illustrate this principle.

The IDA funded predecessor to the current GPOBA Bolivia SHS project contained a strong pro-poor element to its subsidy design. Box 3 below describes how this was achieved and its role in influencing the design of the current GPOBA Bolivia SHS project.

The Bangladesh SHS project uses a combination of geographic targeting and proxy. The scheme focuses on off-grid rural areas to capture households that are poor, since the grid is only extended to areas if consumers in that area can pay for the new extension. By definition therefore, off-grid consumers are low income. In addition, the scheme's value is further targeted at the poor because the subsidy (of $50 per household) is fixed. Smaller systems,

BOX 3 USING SUBSIDIES TO TARGET THE POOREST HOUSEHOLDS IN BOLIVIA

The GPOBA Bolivia SHS project was preceded by an IDA financed SHS project that introduced targeted subsidies. In particular, subsidies were available for SHS installations in public facilities (which tend to be used by the poorest households). As a result, 87 systems were installed in schools and clinics.

The project demonstrated strong demand for systems that benefited the poorest households. This influenced the subsequent GPOBA funded project to offer subsidies for pico-PV systems (small, low capacity, and low cost systems), which tend to be used by the poorest households. In addition, the GPOBA funded project is available for larger SHS system sizes. However, a focus on low income consumers is maintained by offering an increase in unit subsidy for SHS units up to 40Wp only, beyond which the unit subsidy is constant and the subsidy becomes a lower proportion of costs as the system size is increased.

Source: GPOBA 2006:19 and Mumssen et al. 2010.

typically purchased by poorer consumers, benefit from a higher proportion of their costs being covered by the subsidy.[26]

The Ethiopia Electricity Access Rural Expansion Project delays the introduction of its loan program until the second year of the project in newly electrified towns. This means that the consumers left unconnected are predominantly those who are unable to pay, making it easier to target the subsidies at the most needy households.[27]

The Ghana Solar PV project targeted the poorest households but found that these households were demanding different size systems from those anticipated and, as a result, the subsidies were recalibrated to cover the smaller and mid-sized systems that were being demanded by the poorest households.

For larger projects under other RBF instruments, pro-poor targeting may not be a key objective, but the ability to target recipients of payments is likely to be very important to improving effectiveness of the support. The previous examples are all sound targeting methods.

The Approach Creates Incentives for Service Providers to Deliver Projects Quickly and Efficiently

OBA, as with all RBF approaches, incentivizes Service Providers to deliver projects quickly by paying only upon delivery of outputs. Liquidity constraints were discussed in Section 2 as a barrier to investment. The quicker a project is delivered, the quicker returns will be realized and the more attractive it is for investors.

OBA incentivizes efficient delivery because the subsidy payment the Service Provider receives is fixed and known upfront, irrespective of actual costs incurred. It is therefore in the interest of the Service Provider to deliver the results at least cost and retain the benefits of any cost saving. In regulatory terms, this is a similar incentive concept to facing price controls.

To try to ensure that the subsidy remains efficient over time, a process can be followed to review and adjust the levels of subsidy up or down as required for new installations. This has been the case for the Nepal Biogas Support Program, where continued strong demand has resulted in subsidies being lowered over time to ensure subsidies are efficient and reflect consumers' willingness and ability to pay for energy.[28] However, care needs to

[26] GPOBA 2009.
[27] GPOBA 2008a and GPOBA 2010c.
[28] 28 GPOBA 2006b.

be taken that such reductions do not create unnecessary regulatory risks. If payments can be lowered at a future date, Service Providers may start to discount the payment. This would be of particular concern if reimbursement of significant capital costs were due to happen through the subsidy payment. Good regulatory practice suggests that such subsidies to Service Providers should only be adjusted for new Service Providers. Existing arrangements should be grandfathered (unless the agreement period comes to an end). If Service Providers face a risk that their subsidy may be cut mid-way through an engagement, this will serve to reduce the incentive power of the scheme.

Where external events force a project onto hold, as was the case for the Ethiopia Electricity Access Rural Expansion Project and the Bolivia Decentralized Electricity for Universal Access, a striking difference between OBA and traditional up-front subsidies is that no grants are disbursed up front or during this holding period (as no outputs are being delivered) and that these grants continue to be available to be restructured/re-allocated, if required.

Which Aspects of OBA Overcome Risks and Institutional Barriers?

To ensure greater private sector investment in clean energy, Section 2 drew the conclusion that any solution must deliver one or more of the following actions:

- **Disbursing subsidies** to co-finance projects and address the viability gap, thereby making them viable/bankable;
- **Maximizing cashflows** to the project (through means additional to a subsidy);
- **Reducing risk** to the project; and
- **Developing access to local finance institutions**, especially where project scale is small.

OBA subsidies can be effective in disbursing subsidies, reducing risks and developing access to finance.

Disbursing Subsidies to Make Projects Viable

The main aim of a subsidy is to increase a project's cash-flow and make a project financially viable from the view point of investors. As with traditional subsidy financing mechanisms, OBA subsidies achieve this.

Demonstrating ex-ante financial viability

OBA subsidies are designed to make the project financially sustainable in the long-term. This normally translates to a focus on subsidizing upfront and one-off costs such as costs of connection to the grid or capital costs of installing generation capacity. The aim is normally to encourage ongoing operating costs to be paid by consumers. In addition, subsidies are only disbursed after a number of months' continuous service delivery, and can be withheld if contractual service terms are not met. However, as highlighted in Table 1, OBA subsidies can also be transitional or ongoing. For example, the Bangladesh RERED mini-grid project (Box 1) will require the subsidy to ensure (in part) that ongoing consumer tariffs are affordable to consumers benefiting from the mini-grid.

By setting the level of subsidy payments ex-ante, OBA projects provide investors with a transparent demonstration of potential financial viability. This benefit arises from the clear link between outputs and financial support, meaning that OBA projects tend to come with clear and contractually/legally defined payments before the investor has even decided to invest. Potential investors can use this information to re-calibrate their financial models (by increasing revenues linked with operations). This can assist with investor and bank financing.

Box 5 describes how the Ghana SHS project was able to demonstrate financial viability by comparing detailed information on the expected costs and benefits of the project.[29] This information would be available to and verifiable by investors prior to making the investment

[29] GPOBA 2008c.

BOX 5 DEMONSTRATING FINANCIAL VIABILITY TO INVESTORS FOR THE GHANA SHS PROJECT

Year	Financial Costs (US$) = Cost of SHS unit +	Hardware replacement +	Maintenance =	Total	Financial Benefits = Cost of kerosene and battery replacement	Total net benefits (US$)
1	800		50	850	76.8	–773
2			50	50	76.8	27
3		100	50	150	76.8	–73
4			8	8	76.8	69
5			8	8	76.8	69
6		100	8	108	76.8	–31
7			8	8	76.8	69
8			8	8	76.8	69
9		100	8	108	76.8	–31
10		50	8	58	76.8	19
11			8	8	76.8	69
12		100	8	108	76.8	–31
13			8	8	76.8	69
14			8	8	76.8	69
15		100	8	108	76.8	–31
16			8	8	76.8	69
17			8	8	76.8	69
18		100	8	108	76.8	–31
19			8	8	76.8	69
20		50	8	58	76.8	19
FIRR (without GPOBA subsidy)						–3%
FIRR (with US$550 GPOBA subsidy reducing Year 1 cost of SHS unit from US$800 to US$250)						9%

Source: GPOBA 2008c.

decision. In particular, investors are shown the expected magnitude and timing of the costs and benefits as well as the financial impact of the OBA subsidy. In this case, the subsidy is used to reduce the cost of the SHS unit in Year 1 from US$800 to US$250. As a result, the overall financial internal rate of return (FIRR) increases from a negative amount (–3 percent) to a positive value (9 percent). If investors' hurdle rates are lower than 9 percent, they will consider investing in the Ghana SHS project.

Reducing Risks

Section 2 discussed the main areas of risk that deter investment. OBA and RBF approaches can help in reducing all three main areas of project risk: construction risk, operational risk, and contract terms risk.

Reducing construction risks

OBA requires that project outputs are well defined at the start of the project. For example, in the case of an electrification project such as the Ethiopia Electricity Access Rural Expansion Project the outcome can be defined as providing a community with access to working electricity services and the output can be defined in terms of the number of working grid connections established, or in remote areas, the number (or capacity) of free-standing generating units installed. Service Providers only receive subsidy payments if and after they deliver these outputs. They are therefore highly incentivized to deliver the intended measurable outputs as quickly as possible, reducing the possibility of construction delays. The subsidy amount is pre-determined so there is also a high incentive to avoid cost overruns, since the Service Provider will not be compensated for these.

Reducing operational risks

OBA provides the flexibility to stagger subsidy payments through the course of a project to reflect a number of desirable outputs that relate to the operational phase of a project. For example, the current GPOBA-funded Bolivia and Ghana SHS projects spread the payment of subsidies to the Service Providers over a number of years to reflect a series of medium term project milestones.[30] To receive all of the subsidy payment, a Service Provider must correctly install a SHS system and carry out annual service visits for the following three years. This ensures that a SHS unit is installed *and* is subsequently operating properly over a number of years.[31]

If these outputs are not achieved, subsidies will not be disbursed. Again the direct output based subsidy provides a strong incentive to deliver measurable output and in this case, reduces a project's operational risks. Box 6 describes how the Bangladesh RERED SHS project has been able to achieve this by implementing a thorough inspection process.

Reducing contract terms risks

In designing an OBA scheme, there is significant focus on getting institutional arrangements right at the program design stage. This includes

BOX 6 BANGLADESH RERED: USING RBF TO INCREASE LIKELIHOOD OF PROJECT PERFORMING

The Bangladesh RERED project has been hugely successful in delivering its aim of investment in SHS in rural Bangladesh. In the space of ten years, investment in Solar Home Systems increased from just 7,000 units to over 1.2 million units. The project is currently delivering investment at a rate of 41,666 systems per month.

The project has minimized the risk that its suppliers do not perform by carefully designing project outputs (including a post-installation warranty) to reflect desired performance and by having an inspection process undertaken by the government coordinating agency (IDCOL) as a central design detail of the project. IDCOL checks the Service Provider's performance as part of the process of releasing subsidies and refinancing arrangements.

This inspection process is considered "absolutely critical" by the project team in terms of ensuring confidence in the program by Service Providers, financing agencies and consumers. The project team monitors inspection rates and the quality of outputs and observes a direct link between the probability that a Service Provider's outputs will be inspected and the quality of the output it delivers.

Source: Based on discussion with World Bank project Task Team Leader.

30 GPOBA 2006 and GPOBA 2008c.
31 Operation risk is also reduced by FiTs, which pay a fixed rate tariff over a period of around 20 years.

determining the required outputs, payments for eligible outputs and how funds will flow. Determining and operationalizing these arrangements ahead of time offers significant certainty to the Service Provider that payments will be received if it performs. In most projects, the Service Provider deals with a local agent, but has the assurance that the local agent is acting on instruction from and financial/technical support of the government (or perhaps one or a group of international organizations). This may help reduce perceived counterparty risks. For example, under the Bangladesh RERED SHS phase I project, the local Service Providers were able to access credit more easily because of the good reputation of the project and, in particular, the guarantee that a government sponsored program involving international donor agencies supported Service Providers financially (and often technically).[32]

The combination of well-defined outputs and linked subsidy payments can reduce investor concern over project delivery and provide increased confidence over future returns. This assumes that there is a high degree of confidence in the central institution managing and funding the subsidy payments.

Developing Access to Local Finance Institutions

One of the key benefits associated with OBA to date is its ability to develop access to local finance institutions. As discussed herein, two factors encourage the Service Provider to make the most of possible local/regional financial options:

- **Service Providers must pre-finance project outputs:** This is one of the central features of the OBA process, as illustrated in Section 3. Service Providers are required to self-finance project outputs (e.g., the purchase of capital equipment and labor costs) until the delivery of outputs has been independently verified. Unless the Service Provider has significant working capital, which is unlikely to be the case in many of the remote rural areas that OBA projects target, the Service Provider will have to seek external finance to cover these up-front costs.
- **Service Providers are unable to access international finance sources for small projects:** Access to local finance is important for many OBA projects because the project size is often too small, and the risks associated with (local and small) Service Providers too high, to attract international investment (see Section 2).

OBA projects have the potential to both access local finance and, where the local finance infrastructure is less well developed, to remove capacity constraints.

OBA projects can help Service Providers access local finance

With a well-designed OBA project, the local finance institutions are given sufficient comfort and are able to offer financing to the Service Provider:

- Potential investors can see that the project is financially viable because of the pre-set OBA subsidy (see, for example, Box 5), which is carefully sized, taking account of consumer willingness and ability to pay;
- The perceived credit risk of local Service Providers is lowered because they have an explicit contract with national or international institutions paying the subsidy and these institutions are viewed as credible by local lenders; and
- Perceptions of performance risk are lowered through clear output definition and providing delivery incentives to Service Providers in the form of performance based subsidies.

OBA projects can remove capacity constraints within local financial markets

Where projects cannot access international finance markets, a key barrier to accessing

[32] Source: Conversations with the current Bangladesh RERED project TTL

finance is often the lack of existing financial capacity within local finance markets. Finance institutions may be constrained in their ability to lend because of their relatively small size and the short-term nature of the deposits that secure their lending (IDA 2009). OBA can attempt to address this issue by providing low cost financing to local financial institutions. In many OBA projects, the local financial institutions are also the dealers. This allows profits from one activity (finance) to be transferred to the other (dealing). The financial institutions use the low cost loans they are eventually able to secure through OBA to offer (higher cost) loans to consumers. As well as addressing households' finance constraints, the profits from offering the loans can be used to expand the capacity of their dealer business. The Bangladesh RERED SHS Project is an example of how low cost IDA lending combined with

BOX 7 THE BANGLADESH SHS PROJECT: EXPANDING LOCAL FINANCE CAPACITY

The Bangladesh RERED project has been particularly successful because of a project design that effectively leverages the existing network of the local finance community to support the RERED project's activities.

The RERED project identified affordability and access to finance as the key barrier to SHS investment in rural Bangladesh. Local finance institutions had some difficulty in offering loans to households because the short-term nature of their deposits would not support the medium-term loans required by households to pay for SHS units.

To address these issues the project sought to demonstrate and then roll out a credit facility to households that would make the SHS units affordable and develop the local finance market so that eventually there would be a sustainable local credit market.

This was achieved through a two-step process:

- First the project demonstrated the viability of offering credit to households via a no-risk pilot project. The pilot offered participating institutions total refinancing of their loans to households thereby eliminating their credit exposure to households.
- Next, the OBA project was started. This enabled Service Providers to benefit from a low-cost (government backed) IDA credit to refinance 80 percent of each existing micro credit loan, once the outputs for the project had been verified.

Participating Organizations (POs) were offering households credit at a rate of 12 percent to 15 percent with a repayment period of three to five years. By being on-lent (upon output verification) IDA credit at a rate of six percent to eight percent over a period of 10 years, the POs could extract their capital for use in further new projects, thereby enabling them to rapidly increase the size of their lending and projects portfolios (all based on delivering results).

As a result, the project has seen the entry of several financial institutions into the market, all of which are offering credit to rural households. It is the view of the project team that the project has led to at least one institution having sufficient lending capacity that it could offer credit without any donor support.

Source: Based on discussion with the World Bank project Task Team Leader.

a results-based approach can be harnessed to grow the capacity of the local financial institutions and deliver clean energy investment. This is summarized in Box 7.

Similar credit schemes have been put in place for other GPOBA funded projects to enhance the capacity of local finance providers. The Nepal Biogas Support program is subsidizing approximately 37,300 biogas plants for rural Nepalese households. The program targets households with the ability to raise up to US$485 of capital, which can be partially achieved through micro-credits. The program supports this by including a microfinance component to help target households pre-finance their investment. Local microfinance institutions have been provided with a credit facility (sourced from KfW) to finance loans to biogas users. The Micro-Finance Institutions (MFIs) can charge households an interest rate of up to 16 percent on their loans, enabling them to build lending capacity. In addition, the project is providing MFIs with ongoing capacity-building advice.[33]

Where there is an absence of microcredit, OBA can help overcome this by supporting alternative sources of credit. The GPOBA Ethiopia Electricity Access Rural Expansion Project is providing a connection subsidy to the local electricity supplier EEPCo. This provides the utility with sufficient working capital to be able to offer poor new households five-year loans to cover their grid connection costs.[34]

OBA projects appear to generally have several positive facets, especially relative to up-front subsidies. They can address risks and institutional barriers that have been identified as key blocks to scaling up investment in clean energy.

There is never, of course, a one-size-fits-all solution. OBA relies on the capacity of Service Providers to pre-finance their activities and, in some cases, to offer consumers access to credit. It also requires some level of institutional capacity to allow credible independent verification and funds flow. Most often, this institutional capacity is most beneficial if held at the government level. OBA is also reliant on being able to identify the efficient cost of delivering the service ex-ante.

Furthermore, slightly different concerns may apply when considering larger-scale solutions. The final chapter of this report looks at what these concerns may be and discusses how OBA experience could be applied at scale.

[33] GPOBA 2006b and GPOBA 2007.
[34] GPOBA 2008a.

6 USING RBF TO DELIVER CLEAN ENERGY IN DEVELOPING COUNTRIES

As the previous sections have demonstrated, OBA, a form of RBF, has been effective in addressing critical areas for projects (including clean energy), namely: enabling a project to be financeable by disbursing subsidies—and in many cases doing so in ways that has reduced risks and increased project cash flows; developing institutional arrangements including local financing architecture; and enabling continuous project evaluation and improvement.

The experience to date with OBA is however with relatively small-scale projects. This section looks to how OBA could be scaled up to deliver significant clean energy investment.

The key messages of this section are summarized in the box below.

Introduction

The previous sections have discussed OBA and its effectiveness in addressing areas of concern for implementing RBF clean energy projects in developing countries on a larger scale. This section looks to how OBA outcomes could be scaled up to deliver significant clean energy investment.

- OBA schemes include payments for consumer connections that have also included covering the costs of generation investment. FiTs have focused on supporting generation investment. It appears to be sensible to combine the experience from both schemes to develop RBF projects. In particular, there appears to be a good case for results-based support for generation investment that goes beyond FiT payments and offers a more bespoke design for the project along the lines of designs undertaken for delivering OBA projects to date.
- Employing OBA principles at scale, an RBF facility focusing on clean energy could be set up as a government run national umbrella receptacle for international climate finance for a particular country. It would be a national level entity offering targeted subsidies/ reimbursement after pre-agreed upon results have been independently verified. Contributors (donors) to the facility would effectively be purchasing results.
- These results could be broader than meter readings (which are the typical results under FiTs and which are the result of a number of intermediate steps). Subsidy payments could target intermediate steps in developing the projects (which may include targeting project developers, financiers and household consumers in turn). A number of different intermediate and final outputs could be incentivized and a variety of results could be crafted to act as triggers for disbursement. These could include financial closures for targeted technologies, project commissioning, generation of verified MWhs and working connections to consumers.
- A partial risk guarantee issued by an MDB such as the World Bank could be used to backstop host government credibility in the actions of such a national facility (especially in early years and in countries with high government risk perception).

The section starts by recapping on the issues that need to be addressed when developing RBF projects, and discusses the additional evidence on these issues that has been gathered during the course of this research through conversations with developers and financiers. The section then proposes a framework for making use of the benefits of OBA to date to deliver larger scale investment in renewable energy projects.

Issues that Need to be Addressed to Develop RBF Projects

To date, the focus on scaling up investment in developing countries has been on FiTs. Under the heading of the potential of FiTs to deliver scaled-up investment, the Deutsche Bank GET-FiT paper[35] identified a number of issues in implementing FiTs, but these concerns are relevant to RBF in general. These concerns have been confirmed and added to by developers during the course of the research for this paper and are summarized in Table 3.
Many of these considerations (highlighted in bold in Table 3) derive from concern around institutional arrangements. For example, the need to: level the playing field for renewable technologies through incentive programs; significantly increase knowledge on local resource and grid conditions; increase the regulatory capacity of local operators; and improve the credibility of local legal structures and increase local finance capacity.

Conversations with a developer involved in delivering clean energy projects in Africa highlighted three particular concerns for attracting project investment (see Section 2):

- Liquidity constraints: reflecting the financing concern in table 3 below brought about by the current financial climate whereby investors are less willing to invest in projects where capital must be committed for relatively long periods. This puts some bias in favor of relatively smaller projects.
- Raising developmental equity finance: reflecting the financing and technical concerns in Table 3 on the costs and risks associated with preparing a project for financial closure and difficulties raising equity finance to do so.
- Raising project debt finance: reflecting the financing concern in Table 3 that local banks lack the capacity to offer more sophisticated forms of project debt finance and expertise in renewable energy. This applies mainly to smaller projects, since larger projects will attract more

35 Deutsche Bank 2010.

Table 3 Considerations that need to be addressed to implement RBF in developing countries

Consideration	Examples of specific concerns
Cost competitiveness	Cost competitiveness of renewable technologies and **availability of incentive programs to level the playing field with conventional technologies**.
Technical and engineering concerns	Grid quality and **availability of grid data**; **availability of resource data; ability to integrate renewable energy generation; local technical expertise;** and equipment supply.
Project development concerns	Experience of local utilities and developers with **PPAs, feed in tariffs and standard offer contracts; local legal structures; interconnection standards; utility regulatory structure;** available financial resources for development.
Financing concerns	Risk-return ratios; **credibility of policies and regulations; political currency and corruption risks,; local bank lending capacity and expertise in renewable energy;** access to international finance and **investor liquidity constraints**.

Source: Deutsche Bank 2010 and conversations with developers.

sophisticated regional commercial banks (and many practitioners are of the view that there are sufficient quantities of debt for larger well-prepared projects).

With the case of FiTs in *developed* countries, pre-existing institutional arrangements (such as the availability of wind data or regulatory and interconnection arrangements) have typically been strong and FiTs have tended to focus on providing viability gap payments for renewable generators on the basis of power generated. In contrast, OBA addresses low-income consumers in areas that typically have relatively weak institutions. A significant part of designing the OBA scheme has therefore been about designing appropriate institutional relationships, incentives, targeting, independent verification and funds flow. **These would all be important agenda items for successfully extending FiT type RBF schemes into developing countries.** The announcement of FiTs on their own—without setting up the arrangements above—would likely look good on paper but would leave a lot of work still to do on the implementation of such projects.

The challenge is therefore how to apply the lessons from individual OBA projects to funding larger scale RBF (e.g., FiT) projects at a national or regional level.

Proposal for Developing RBF Projects

In some cases, OBA has provided payments for connections that have also included payment for generation investment. FiTs have focused on supporting generation investment. It appears to be sensible to combine the experience from both schemes to develop RBF projects. **In particular, there appears to be a good case for results-based support for generation investment that goes beyond FiT payments and offers a more bespoke design for the project along the lines of designs undertaken for delivering OBA projects to date.**

Proposal for an RBF Facility for Clean Energy

This section considers delivery of supports to clean energy at scale, using OBA experience. An RBF facility could be permanent. It could be based around a credible national institution with a well-designed system of delivering subsidies and concessional/long tenor financing to incentivize increased investment in, and use of, certain forms of generation capacity. The facility could bring together several sources of donor funds and could be scaled up over time.

One of the principal benefits of having such a facility in place is that a number of common issues are addressed upfront at the design stage. This includes identifying key institutions involved in the scheme and developing appropriate legal/financial inter-relationships. Key institutions and staff can receive capacity building at an early stage. There may also be a technical assistance (TA) window, independent verification, and secretariat capabilities that can be shared across projects operating through this facility. Having such a credible national facility in place encourages new Service Providers to enter the market and, it is expected, will encourage greater donor and national commitment to providing these basic services.

The Facility would offer an umbrella arrangement, allowing government and various donor funds to be co-mingled for coordinated disbursement. This allows flexibility if the government or donor funds vary in size (even significantly) over time. Such a facility arrangement could start small but expand to receive much larger sums for disbursement should a global funding agreement for GHG reduction be reached.

The facility would be housed in an existing national institution with a good reputation for independent, credible, and transparent decision-making. The basic concept is for the facility to enter into legally binding agreements with Service Providers before disbursing funds. These agreements would define the scope, scale, and requirements for subsidy payments to be delivered. The facility may also provide technical assistance to support project implementation.

As they are described above, the permanence of such a facility addresses the need to deliver subsidies on a scaled-up basis, rather than on the pilot basis that is the case for most OBA projects. Such facilities are also likely to bring together several sources of donor funds. This sends out a strong signal to potential investors that funds are immediately available to support eligible projects and will be for the foreseeable future.

Donors should be attracted by the institutional arrangements and results-based approach. Different donors (and the government) could pick different results off a menu of results that would be independently verified prior to disbursement by the facility. The aim would be to incentivize behavior that leads to the outcomes required by those contributing the funds. The government and the donors would effectively be "purchasing results" in relation to clean energy investment and production.

Subsidies for large-scale investments using FiTs are designed to make an investment financially viable. OBA is often employed to address downstream household affordability. Large-scale clean energy investment in developing countries may, in practice, need to address both upstream financial viability and downstream consumer affordability. Additional targeted subsidies may therefore also need to be paid directly to low-income households.

It could be envisaged that projects—especially larger ones, would have cash flows from the facility shaped/tailored to ensure the projects are able to move ahead. This would, for instance, require care as regards the capabilities of parties to reach financial closure and to address risks as appropriate.

Once there is a national facility in place, credible and effective technical support to projects' developmental phases could be built into processes relating to working with the facility. For instance, a requirement of bringing a project to the facility could be that it is pre-screened, found to meet requirements, and then vetted in detail by a credible technical body. This support could be achieved through parallel contracts with national and international level research bodies under credible confidentiality agreements with the developer. Such a body would contain the required technical and resource capacity to effectively and quickly provide a credible view as to whether the project should move ahead.

Figure 6 illustrates a possible structure for using an RBF facility to scale up investment in a developing country.

The remainder of this section provides a more detailed description of the characteristics of the proposed national RBF facility and how such a facility would address the problems faced in scaling up clean energy investment while fitting in with MDB priorities.

The Characteristics of an RBF Facility

The characteristics of a RBF facility are described below in terms of the:

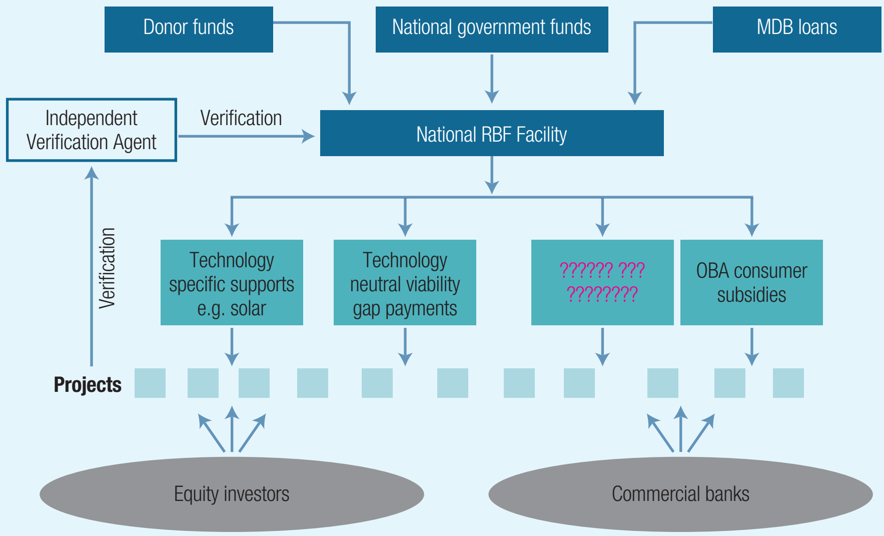
- Overall characteristics of the facility;
- Eligible results that could be supported;
- Types of funds that could be held; and
- Potential counterparts to the facility (direct recipients).

Overall characteristics of the facility

The RBF facility could have the following key characteristics:

- ***Disburses against results, not inputs –*** Disbursements would occur after progress has been verified against pre-agreed results. The aim would be to incentivize behavior that leads to the outcomes required by those contributing the funds.
- ***Flexibility on types of results (which means flexibility on types of actions being incentivized) –*** Results would not be limited to electricity generation meter readings (as is typically the case with FiTs). The Facility could pay out for a number of (intermediate) activities that donors or government are trying to incentivize.

FIGURE 6 ONE POSSIBLE STRUCTURE OF AN RBF FACILITY TO SCALE UP INVESTMENT IN DEVELOPING COUNTRIES



Source: Authors.

For instance the facility could incentivize banks/national financial institutions to achieve financial closure for eligible technologies through the provision of debt/equity, in which case financial closure and subsequent commissioning could be triggers for disbursement of concessional funds to the project. Certain donors/the government could focus on specific technologies by specifying results specific to the technologies, for instance, concentrating solar power could be given a boost by defining installation of generation capacity and generation of MWhs of energy as earning disbursements. Others funds in the facility could remain technology neutral and pay out simply on results relating to a broad set of qualifying (renewable energy) technologies.

- ***Programmatic and national level*** – A partnership approach across the donor community would maximize the impact of limited funds. This suggests an approach that uses a broad program—with RBF taking the form of a national level Facility. Ideally, the Facility would be housed in an existing credibly run national institution (e.g. the major national development bank). This ***would help to reinforce the fact that this is a facilit***y ***for the country and for the long-term***.
- ***Targeted –*** Different windows could target project types and end-consumer types that meet the overall objectives for the facility. Targeting would be carried out by clarifying what is and isn't eligible for reimbursement from the Facility. Such targeting could also help countries with untargeted existing subsidies to target them by re-channeling these funds through the RBF Facility.
- ***Verification –*** Results would be verified independently prior to disbursements by the facility. Verification could take many forms, including documentary audits and physical assessments/meter readings. The verifier would be independent and credible.

Eligible results that could be supported

The government and the donors would effectively be "purchasing results" in relation to clean energy investment and production. These results can take many forms as long as they can be clearly understood, captured in contracts and verified.

OBA subsidies have tended to cover upfront costs—the thinking being that not subsidizing ongoing costs would help to ensure that the scheme is sustainable in the long term (as it would not require ongoing subsidies). On the other hand, FiTs are all based on ongoing costs. There is some experience in OBA with transitional subsidies. For instance, the Private Sector Participation in SPUG areas project in the Philippines involves a subsidy designed to cover the difference between the "True cost of generation rate," a rate revealed through an auction process, and the "socially acceptable generation rate." This subsidy is levied on all users of electricity.

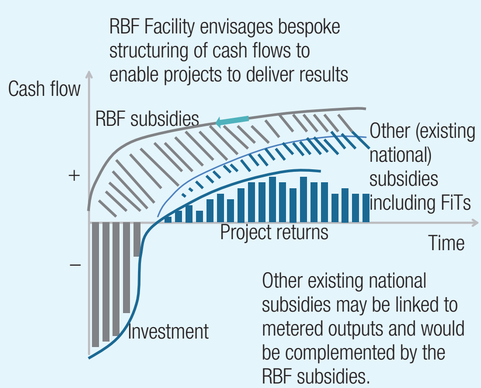
- Results can be broadly specified, such as "energy from a list of qualifying technologies," or narrowly specified, such as "energy from wind or CSP." Donors could influence the types of results used as disbursement triggers based on their and host government priorities.
- Results could relate to a number of different stages of developing the project, including financial closure, commissioning, meter readings, etc. Therefore, this could be wider than simply feed-in tariffs (though it needn't be if FiTs would be appropriate). The approach would be bespoke (though probably less so for smaller projects). The design of these stages would be important to reducing some of the risks perceived by developers. For instance, early stage investors would be comforted that as long as they take the risk and invest on early stages (data gathering and feasibility studies), they would receive payment rapidly at a certain point in time that does not have to be as late as the project generating revenues. Clearly, the existence of the subsidy should not take away risks that the developer is best equipped to handle (such as commercial risks). However, payment and timing risks are risks that could be reduced through this arrangement. Cash flows can be shaped to provide appropriate incentives to developers etc.

Type of funds that could be held

The funds held by the facility could originate from a number of sources.

- From an international perspective, the Facility acts as an umbrella set-up for all donors, increasing coordination and consistency in use of donor funds. Looking forward, such a facility could be the national receptacle for new global climate finance funds for the country in question. It could also be a focal point for the MDBs delivering clean energy related funds.
- However, national (domestic) funds could equally be routed through this facility.

FIGURE 7 RBF FACILITY PAYMENTS ENVISAGE BESPOKE STRUCTURING OF CASH FLOWS—ESPECIALLY IN THE EARLY YEARS—WITH A FOCUS ON DELIVERING OPERATIONAL PROJECTS FROM QUALIFYING TECHNOLOGIES



Source: Authors.

These could be from the central budget or from specific surcharges on energy users. They could also be sourced from current untargeted subsidy programs.

Experience with OBA has mainly been with grants, and grants would clearly offer the easiest approach for delivering the subsidy. The amount required could be estimated to be roughly equivalent to the difference between the avoided cost of viable conventional power and the cost of clean energy (multiplied by the quantity of clean energy being developed). However, grants may be limited and subsidized loans, especially those offering long tenor, may be extremely attractive. Depending on the country, IBRD and IDA could be on offer as well as CTF. These come with repayment moratorium periods and long repayment tenors.

Potential counterparts to RBF Facility (direct recipient of payments)

The Facility could disburse to a number of different counterparties. In fact, one project could have a number of recipients from the Facility, especially if it is a large project and different stakeholders are responsible for delivering different pre-agreed results.

- **Developers/IPPs:** Developers and the IPP project company would be assimilating the equity to cover the riskiest upfront costs for the project (including land, permits, feasibility studies, etc.). The experience to date with FiTs in developing countries

BOX 9 USE OF IBRD, IDA AND CTF FUNDS AND IBRD/MIGA GUARANTEE OPPORTUNITIES

As the Facility is housed in a national institution, IBRD, IDA and/or CTF funds could be disbursed to the facility with the usual sovereign guarantee arrangements. IBRD would help to extend tenor while IDA and CTF would clearly offer extremely concessional terms (together with long tenor).

How RBF facilities fit with MDB priorities

The World Bank is preparing a number of lending projects with disbursement based on results. These are referred to as output-based disbursement (OBD). The aim is to shift from funding inputs to funding outputs. This also means that the focus of preparation moves from developing and assessing procurement plans to setting up verification and monitoring mechanisms. The latter are institutional arrangements that could outlast the project itself.

In fact, the World Bank recently launched a new instrument known as "Program-for-Results." This is in line with a broader shift from transaction-based to program-based support to governments. It would ensure that the Bank's technical as well as financial support is even more strongly focused on institutional development, capacity building, and implementation support at the program level with emphasis on the countries' capacity to monitor results. It would also enable the Bank to more effectively leverage its own financing and collaborate with other development partners in supporting government programs.

The RBF facility approach set out in this paper would therefore be very much in keeping with the direction of the World Bank in relation to its approach to lending. Funds from the CTF that currently use World Bank lending modalities would also be able to be disbursed using approaches consistent with the RBF facility approach, whether with the existing Investment Loan (IL) Output based disbursement instrument or the new Program-for-Results instrument.

Source: World Bank 2010d.

suggests that there may be significant reduction in risk for these parties if the Facility disburses directly to them rather than to a utility that is eventually purchasing the power. Paying each developer/IPP separately may increase transaction costs relative to paying an intermediary (such as the utility). However, direct payment to the investor is considered to reduce potential risk surrounding the willingness and ability of the intermediary utility to continue to pay the agreed subsidy to the investor throughout the project term. It is likely that risk mitigation would more than compensate for the higher transaction costs. More actions may be required though in terms of developing contractual certainty (for instance through PPAs) in conjunction with the facility.

- **Commercial bank or syndicate:** The facility can also focus on financial closure and thus a financial institution, fund, or other entity could receive payments from the Facility when financial closure and further financial milestones are achieved. Disbursing directly to financial institutions may reduce their risk and increase their willingness to participate in financing the project.

How the RBF Facility Addresses the Investment Problems

The RBF facility has the potential to address a number of problems related to scaling up clean energy investment.

- **Attracting equity finance:** Equity financing the developmental stages of a project is high risk and in practice, few developers are available to come in with equity finance for these early stages (project preparation). Yet, at the developmental phase, equity finance is often critical to obtaining the necessary further equity and debt finance and therefore financial closure. In discussions, a developer supported the concept of an RBF facility solution that delivered payments for results based on delivery of early stage outputs such as achieving financial closure. The developer commented that early output triggers (rather than waiting for project revenues) would have a significant impact on attracting equity investors to finance the developmental phases of projects and interestingly, that using such incentives to attract early phase equity would have a significant positive impact on a project's ability to attract equity investment for the later phases.
- **Attracting debt finance:** The RBF facility may mobilize/scale up local financial institutions by providing them with more certainty of refinancing through the RBF Facility once the project reaches certain milestones. This is a particularly important area. A developer commented that, based on its experience delivering a project in East Africa, medium/small-sized projects often find it hard to attract debt finance (more so than equity). For the East Africa project, while local African (equity) funds were available to take on the project risk and invest up until the project was operational, obtaining the necessary debt finance was more challenging. In particular, the local banks' experience was limited to simple loans or balance sheet financing arrangements and they lacked the capacity to provide project finance. The view on RBF is that if these commercial banks receive comfort that there will be cheaper refinancing available in the future (RBF payments based on the project reaching certain milestones), they may feel comfortable to develop their capabilities and business line in this area. This would be similar to the effect discussed in the context of micro-finance for the GPOBA project in Bangladesh, where the provision (and certainty) of cheaper refinancing when outputs were verified spurred the microfinance firms to expand their business lines in relation to solar home systems.

- **Liquidity constraints:** The current financial climate puts a premium on investments that are able to make early returns on investment, releasing the original investment capital back to the investor. The RBF facility would use results-based subsidies to provide strong incentives to deliver outputs rapidly (as subsidy disbursements are dependent on this) and would therefore have the effect of speeding up returns on invested capital. In addition, a subsidy that could be designed to provide payments at early project milestones would further incentivize investors who are looking for early returns on their investment.
- **Policy credibility:** A credible, national, visible institution will help to reduce risks that the payments will not be forthcoming in the future. Ideally, the Facility would be housed in an existing credibly run national institution (e.g. a national development bank). This would help to reinforce that this is a facility for the country and for the long-term.
- **Credibility of agreements:** The national facility could be reliant on the government following an operations manual setting out the detailed institutional arrangements. Investors with concerns over whether these arrangements will be adhered to could benefit from an MDB backed partial risk guarantee (PRG). A PRG provides a guarantee for private lenders against the risk of a government (or government owned entity) failing to perform its contractual obligations with respect to the private project. In this case, **the PRG could guarantee the actions of the national RBF Facility** (see Box 10).

BOX 10 FOCUS ON GUARANTEE SUPPORTS FOR THE FACILITY AND ITS ACTIVITIES

The RBF national facility being discussed would be reliant on the host government institution following an operations manual setting out the detailed institutional arrangements. Investors with concerns over whether these arrangements will be adhered to could benefit from an MDB-backed partial risk guarantee (PRG). A PRG provides a guarantee for private lenders (and indirectly for investors/project companies) against the risk of a government (or government-owned entity) failing to perform its contractual obligations with respect to the private project. In this case, the PRG could guarantee the actions of the national RBF Facility.

IBRD guarantees are counter-guaranteed by the sovereign and could be offered at two levels—the entire facility and on a project-by-project basis. Guarantees would cover specific actions under the control of the sovereign or its institutions. For example, changes in law, failure by a national entity (such as the facility) to meet contractual agreements, and failure to issue approvals in a proper and timely manner. Guarantees, when triggered, have a significant impact on the sovereign in terms of requirements for repayment on outstanding loans and negative market perception and are therefore highly effective at enforcing government actions relating to contracts and policy. They also provide a strong signal that the government is committed to the program. It should be noted here that the host government's indemnity of the World Bank does not actually increase the government's liabilities if the government is already directly obligated to the private sector on the same liabilities.

7 CONCLUSIONS

There is considerable discussion on the need to scale up investment in clean energy through more effective use of donor funds and their use to leverage greater levels of private investment. There is currently considerable debate about how RBF instruments (including FiTs) could be applied to better deliver scaled-up investment in developing countries, for instance deliberations prompted by Deutsche Bank under a scheme known as "GET FiT." RBF, which can be defined as payments that are provided after measurable pre-agreed actions have been achieved and verified, has been delivering large-scale clean energy projects successfully in developed countries (under FiTs), but faces institutional hurdles before it can be used to deliver similar projects in developing countries.

These institutional hurdles to scaling up investment include (but are not limited to) the issues of: setting in place credible payment and verification mechanisms; raising equity finance, particularly to finance the early development stages of a project where lack of data can make it difficult to predict future performance; raising debt finance especially for small projects where there is limited access to sophisticated national or regional lending facilities; investors' liquidity constraints, a result of the current financial climate which puts a premium on (smaller) projects where capital is committed for relatively short periods; and the credibility of policies and agreements that support project delivery.

There is already considerable experience in developing countries with one form of RBF—OBA. OBA projects focus on delivering pro-poor services. Depending on their design, they can also be effective in addressing a number of the critical areas for clean energy projects, namely: enabling a project to be financeable by disbursing subsidies in such a way as to reduce risks and increasing project cash flows; and ensuring continuous project evaluation and improvement. The experience with OBA appears to be relevant to a number of institutional aspects that need to be developed in order for RBF to be a success in developing countries.

This paper puts forward the concept of RBF Facilities as a way to apply OBA type solutions at scale to address a number of the issues for delivering scaled up investment in clean energy. An RBF Facility focusing on clean energy could act as a national umbrella receptacle for international climate finance for a particular country. It would be a national level entity offering targeted subsidies/reimbursement after pre-agreed results have been independently verified. These results could be broader than simply meter readings (the typical results under FiTs). Subsidies could target projects, project developers, financiers, and household consumers.

A number of different activities could be incentivized and a variety of results could be crafted to act as triggers for disbursement. Bespoke subsidy cash flows could be crafted to maximize the likelihood that good projects from qualifying technologies reach financial closure and are developed. Results triggering disbursement could include financial closures for targeted technologies, project commissioning, generation of verified MWhs and working connections to consumers.

A partial risk guarantee issued by an MDB such as the World Bank could be used to support investor confidence in such a national facility. Close scrutiny needs be given to how these lessons can be applied to use of funds from CTF, SREP and general MDB lending, which are all increasingly under pressure to make use of results-based mechanisms for disbursement.

8 REFERENCES

Bajgain, S. and Shakya, I. 2005. The Nepal Biogas Support Program: A successful model public private partnership for rural household energy supply. Ministry of Foreign Affairs, The Netherlands, SNV-Netherlands Development Organisation, Biogas Sector Partnership, Nepal.

Blok, K. 2006. Renewable energy policies in the European Union. Energy policy, Vol. 34, 251–255.

Bloomberg New Energy Finance. 2010. Asia outstrips the Americas. Press release 07 January 2010.

Chafe, Zoe, and Hilary French. 2008. Improving carbon markets. In State of the World 2008: Toward a sustainable global economy. Washington, DC: WorldWatch Institute.

Chatham House. 2009. Unlocking Finance for Clean Energy: The Need for 'Investment Grade' Policy. London, Chatham House.

Chatham House. 2010. Scaling up Renewable Energy in Developing Countries: Finance and Investment Perspectives. London, Chatham House.

Deutsche Bank. 2010. GET-FiT Program Global Energy Transfer Feed-in Tariffs for Developing Countries. DB Climate Change Advisors. April 2010.

DfID. 2009. Advance Market Commitments for low-carbon development an economic assessment, Vivid Economics for DfID, March 2009.

DfID. 2010a.UK to review multilateral aid spend. Press release 09 June 2010.

DFID. 2010b. Department for International Development Project Concept Note – Pilot low carbon AMC in Rwanda. 22 April 2010.

DfID. 2010c. Advanced Market Commitments for low carbon technology: institutional dimensions, Chatham House for DfID, (Draft) April 2010.

Francoz, E. 2010. Renewable Energies and Energy Efficiency, Beauty and the Beast. Private Sector and Development, Issue 6. Paris, Proparco.

Frontier Economics. 2009. Alternative policies for promoting low carbon innovation: A report for the Department of Energy and Climate Change. Available at: http://www.renewableseast.org.uk/uploads/FrontierEconomicsLowCarbonInnovationSTC130709[1].pdf

Government of the Philippines. 2010. Philippines National Output-based Aid Facility (NOBA). Operations Manual for Output-based grants and technical assistance. 26 May.

GPOBA. 2006. GPOBA Commitment document: Bolivia Decentralized Electricity for Universal Access

GPOBA. 2006b. GPOBA Project Appraisal Commitment Document: Nepal Biogas Support Program IV

GPOBA. 2007. GPOBA Operational Manual: Support for Nepal Biogas Program

GPOBA. 2008a. GPOBA Commitment document: Ethiopia Electricity Access Rural Expansion Project.

GPOBA. 2008b. GPOBA Operational Manual: Solar PV Operational Manual for Ghana Energy Development and Access Project (GEDAP), September.

GPOBA. 2008c. GPOBA Commitment document: Solar PV systems for rural poor in Ghana

GPOBA. 2009. GPOBA Commitment document: OBA for Rural electrification and renewable energy development in Bangladesh

GPOBA. 2010a. GPOBA Semi-Annual Status Report: Bolivia Decentralized Electricity for Universal Access. 15 February.

GPOBA, 2010b. GPOBA Semi-Annual Status Report: Solar PV systems for rural poor in Ghana. 15 February.

GPOBA. 2010c. GPOBA Semi-Annual Status Report: Ethiopia Electricity Access Rural Expansion Project. 15 February.

GPOBA. 2010d. GPOBA Semi-Annual Status Report: Nepal Biogas Support Program. 15 February.

Hamilton, K. 2010. Scaling up Private Equity Investments in Renewable Energy in Developing Countries. Private Sector and Development, Issue 6. Paris, Proparco.

Hussain and Irwin. 2008. Attracting Private Investment in Mitigating and Adapting to Climate Change in Developing Countries: Is there a role for New Donor-funded financial interventions? World Bank Working Paper, Second Draft. October.

Intelligent Energy Executive Agency. 2007. Assessment and optimisation of renewable energy support schemes in the European electricity market. Intelligent Energy Europe. February.

International Development Association. 2009. Project paper on proposed additional financing credit for the rural electrification and renewable energy development credit. July.

International Energy Agency. 2009. World Energy Outlook 2009. Paris, IEA/OECD.

International Finance Corporation and Castalia. 2007. Improving electricity supply in remote island areas through subsidized private provision. November.

Kossoy, A. and Ambrosi, P. 2010. State and Trends of the Carbon Market 2010. Washington D.C., Carbon Finance.

McKinsey & Company. 2009. Pathways to a low-carbon economy – version 2 of the global greenhouse gas abatement cost curve.

Mitchell, C., Bauknecht, D., and Connor, P. 2006. Effectiveness through risk reduction: a comparison of the renewable obligation in England and Wales and the feed-in system in Germany. Energy Policy 34, 297–305.

Mumssen, Y., Johannes, L. and Kumar, G. 2010. Output Based Aid: Lessons Learned and Best Practices. Washington D.C., World Bank.

Paris Declaration on Aid Effectiveness. 2005. Available at: http://www.oecd.org/dataoecd/30/63/43911948.pdf

Proparco. 2010. Annual Report 09: Investing in a sustainable future. Available at: http://www.proparco.fr/jahia/webdav/site/proparco/users/administrateur/public/PDF/RA%20Proparco%202009%20BD_Eng.pdf

REN 21. 2010. Renewables 2010 Global Status Report (Paris: REN21 Secretariat)

REEEP. 2009. Renewables Global Status Report (2009 Update). Washington D.C., Renewable Energy Policy Network for the 21st Century: 32.

Ritchie, D. 2010. Barriers to Private Sector Investment in the Clean Energy Sector of Developing Countries. Private Sector and Development, Issue 6. Paris, Proparco.

Stern. 2007. The Economics of climate change: The Stern Review. Nicholas Stern, Cambridge: Cambridge University Press.

UNECA. 2011. Public-private partnerships in Africa's Energy Sector: Challenges, best practices and energy trends. Addis Ababa, UNECA (30 June–1 July).

UNEP SEFI NEF. 2009. Global Trends in Sustainable Energy Investment 2009. Paris, UNEP/NEF.

UNEP SEFI NEF. 2010. Global Trends in Sustainable Energy Investment 2010. Paris, UNEP/NEF.

UNEP SEF Alliance. 2010. Publicly Backed Guarantees as Policy Instruments to Promote Clean Energy. Paris, UNEP.

UNFCCC. 2007. Report of the Conference of Parties on its thirteenth session, held in Bali from 3 to 15 December 2007. Addendum. Part Two: Action taken by the Conference of the Parties at its thirteenth session. Decision 1/CP.13.

United Nations General Assembly. 2009. Progress report on innovative sources of development finance: Report of the Secretary-General, 29 July 2009.

United Nations. 2012. Sustainable Energy for All: A Global Action Agenda. The Secretary-General's High-Level Group on Sustainable Energy for All. Final Review Draft, 5 April.

World Bank. 2002. Project Appraisal Document on a proposed credit to the People's Republic of Bangladesh for a Rural Electrification and Rural Energy Development Project, May 31. Energy and Infrastructure Sector, South Asia Regional Office.

World Bank 2003. Project Appraisal Document on a proposed IDA credit to the Government of Bolivia for an adaptable program credit decentralized infrastructure for rural transformation, May 22. Finance Private sector and Infrastructure Department, Latin America and Caribbean region.

World Bank. 2010a. World Development Report 2010. Washington D.C., World Bank.

World Bank. 2010b. Beyond the sum of its parts: Combining Financial Instruments to support Low Carbon Development. Washington D.C., World Bank.

World Bank. 2010c. Concept Note (Draft): Review of the Design and Performance of RE policy: Experience and Best Practice in Selected Developing Countries. April.

World Bank. 2010d. Concept Note (Draft): Investment Lending Reform: A new results-based lending instrument. Operations Policy and Country Services. September.

World Bank. 2010e. Innovative Finance for Development Solutions: Initiatives of the World Bank Group. Washington D.C., World Bank.

World Bank. 2012. Inclusive Green Growth: The Pathway to Sustainable Development. Washington D.C., World Bank.

ANNEX

Annex 1
Financiers and Developers Consulted during the 2010 Africa Energy Forum, Basel

1. ABSA Capital, South Africa.
2. AES Africa Power Company.
3. Aldwych International.
4. Fieldstone Private Capital Group.
5. Globaleq.
6. Nur Energy.
7. Vestas Mediterranean.

Annex 2
World Bank Clean Energy OBA Projects

Project Name	Country	Funding source	Type of output	World Bank subsidy (US$m)	Planned number of beneficiaries	Project status
Rural electrification and renewable energy development (IDCOL SHS)	Bangladesh	GEF, IDA, ADB, IDB, KfW, GTZ	SHS installations	8.2	1,221,960	OBA component complete (met targets)
Bangladesh RERED Phase II (SHS)	Bangladesh	GPOBA	SHS installations	13.75	2,373,075	Implementation
Bangladesh RERED Phase II (mini-grids)	Bangladesh	GPOBA	Household connection to the mini-grids and solar irrigation pumps	1.1	TBD	Implementation
Bolivia infrastructure for rural transformation	Bolivia	IDA	SHS installations	10.0	90,000	OBA component complete (met targets)
Renewable energy development	China	GEF	PV SHS	27.0	1,600,000	Closed (target achieved)
Renewable energy development	Cambodia	GEF	PV SHS	3.5	316,200	Closed (target not fully achieved)
Rural energy access	Ethiopia	GPOBA	Household connections and CFLs	8.0	1,142,857	Implementation
Solar PV systems to increase access to electricity services	Ghana	GPOBA	SHS installations	4.35	75,000	Implementation
Rural Electrification Project	Honduras	GEF	SHS installations	2.35	35,000	Implementation
Home Solar Systems	Indonesia	GEF	SHS installations	5.2	35,438	Closed (under-achieved on targets)
Household energy and universal access	Mali	IDA, GEF	Household connections and SHS	3.5	36,360	Implementation
Biogas Support Program IV	Nepal	DGIS, KfW, GPOBA	Biogas plants	5.0	261,000	Closed
Off-grid Rural Electrification	Nicaragua	IDA	SHS installations	1.8	42,000	OBA component complete (met targets)
Rural Power	Philippines	GEF	SHS installations	1.85	50,000	OBA component complete (met targets)
Sustainable Energy Development Project	Rwanda	GEF	Solar Water Heaters	TBD	TBD	Implementation

(Continued on next page)

(*Continued*)

Project Name	Country	Funding source	Type of output	World Bank subsidy (US$m)	Planned number of beneficiaries	Project status
Renewable energy for rural economic development	Sri Lanka	GEF	SHS installations	3.9	425,000	*OBA component complete (met targets)*
Energy services delivery	Sri Lanka	IDA	SHS installations	5.7	75,000	*Closed (over-achieved on targets)*
Increased Access to Electricity	Zambia	GEF	SHS installations	2.54	15,000	*Implementation*
Additional Financing for Zambia Increased Access to Electricity Services	Zambia	IDA	SHS installations	10	180,000	*Implementation*

Source: Mumssen et al. 2010: 148–150 and World Bank data.
Note: Project status dates as of June 2012.

Annex 3 Discussion on GPOBA Project Progress

The experience to date with GPOBA funded renewable energy projects is that, in general, once a project has been approved for OBA funding, it takes typically at least 18 months to deliver verifiable outputs when dealing with incumbent Service Providers, longer when competitive bidding is involved.

Table 4 illustrates the progress of the seven GPOBA funded projects and the relevant predecessors.

Four of the projects in Table 4 have been delayed either because there has been a higher than expected need to invest in the local finance infrastructure, or because political upheaval and/or local generation capacity issues have made it impossible to proceed.

The following sub-sections describe the issues encountered and progress to date for these four delayed OBA projects—Bolivia decentralized electricity for universal access; Ethiopia rural energy access; solar PV systems for rural poor in Ghana; and Nepal biogas support program IV.

Bolivia – Decentralized Electricity for Universal Access[36]

The GPOBA Bolivia decentralized electricity project continues the investment in SHS units that was started by a similar International Development Agency (IDA) funded project. The project aims to provide at least 7,000 households, micro enterprises, and schools with

[36] The principal source for this sub-section is GPOBA 2010a.

Table 4 Summary of GPOBA clean energy project progress

Project Name	Technology	Planned subsidy disbursements (date vs. % of total)	Actual % subsidy disbursed
Bangladesh RERED Phase I (not GPOBA funded)	SHS 20–85Wp	Completed project	100%
Bangladesh RERED Phase II (SHS)	SHS 20–85Wp	2010 (25%) 2011 (35%) 2012 (40%)	62%
Bangladesh RERED Phase II (mini grid)	Renewable energy mini-grids 10kW–500kW	2010 (15%) 2011 (40%) 2012 (45%)	15%
Bolivia – decentralized infrastructure for rural transformation	SHS units 10–100Wp	OBA component complete	100% (OBA component)
Bolivia – decentralized electricity for universal access	SHS 30–75Wp	2007–09 (100%)	3%
Ethiopia – rural energy access	Grid access and CFLs	2008 (18%); 2009 (41%); 2010 (41%)	0.7%
Solar PV systems for rural poor in Ghana	SHS Solar lanterns – 50Wp	2008 (10%); 2009 (25%); 2010 (65%)	23%
Nepal Biogas Support Program I,II,III (not GPOBA funded)	Biogas 4–20m^3	Completed project	100%
Nepal Biogas Support Program IV	Biogas 4–10m^3 GPOBA funding up to 8m^3	2008 (10%); 2009 (40%); 2010 (50%)	100%

Sources: World Bank Analysis based on information provided in the GPOBA database (April 2010); GPOBA 2002:15; GPOBA 2009:24,30; GPOBA 2010a; GPOBA 2008a:9; GPOBA 2008b:18; GPOBA 2006b; GPOBA 2007:10,12;GPOBA 2010b; GPOBA 2010c; and World Bank 2003.
Note: Subsidy disbursement data based on GPOBA records as of 29 June 2012.

access to electricity and to deliver improved lighting to communities. Overall the project hopes to benefit 9,000 households or 45,000 people.

A key technical aspect of the GPOBA Bolivia project was to refine and bring into more common usage, an output based service contract mechanism. This has been achieved. The Bolivia project was the first to implement medium-term service contracts (MSCs).[37] In doing so it has passed on valuable lessons to subsequent projects such as the Ghana SHS project (described subsequently).

By June 2012 the project had disbursed three percent of its total subsidies against a planned disbursement total of 100 percent by the end of 2009. Aside from the achievement of developing a service contract mechanism, the project which is being delivered with the Bolivian Government had been severely delayed because of political upheaval:

- 2007–08: the project changed Ministry which in turn saw three changes of Minister and the departure of key project staff within the Ministry.
- 2009: Project paralyzed for nine months while new Ministry staff appointed. Project recommenced in September 2009 when the project coordination unit became fully operational.

Overall, the project was delayed by over 2 years but is now on track to achieve planned outputs. Contracts were awarded in 2011 and implementation work has commenced.

Ethiopia – Rural Energy Access[38]

The Ethiopia rural energy access project aims to connect (or legalize the connection of) 229,000 households, or 1.14 million individuals. Poor rural households are unable to afford the upfront costs of connecting to the grid and in some cases the ongoing cost of electricity. The OBA subsidies are being used to help finance the local electricity provider's connection finance program, whereby households are provided with a five-year connection fee loan, and to lower ongoing electricity costs by providing each household with two compact fluorescent lamps (CFLs). The Project had been delayed for about two years due to a now-resolved national energy supply crisis.

The Project was extended and restructured to modify the subsidy disbursement schedule to 80 percent disbursed upon physical verification and 20 percent after three successive billing cycles in order to ease the pre-financing burden on the service provider.

Solar PV Systems for Rural Poor in Ghana[39]

The Ghana solar PV systems project aims to deliver 15,000 solar lanterns and SHS units, benefitting 90,000 households—this is three times the current level of installations in Ghana. The project became effective in January 2009 and by September 2010 had disbursed 14 percent of the total project subsidy (against a planned disbursement of 35 percent by the end of 2009). As of June 2012, the project has disbursed 23 percent of the planned subsidy.

The relatively low subsidy disbursement masks significant project activity in three principal areas:

- **Building local microfinance capacity:** Micro-financiers at the rural bank responsible for refinancing Service Providers' loans received training during the first two months of the project.
- **Training inspectors:** Inspectors were hired and trained and an inspection manual developed and consulted on during the first four months of the project.

[37] MSCs provide suppliers with exclusive access to project subsidies for a period of three to four years following installation. In return, suppliers are contracted to not only connect households to SHS technology, but to ensure the units remain serviceable and to engage in market development activities to support market growth and sustainability of servicing facilities. After the contract period, users and suppliers may graduate to open competition (Mumssen et al. 2010).

[38] The principal source for this sub-section is GPOBA 2010c.

[39] The principal source for this sub-section is GPOBA 2010b.

- **Product and market development:** The project team found there to be a largely absent product market. Local vendors were largely new to the market and were developing bespoke PV solutions at (too) high costs. A pilot phase ran from June to December 2009 to test demand and the efficacy of other project areas.

Access to local finance, a solid inspection process and a marketable product are all fundamental aspects of any OBA clean energy project, yet were largely absent at the start of the project. A key output of the project was to rectify this. The Project was extended and restructured to (i) reduce the target for large SHSs and increase the target for small and medium-sized SHSs, responding to market demands; (ii) offer an output-linked incentive payment for participating rural banks to compensate their costs in servicing PV rural loans.

Having done so, the Ghana project is now expected to achieve its targets, taking into account the necessary delays discussed above and valuable lessons can now be passed onto other RBF projects that face similar issues.

Nepal Biogas Support Program IV[40]

The Nepal Biogas project aims to construct 37,300 household size biogas plants, benefitting 261,000 people. The project became effective at the end of 2007 and closed by April 2012 having achieved all targets.

The project completed the design phase on time but was delayed a bit due to weak demand. Lack of demand may have been driven by, for example, the difficulties in mobilizing remote communities with no experience of biogas; to some extent the ongoing political instability in Nepal, and perhaps to a larger extent, currency changes that increase the cost of raw materials such as cement to households. To address these issues the project delivered an improved dissemination strategy, revised its subsidy rates and is also decreased the wholesale loan rate to microfinance institutions.

[40] The principal source for this sub-section is GPOBA 2010d.

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