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The Economics of Results-Based Funding in the Energy Sector

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CONTENT

Foreword

Over the past few decades, efforts regarding how to make development aid more effective have intensified. Aid effectiveness was a key area of focus discussed in a series of events collectively known as “the aid effectiveness agenda” that culminated in the Paris Declaration on Aid Effectiveness in 2005.

Results-based approaches gained considerable attention during the same timeframe. Results-based systems explore ways to shift the focus from carrying out activities (inputs) to achieving results by linking financial development support to outcomes and outputs rather than inputs. The idea that payments are made only when results are achieved is an attractive option for the development community, politicians and taxpayers alike.

Norway is one of the countries that has been exploring whether results-based approaches in development cooperation can contribute towards increased effectiveness. The focus has primarily been in the health sector, and climate and forestry. In recent years, however, Norway has also supported results-based approaches in the energy sector through support to the Clean Development Mechanism (CDM), GetFit in Uganda, the Energizing Development initiative and Energy+.

However, uncertainties remain regarding under what conditions results-based funding are appropriate and when they can add value compared with traditional approaches. This paper, *The Economics of Results-Based Funding in the Energy Sector,* identifies a number of issues that should be analysed before a results-based programme is implemented, providing a possible theoretical economic framework within which such programmes can be assessed.

Norad aims to ensure that Norwegian development aid funds are spent in the best possible way, and to report on what works and what does not work. Whereas the findings, interpretations, and conclusions are those of the authors, by publishing this paper Norad aims to stimulate to further debate about when results-based funding can be appropriate. Norad is very grateful to the authors, especially Pernille Holtedahl who took initiative to develop the paper. Their analysis provides an extremely valuable and timely contribution to the ongoing international discussion regarding results-based funding in the energy sector.

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Abstract

There is an increasing interest among development agencies and international financial institutions in employing results-based systems when providing support to projects in developing countries. This is also the case more recently for the energy sector. Results-based systems could potentially help increase financing flows to renewable energy and energy access, however important questions remain as to under what conditions such support systems are appropriate and provide efficiency gains relative to current practices. Whether the framework is suitable is both a theoretical and empirical question, based on what we know from behavioural economics as well as through practical experience through projects. In this paper, we identify and discuss a selection of issues that should be analysed before a results-based programme is implemented and suggest a theoretical framework within which such funding programmes can be analysed.

Mosambique // Photo: Ken Opprann

01 Introduction

More effective use of development assistance is an ongoing challenge. The reform and re-structuring of development assistance has its roots in the 1990s with the establishement of the Milennium Development Goals in 2000 and the OECD-co-ordinated "Paris Declaration on Aid Effectiveness" in 2005[1]. Moreover, many donor Governments, coping with constrained budgets since the financial crisis in 2008, are now even more closely scrutinized at home and are pressed to justify transfers to developing countries.

A greater focus on effectiveness and results has led to a push to think creatively. One of the schools of thought has been the growing interest in what is termed *output-based aid* or *results-based aid.* The sector that has had the most experience with this approach, is the health sector. Results-based funding (RBF) for health services is already common in many developed countries – for instance rewarding hospitals for meeting volume and quality targets - and the use of this framework for providing aid to the same sector in developing countries has been a logical extension[2]. Perhaps the richest source of experience with results-based funding in developing countries so far comes from The World Bank Global Partnership for Output-Based Aid (GPOBA) - a partnership of donors and organisations with a mandate to fund, design and share information about output-based approaches to funding in developing countries[3].

Recently, the interest in re-designing programmes has turned to the energy sector[4]: examples include the Government of Norway which launched an international initiative to support renewable energy and energy efficiency in developing countries (*Energy+*), the multi-donor *Energising Development (EnDev) RBF Facility* and the World Bank's *Program-for-Results (P4R)*. Other World Bank initiatives are currently carrying out research on the potential for RBF in the energy sector[5]. These initiatives are relatively recent, however, so lessons learned within the energy sector are still quite limited.

The hypothesis of this paper is that the conditions under which RBF is appropriate are not always present in the energy sector. Indeed the value of RBF programmes is so far unproven and tailoring to each situation is very important[6]. Meanwhile, designing RBF schemes opens up a number of questions regarding what results to measure, how to measure them, when to measure them, and whether the organisational model will produce the desired results. It is important that non-RBF options are fully considered as well, and that all components of a results-based program are thought through before implementation, so that costly or poorly designed processes are avoided. Whether the

1 See e.g. http://www.oecd.org/dac/effectiveness/parisdeclarationandaccraagendaforaction.htm for more information on the Paris Declaration.

2 For example, established in 2007, the World Bank's Health Results Innovation Trust Fund (HRITF) has USD 550 million of commitments until 2022: http://www.rbfhealth.org/ (accessed June 2014). See also Savedoff (2010) for an overview of examples of results-based financing in the health sector.

3 As of 2013 GPOBA provided USD 170m in subsidy funding and technical assistance to 37 projects in its portfolio (Source GPOBA www.gpoba.org, accessed June 2014).

4 It is likely that the new UN Sustainable Development Goals to be implemented from 2015 onwards will include a goal on energy, which has not been the case with the Millennium Development Goals agreed in 2000.

5 See World Bank (2013), which analyses the application of RBF in the energy sector, particularly for energy access and energy efficiency.

6 See e.g. DFID, 2013 p31-32.

framework is suitable is both a theoretical and empirical question, based on what we know from behavioural economics as well as from practical experience through pilot projects.

It is moreover important when citing the success of result-based funding in other sectors, such as the health and forest sectors, that we consider any contextual differences. For example, the upfront costs in a large energy infrastructure project are typically far greater than investments needed in the forest sector. Verification is simpler with regards to vaccines in the health sector when we already know that a person will continue to be immune and hence do not need to verify this years later. Furthermore, the project lead time is typically longer in the energy sector than either the health or forest sector. Similiarly, susainability is a high risk in the forest and energy sectors, whereas with regards to vaccines, again we know by and large that the persons vaccinated will continue to be immune. That is, success in one sector is not automatically transferrable to another sector. Furthermore, the energy sector itself is also very diverse. Programmes involving clean cookstoves


Laos // Photo: Ken Opprann


Nepal // Photo: Ken Opprann

installations, are very different from a regional grid development programme or a hydropower plant development project.

This paper discusses some important issues related to results-based funding in the energy sector and suggests a possible economic framework within which they can be analysed. The intent of the paper is not to provide final answers but rather to stimulate to critical thinking and debate.

02 What do we mean when we talk about “results”?

Concepts such as “results-based financing”, “output-based aid”, “payment by results”, “performance-based funding”, etc. are often used interchangeably and due care is not always taken as to their precise meaning. For instance, one may argue that a distinction should be made between the terms “funding” and “financing” – the first term suggesting a grant whereas the second indicates a return on investment. Important players such as the World Bank and the UK Department for International Development (DFID) interpret these terms differently[7]. Different interpretations may make the task of exploring and designing new “results-based” systems more challenging, as different partners may have different ideas in mind. In this paper, we will use the term *results-based funding* as what we are discussing are grants that are given with no expectation of a financial return or of the funds being repaid.

In a results-based system, funding to a program or project is only released upon evidence that certain pre-agreed results have been met.

Although all development assistance programs today make use of some form of focus on results, e.g. by managing projects using the Logical Framework Approach (LFA), results-based systems try to shift the focus from payments for inputs to payments for outputs, or outcomes. The intent is to move down the direction of the arrow in Figure 1.

Ideally, we’d like to incentivise at the development impact level - for instance *poverty reduction* due to increased access to electricity – but that is usually too complex and comes at a very high monitoring cost. Indeed, there is usually a trade-off between the relevance (or quality) of what we measure and the ease with which we can measure it, and often we settle for outputs or inputs which are easier to measure and value.

FIGURE 1: EXAMPLE OF A PROJECT LOGIC FLOW IN THE ENERGY SECTOR

7 See Pearson, 2011, in a study of the health sector.

Some additional definitional aspects that merit further thought are:

Firstly, what we aim to measure depends on the ultimate stated goal of a programme: there is a difference between the goals of “75% of households have access to reliable grid electricity supply” and “75% of households have grid connections”. In the latter case one could at least in theory install the connections and on the surface achieve the results, but if maintenance is not kept up or there are operational problems, then the goal in the first statement will not be reached. This points to the need for a careful definition of goals, indicators and measurement techniques.

Secondly, results-based funding in the “purest” sense in a (renewable) energy context would take the form of a continuous release of payments upon proof of results, for instance a feed-in-tariff (FiT) paid per produced kWh of renewable energy despatched to the grid (the “result”). This is different from a payment to a PV installer for each installed PV panel, which should arguably be labelled as output-based

Uganda // Photo: Ken Opprann

funding. Hence, a distinction in this case can be made between outputs and results – in Figure 1 labelled outcome- but more generally it again points to a need for a careful discussion of definitions both at the theoretical and practical level when results-based programmes are designed and implemented.

03 The Sequencing of funding and results and the challenge of upfront capital needs

One of the distinctions between results-based funding systems and traditional official development assistance (ODA) programmes is the sequencing of funding and results. Typically, when it comes to ODA programmes, objectives for, say, the subsequent year are agreed upon and funding released to implement those objectives. That is, funding is given to inputs. In a results-based funding system, the objectives with corresponding "price tags" are set, but the funding is released only when the objectives have been met and the *outputs* (or results) produced.

This sequencing becomes a challenge when capital is required upfront. The type of incentive structure in results-based funding assumes certain characteristics in the relationship between funder and implementer. Some may see the parallels to a teenager receiving pocket money once certain household chores have been carried out. But the teenager does not need to make an investment, other than his/her time, during the implementation process. Similarly, a salaried employee will typically receive his/her salary half-way through each month, usually under the contractual obligation that he/she will complete the month's work. Again, no investments – in capital, or labour other than one's own hours – are required.

However, in the energy sector, as in all infrastructure sectors, an upfront investment is needed- be it in a PV panel, cables for a grid connection, or the construction of a hydropower plant. The implementer may or may not want to undertake such an investment, depending on the risks and rewards involved. If it's not a commercially viable project on its own and a support component is needed, but that support component is only released based on results produced some time into the future, a potential investor may very well walk away from the opportunity if the support is not viewed as credible – that is, likely to be forthcoming. This is particularly important to keep in mind when operating in a developing country environment, where other risks (political, currency and Purchasing Power Agreement/"off-taker" creditworthiness, etc.) are often perceived to be higher from the outset. A results-based funding system such as a feed-in-tariff or renewable certificate system will only work if the regulatory environment is viewed as transparent and stable. A complicating factor arises when the support depends on funding from another country or international organisation, as would be the case in an ODA context; a cautious investor may view such support only as an upside to the cash flow in the operational phase, and, if so, the support will have a limited effect on the investment decision, especially when the construction phase is long.

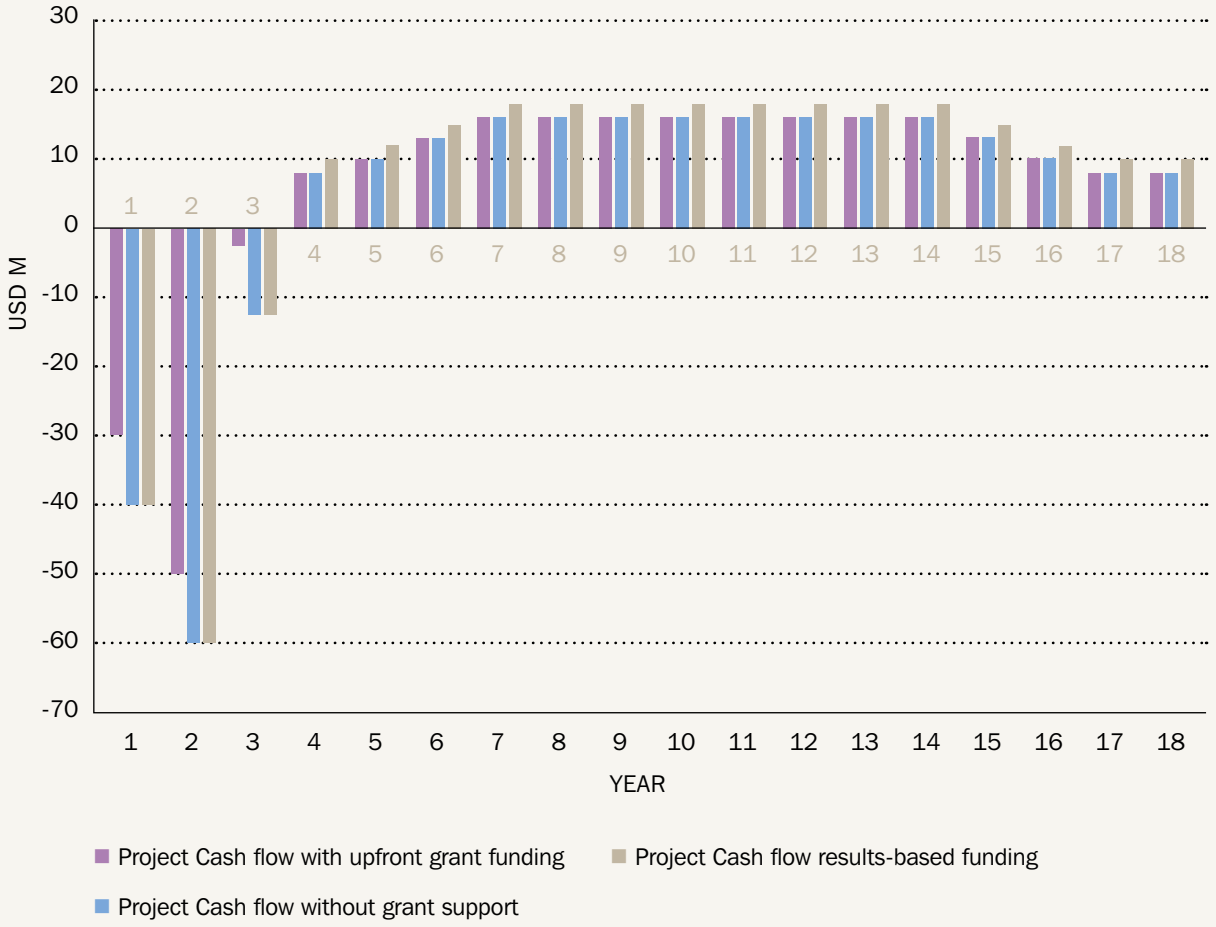
The following example may serve to illustrate this point: Figure 2 shows the cash flow of a photovoltaic (PV) project, with investments taking place in years 1-3 and operation over the subsequent 15 years[8]. We have assumed a PV plant of some 55 MW capacity, investments of USD 112.5 million over the first three years, operating costs of USD 2 million over 15 years, and revenues from electricity sales between USD 10-18 million per annum over 15 years. The project will be financed by equity and debt, with a grant component from an international

8 For illustration purposes, we consider a simple case of an unlevered cash flow, composed only of CAPEX, OPEX, electricity revenues and subsidies. The example is admittedly greatly simplified, however it serves to illustrate the challenges the timing and credibility of funding pose to the private investor and the grant provider.

agency supporting renewable energy projects in a developing country. There are three cases: The blue bars show the cash flow for the project with no grant funding. The internal rate of return (IRR) for this project is 7%. The purple bars show the cash flow of the same project, but where a USD 30 million investment grant has been provided (USD 10 million each over the first three years), producing a less negative cash flow in the investment period. This corresponds to a funding of "inputs" approach and generates a higher IRR of 11%. Finally, the grey bars show the effect on the cash flow of spreading the same subsidy over the operating period, in the form of 15 installments of USD 2 million – we can think of this as our results-based funding case. The IRR in this results-based funding case comes to only 9%, reflecting the "time value of money" in the IRR calculation. That is, the same grant will have a much greater impact for the investor if given early on in the project (i.e. when the grant support is "front-loaded").

If the private investor has a "hurdle rate" (the minimum acceptable rate of return on a project) greater than 9%, then the "results-based" way

FIGURE 2: CASH FLOWS OF PV PROJECT OVER 18 YEARS, IN USD MILLIONS



of supporting the project will not be able to attract investors. If, in addition, the results-based funding component is not viewed as credible – the case of the investor only viewing it as a potential upside and not including it in the projected cash flow - the IRR will remain at (the non-subsidised level of) 7%, that is, the results-based approach will not affect the investment decision. If the hurdle rate is higher than 11%, neither the input- nor the results-based approach will incentivise the investor.

To summarise, there are two challenges presented here: the fact that upfront support is valued higher than future support and that future support has to be viewed as credible for it to have the intended effect. Neither challenge is necessarily insurmountable, but policy makers and development partners should be aware of them. For instance, the first challenge- upfront investment- has not proved to be an obstacle for the deployment of renewables in Europe: Countries such as Spain, Germany and the UK have successfully employed feed-in tariffs and renewable obligations certificates which only pay out upon proof of produced kilowatt hours (kWhs). The result-based incentives have been high enough – even if they are only awarded in the future - to make the investments profitable for the project sponsors. Key here has been the perception of stability and transparency in the regulatory environment in Europe, a perception which may not be there to the same extent in a developing country.

Ways to get around the second challenge of the credibility of future grant contributions in a developing country environment include obtaining a *guarantee* for the grant component or setting aside the funds in an *escrow account*. Both methods will serve to give the investor confidence that the extra revenue stream from the grant will indeed be forthcoming. The guarantee would have to come from a trustworthy institution such as the Mulitlateral Investment Guarantee Agency (MIGA). However, there are costs and constraints related to such risk-mitigating measures: Agencies like MIGA operate under financial constraints with respect to scope as well as scale. And while placing the funds in an escrow account is certainly feasible, it also carries a cost.

Another option is to link the funding only in part to the results in terms of kWh produced, in such a way that, say, 30-50% of the funding (in present value terms) is released at the time of the certified commissioning of the project, and the remaining upon realised annual production. In that case, the approach is a modified version of a truly "results-based" funding arrangement: one that retains elements of payments-for-results but also caters to the need for upfront support. A number of the projects funded by GPOBA appear to be of this type and the *Get Fit Uganda* programme, which targets small-scale renewable energy investments, is designed so that results-based premiums are *front-loaded*[9]. Hussain & Etienne (2012) refer to this approach as one that rewards a variety of results, including intermediate outcomes and they go on to advocating such an approach, arguing that flexibility on the types of results is useful in the context of clean energy projects.

9 See Hussain & Etienne (2012), GPOBA (2012) and Get Fit Annual Report (2013).

04 Distribution of risk and the cost of capital

Another aspect of results-based programmes that should be kept in mind is the allocation of risks between parties, and how that affects the costs of implementing the project. In results-based systems, project performance risk is transferred from the funds provider to the implementer/private investor: the grant will not be released if the project does not perform as aimed for. However, the balance of risk and rewards has to be "right" for the investor to want to participate. If risks are perceived to be too high, increasing the rewards will be necessary. However, by increasing rewards (the return on investment), the cost of providing the service, that is, the level of grant required, increases as well.

The following serves to illustrate: An investor's cost of capital consists of the risk-free rate of return required to cover costs and the risk premium. That is,

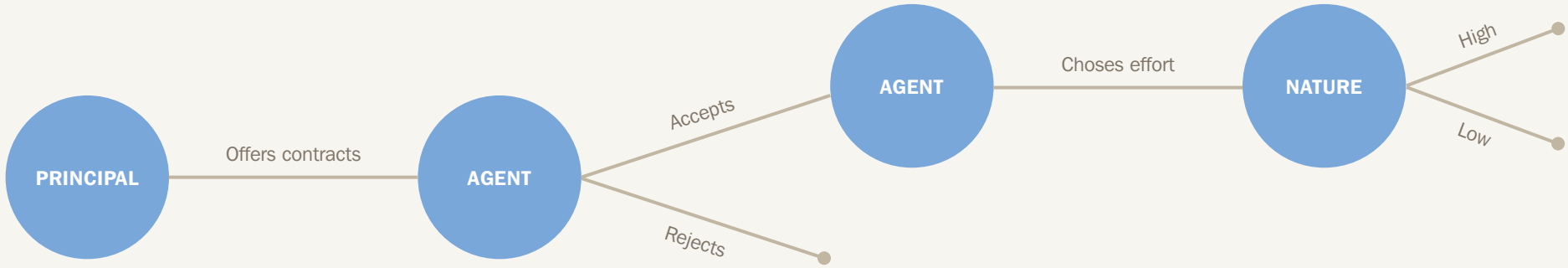
COST OF CAPITAL = RISK FREE RATE OF RETURN + RISK PREMIUM

If the risk premium increases, the cost of capital goes up. Investors will adopt a higher hurdle rate for such projects – using our previous example, it could go up from 9% to, say, 12%. The investor will then either opt not to invest in the project or ask for a higher grant contribution that would increase the IRR to a level exceeding the hurdle rate. In our example, the grant contribution would have to increase from USD 2 million to USD 6 million per year (for 15 years), that is, three times the amout of support.

This is further discussed within the context of a Principal-Agent model in the next section. Designers of results-based aid programmes should be aware of this trade-off and weigh the need for terms necessary to attract investors against the objectives of the programme in such a way that these are achieved at the lowest cost, taking all benefits and costs into consideration.

05 A conceptual discussion of RBF: A Principal-Agent Model

FIGURE 3: MORAL HAZARD WITH HIDDEN EFFORT



Principal Agent Theory Model

This section places the RBF relationship within a suitable theoretical model. The example we will use is that of a funding provider, or donor, who is requested by a developing country government to provide support to increase access to electricity from solar PV (photovoltaics) systems. This situation can be framed as a *principal-agent* problem, where the donor is the Principal and the Agent is the PV installation company[10].

Principal-agent models have been applied extensively over the years, for instance to analyse interactions within the insurance industry and between employers and workers. Adverse selection and moral hazard are two common characteristics of such interaction[11].

We will use a simple example of results-based payments for the installation of PV panels to "populate" our principal-agent model. In our context, the principal and the agent have different objectives and different levels of information: The company will typically have much more local information than the funds provider and has as its main objective to get paid by the principal and to make a profit. The principal's objective will be to have "x" number of PV panels installed by a certain date, or, more outcome- or impact-oriented goals such as "doubling the access to electricity".

The characteristics of the model are that:

- The Principal cannot observe the *effort level* of the agent (e)
- The Principal can observe the *output* (q)

10 Usually, support goes to the Government, who in turn runs a bidding programme to select the PV company/ies. Note that the example project in this section – an off grid PV project (typically small-scale) - is different from the one we had in mind during the discussion so far (a public-private grid-connected PV park). They serve to illustrate different aspects of results-based systems.

11 See e.g. Rasmusen (1989) for an introduction to game theory and principal-agent models.

- The principal writes a *contract* with the agent: *p(q)*, where the *payment (p)* depends on the *output (q)*
- Output is a function of the agent's effort (e) but also of random events (ϑ): q(e, ϑ), where ϑ is chosen by Nature

Figure 3 shows the game tree for our case, one that can be described as "moral hazard with hidden effort" [12]. The interaction between the PV company and the funder can be seen as one of an "output-based payment under uncertainty".

Optimal pay structure (maximizing the Principal's Expected Value)

Mathematically, the principal's problem is to find the payment structure that maximises the expected value (EV) of the difference between the output and what the agent has to be paid, or;

$$\underset{p(.)}{\text{Max}}\ EV\left(q(\tilde{e},\vartheta) - p(q(\tilde{e},\vartheta))\right)$$

However, the Principal has to ensure that the agent will prefer to accept the contract ("accept" in Figure 3) rather than reject it, and that the contract is set up in such a way that it provides an incentive for the agent to voluntarily pick the principal's desired effort (ẽ). Hence the Principal's maximisation is subject to two constraints: the participation constraint and the incentive compatibility constraint.

In this model, the funder tries, by paying for results, to make the agent act in the principal's best interest, but this can be very challenging. As pointed out in Ross' seminal work (1973), when objectives and access to information differ, it becomes difficult to find an efficient way to delegate. Indeed, the more aligned the payment structure of the agent is to the objectives of the principal, the greater the chance that the Principal's objectives will be reached. Hence, if the Principal's aim is to make electricity available to 80% of the households in Province "X" over the next five years, then the Agent's pay should be released only over time and upon verification of the number of satisfactorily served customers.

The main challenge with this approach is to make the pay structure work for the Agent. A delayed pay structure may not work, if most of the effort is provided up-front or if large capital outlays are required. Furthermore, a number of factors can intervene and derail the attainment of the objectives that are beyond the control of the Agent (expressed by ϑ in our model). Theft (network hookups), natural catastrophes, or a change in government policy are examples that come to mind. The risk of these events ocurring have to be compensated for by commensurate rewards, in order for the Agent to want to take on the task. In other words, if $q <= q^*$, where q^* is the optimal output level obtained from the maximization above, then $p <= p^*$, that is, a lower payment level than expected is received by the agent. To compensate for this, when $q = q^*$, $p >= p^*$, that is, the agent's expected payment has to be higher than the optimal payment, otherwise he will not participate. In other words, the agent will require a profit margin in this type of contract, which increases overall costs of running the programme. This was briefly discussed earlier in terms of hurdle rates. It may very well be that the efficiency gains from a

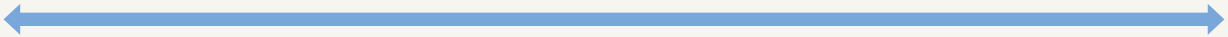
12 See Rasmusen, 1989, pp.174.

results-based approach are higher than the increase in costs associated with having to make higher payments. When that is the case, a results-based model can be considered. However, the cost-benefit analysis should include the increased profit margin cost in the overall cost-benefit calculation.

Negotiating risk sharing

As an alternative to the optimal pay structure as obtained by maximising the Principal's EV (Expected Value), the Principal and Agent can enter into a detailed agreement about risk sharing and responsibility, thus handling the Agent's presumed risk-averse nature and ensuring that the participation contraint is satisfied. However, such concessions will increase the transaction cost of negotiating an agreement and, again, should be taken into account when weighing the costs against the benefits of a results-based approach. In the extreme event that the Agent is very risk averse or has no control over the output, he will insist on payments being made according to input. But then the approach is no longer "results-based".

FIGURE 4: SCALE OF RESULTS-BASED FUNDING



PURE" RESULTS-BASED FUNDING	HIGH DEGREE OF RESULTS-BASED FUNDING	SOME RESULTS-BASED FUNDING	PAYMENTS ACCORDING TO INPUT
All funding according to verified pre-defined results All risk with agent	Most funding according to verified pre-defined results Most risk with agent Transaction costs incurred in order to determine optimal arrangement	Most payments according to input but some results-based funding to promote risk sharing Most risk with principal Transaction costs incurred in order to determine optimal arrangement	All payments according to input Low risk for agent *ex-ante,* although will need to show results because according to most agreements, donor agencies can cease to make payments if intended results are not achieved

Different arrangements regarding risk sharing lead to hybrid arrangements that are neither purely input-based nor purely results-based, as illustrated in Figure 4.

06 Different Models for Different Contexts

Table 1 suggests the most effective relationship arrangement between the Principal and the Agent depending on two dimensions: the level of assymetry of information between the Principal and the Agent about how results are produced, and the ease with which results can be defined and measured[13].

TABLE 1: MODEL CHOICE DEPENDING ON TWO FACTORS

	Principal's Information: High (symmetric information)	Principal's Information: Low (asymmetric information)
Defining and Measuring Outputs / Results – Easy	Freedom to choose between results- and input-based	Results-based (e.g. CDM)
Defining and Measuring Outputs /Results – Difficult	Input-based (e.g. policy impacts)	Restart/ Re-define outputs / results (e.g. "increased access to modern energy services")

When defining or measuring outputs is difficult, but information on how an agent spends his time – his effort (e in the model above) – is high, an input-based model may be most appropriate (lower left-hand corner of Table 1). For example, it can be difficult to measure the impact of a policy change, however, the Principal and Agent have a relatively good idea of the effort necessary to make it happen.

When defining results are easy and there is symmetric information (upper left-hand corner of Table 1), the Principal has the freedom to choose a results-based system or an input-based system, as favourable conditions exist for both. The Principal may in that case choose a results-based system, as such a system may have other benefits such as increased agent motivation and productivity.

In the case where the Prinicipal does not have much information about the production process or local conditions and where outputs are difficult to define and measure – e.g.what is meant or intended by the aim "increased access to modern energy services"? – the process of defining results should probably be restarted (lower right-hand corner of Table 1). Outputs, or results, could be re-defined, for example in terms of utilization rate of a hydropower plant installed, value of electricity received in terms of different services used, number of households connected to electricity, or simply MW installed.

However, when the Principal's information about the production process is low, which could be the case when a funding agency is entering a new sector or country, but defining and measuring the output is relatively easy, a results-based model can work well (upper right-hand corner of Table 1). A parallell exists in the *salesman on the road* model: his employer may not know how he spends his days, but it's easy to measure how much he sells. A relevant example which appears to fit this category is the Clean Development Mechanism (CDM), established under the United Nations Framework Convention on

13 Savedoff (2010) discusses this typology for incentive contracts in the health sector.

Climate Change to reduce greenhouse gas emissions. The CDM is effectively a results-based funding system since payments are made to implementing agents upon verification of reduced greenhouse gas emissions. In the CDM there certainly is assymetry of information between the Principal – the buyers of Certified Emission Reductions (CERs) and the supervising CDM Executive Board- and the Agent- the project developers, but the "result" in the form of tons CO_2 reduced is well-defined and easy to measure and monitor. Due to a very low price for emissions reductions, the CDM is currently going through a crisis in which new and old projects have been mostly put on hold. However, if the CDM revives, it will again provide a significant "live" example of results-based funding from which lessons can be learned. Renewable energy projects have traditionally made up around 60% of all CDM projects[14].

In the EnDev RBF Facility program (see Table 2), which is currently in a pilot phase, RBF aims to partly cover the cost of market development (such as testing new business models where the market returns are uncertain) and is made on the basis of independently verified energy product sales achieved. The agent is free to decide how to best finance and achieve the result, and hence this example also seems to fit in well in the top right-hand box of Table 1. However, as opposed to the CDM, funding is released based on output (energy products sold), not outcome or impact (in the case of the CDM: tons of CO_2e reduced): The preference has been to create results that are easy to define and measure, at the expense of impact accuracy. Furthermore, in this programme, agents must show an exit strategy – i.e. that they can be financially sustainable in the long run, after RBF support stops. The learnings from this facility, once they have been collected and analysed, will undoubtedly prove to be useful input to the design of future RBF programmes in the energy sector.

TABLE 2: EN-DEV RBF FACILITY – EXAMPLES OF PROJECTS AGREED IN 2013 (SOURCE DFID WEBSITE ACCESSED JULY 2014)

Title	Planned incentive amounts (€m)	Products to be marketed
Ethiopia: Cooking stoves to extend supply chains into rural areas	1.2	206,000 clean cookstoves
Rwanda: Sustainable Market Creation for Solar Lighting	3.4	160,000 task lights, 192,000 room lights
Rwanda: Sustainable Market Creation for Renewable Energy Village Grids	1.9	25 pico-hydro mini grids, 10 micro-hydro mini grids
Vietnam: Creating a Market Driven Biogas Sector	2.8	55,000 biogas digesters

14 Source: UNEP, http://www.cdmpipeline.org/cdm-projects-type.htm, accessed Sep.2014.

07 Monitoring Costs

The two dimensions discussed in the previous section are not the only ones of importance to determine whether results-based funding is suitable. Indeed they are additional to the dimensions of whether upfront capital investments are required as well as the level of monitoring costs, both of which have been discussed earlier in this paper. For a results-based system to be superior to an input-based system, the costs of measuring, reporting and verifying results have to be kept low and in line with the efficiency gains it purports to bring. Measuring kilowatt hours is fairly straightforward but measuring a host of "co-benefits" (e.g. poverty reduction, environmental benefits), which some development professionals advocate, will add a layer of complexity that translates into higher verification costs as well. This has been an important consideration in the design of different possible results-based incentives in programs such as EnDev, and for access to funding form the Green Climate Fund[15].

Laos // Photo: Ken Opprann

Nepal // Photo: Ken Opprann

The cost of verification has proven to be a challenge in the case of the results based Clean Development Mechanism, in some cases consuming 14-22 percent of the revenues from CERs[16]. This is a particular challenge when the revenue generated from emission reductions is low (CERs were trading at record-lows of under €0.5/tCO_2e in the first half of 2014). Moreover, during the heyday of the CDM in the period before 2008, the vast majority of CDM activity focused on middle income economies such as India and China, where the investment climate was favourable, project opportunities were large scale and numerous and the monitoring costs were proportinately lower. Monitoring costs for small and dispersed projects in countries with poorly developed infrastructure have and will continue to prove to be much higher – both in the CDM and other programmes.

The cost of monitoring forestry conservation projects is similary a challenge and an area undergoing continuous attempts at simplification and improvements under the Reduced Emissions from Deforestation and Forest Degradation (REDD) programme. In forestry projects, it has been found that costs vary widely, depending on technical factors (e.g. type of forest) as well as

15 World Bank, 2014a and World Bank, 2014b.

16 Hussain & Etienne, 2012.

project size (economies of scale do, not surprisingly, exist)[17]. The same will be true in the energy sector, and hence will be another parameter determining the viability of a system that relies on measuring, reporting and verifying results.

In Table 3 we illustrate cases where a results-based system is more likely to be successful, according to the dimensions of monitoring costs and the need for upfront capital investment. The table can be viewed as complementary to Table 1.

In situations of high monitoring costs and high upfront capital needs, results-based programmes are not likely to be effective, whereas when monitoring costs are low and upfront investment needs are low, the opposite is true.

TABLE 3: CONDITIONS FOR RESULTS-BASED SYSTEMS: LIKELIHOOD OF SUCCESS

	High Monitoring Costs	Low Monitoring Costs
Significant need for upfront capital investments	Poor	Medium
No/minor need for upfront capital investments	Medium	Good

17 See Bottcher, 2009.

08 Conclusion

The aim of this paper was two-fold: on the one hand, to discuss concepts and issues related to results-based funding systems for clean energy projects in developing countries; and on the other to suggest a theoretical framework within which results-based systems can be analysed.

Different terms are used in the literature and among practitioners when it comes to results-based funding and they are often used interchangeably to the detriment of a clear and meaningful policy dialogue. We would argue that "funding" is the appropriate term in this context, rather than financing, as the latter term implies a financial return. Furthermore, what is meant by "results" also appears to vary: if payments are linked to short-term outputs, then it is arguable whether they are truly "results-based", in the sense of a project's outcome. The "results-based revolution" may in such cases not be more than incremental improvements in project management and monitoring practices.

As part of achieving clarity on the merits of favouring RBF above other instruments in any given context, arguably the most important issue to consider when designing results-based systems is the sequencing of funding and the need for upfront capital investments. This is a major constraint in some energy segments such as renewable energy (where capital costs are relatively high) and in Low Income Countries (where financing is more difficult to obtain). It is not always clear how this need is compatible with a results-based approach, and a guarantee or other way of giving the investor more confidence in the grant component may be necessary.

In particular, it would appear that a results-based funding system in the form of a feed-in-tariff or similar supplied by an external (donor) party, will only have the desired effect to the extent that the external party is viewed as reliable and with a high likelihood of providing the promised assistance over time – and where the investment climate in the energy sector is broadly good. This seems to have been the case for some projects funded under GPOBA – for instance a rural non-grid power supply project in the Phillippines[18]. Furthermore, even much cited examples of results-based pilots in the energy sector such as the Get Fit Uganda programme, relies on *front-loading* of payments, highlighting the need for upfront capital support.

The energy sector RBF experience so far has been with off-grid and small-scale on-grid investments whereas large-scale on-grid power projects have been explored to a much lesser extent. It is indeed likely that project size will matter in this context, as larger projects with commensurately higher costs and longer payback periods will be viewed as challenging by private investors, even with a grant funding component. The effect of project size on the viability of RBF systems could be an interesting area for future research.

Furthermore, this paper suggests that the relationship between funder and implementer in an energy sector results-based programme is best analysed within a principal-agent framework with asymmetric information. This principal-agent framework implies that there will be challenges, especially with making the payment structure attractive for the "agent".

18 See Hussain & Etienne, 2012.

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Based on the theoretical implicatons of a Principal-Agent framework as well as practical experience, we are able to indicate circumstances under which a results-based or input-based model is likely to be most efficient. Based on our analysis, it would appear that results-based funding schemes are more likely to succeed when the following conditions are present:

- Low monitoring costs
- Little need for upfront capital
- High credibility related to the result-based payment
- Defining and measuring results is easy

We urge policy makers and implementing agencies to continue exploring and evaluating programme experiences related to energy and to carry out robust cost-benefit analyses of the results: While results-based funding can bring significant benefits, the costs of such an arrangement should be properly accounted for and weighed up against alternative approaches.

REFERENCES

Bottcher et al., 2009, An assessment of monitoring requirements and costs of 'Reduced Emissions from Deforestation and Degradation', Carbon Balance and Management, 4:7.

DFID, 2013, Evaluation of Payment by Results: Current Approaches, Future Needs, Working Paper 39.

DFID, 2014, Sharpening incentives to perform: DFID's Strategy for Payment by Results, Policy Paper.

Get Fit Uganda, Annual Report 2013, available from http://annualreport.getfit-uganda.org/

GPOBA, 2012 Annual Report, available from https://www.gpoba.org/sites/gpoba.org/files/Docs/GPOBA%20Annual%20Report%202012.pdf

Hussain, M.Z. and Etienne, C., 2012, World Bank Working Paper: Lessons from output-based aid for leveraging finance for clean energy.

Pearson, M., 2011, Results based aid and results based financing: What are they? Have they delivered results? HLSP Institute.

Rasmusen, E., 1989, Games and Information; An introduction to game theory.

Ross, S.A., 1973, "The Economic Thory of Agency: The Principal's Problem", American Economic Review, 62.

Savedoff, W.D., 2010, Basic Economics of Results-Based Financing in Health, Social Insight.

World Bank, 2013, Results Based Financing in the Energy Sector – an Analytical Guide. World Bank Group, Washington DC.

World Bank, 2014a, Results-Based Financing for Clean Cookstoves in Uganda, World Bank Group, Washington DC.

World Bank, 2014b, Project Information Document (PID) Report 84217, Global Partnership on Output Based Aid (GPOBA) Grid-Based Electricity Access Project, World Bank Group, Washington DC.

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