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# **Feed-in Tariffs** as a Policy Instrument for Promoting Renewable Energies and Green Economies in Developing Countries

# Acknowledgements


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# Executive Summary

During the last decade, to respond to energy-related challenges such as climate change, air pollution, volatile fossil fuel prices, and a growing demand for electricity, countries have multiplied recourse to renewable energy policy making. In 2011 there were 73 countries around the world that had implemented policy targets for renewable electricity at the federal or regional levels. The most prevalent national renewable energy policy in the world is the feed-in tariff (FIT). As of early 2011, 50 countries had some form of FIT in place, with more than half of these being in developing countries.

This report is intended as a resource for policy makers in developing countries to make informed policy decisions about the "whether," "when" and "how" of FITs and to support nationally appropriate policy measures to scale up renewable energy. The report is also intended to improve the understanding of the potential benefits and challenges for developing countries to design FITs as well as the factors influencing their success, more in depth from the policy and legal foci, whilst also analysing the funding and capacity implications. Throughout the report, FITs are construed as interacting with national energy and non-energy policies in a dynamic manner.

Through a general overview of FIT policies and design elements, the report draws broad and qualitative comparisons between FITs and other policy instruments available for scaling up renewables. It then reviews FIT design issues and options, relevant policy considerations, and text from existing laws as references in the form of a Law Drafters' Guide. The report also discusses strategies for funding a FIT policy, utilizing both domestic and international resources. In addition, the report examines the human, technological, regulatory and institutional capacity that must be in place in order to successfully implement a FIT.

**Policy making involves inherent trade-offs and is dynamic.** Policy makers are continually combining distinct policies in new and innovative ways. The continual evolution of renewable energy policies has led increasingly to blended policies that share many of the same design elements. Different countries have implemented the same policies in different ways and most countries have updated their policies over time. Initially viewed as being mutually exclusive, countries now use opportunities to merge or combine FIT policies with other renewable policies.

**When developing FITs, policy makers need to evaluate how FITs interact with existing or proposed policies - both how FITs might create synergies with other policies and how their interaction may create unintended consequences.** This report analyses FITs as a "package" of different regulatory and incentive policies, thus addressing the 'feed-in' elements and not just only the 'tariff'. These packages can be combined in a variety of different ways, depending on policy makers' goals and constraints. For the purposes of this report, the unifying features of FITs include performance-based cash payments ($/kWh) that are determined administratively (rather than through market competition) and available on a standard offer basis. Beyond this basic definition, FITs may encompass the following policy elements: interconnection, purchasing, distribution and transmission, contracting and pricing.

**Once FIT policies are developed and formulated, various jurisdictions adopt either legal or non-legal pathways to support policy implementation.** This decision will depend on a number of factors, such as political system, legal tradition, governmental structure, legislative process, market structure, etc. Depending on such factors, policy makers may choose different routes to developing FIT laws : legal pathways such as (i) a detailed FIT law, (ii) a combination of high level mandate law with a regulatory body in charge of policy details, or non-legal pathways such as under a general energy law. There are pros and cons to each of these approaches. Establishing a FIT through detailed legislation, for example, may provide greater investor certainty because the law may be viewed as more difficult to change than a policy enacted as a result of an executive branch or regulatory agency initiative. On the other hand, developing and passing FIT legislation may be a lengthier and more challenging process than if a government agency develops and promulgates FIT regulations.

The **major interactions of the design issues and policy considerations** are summarised in the following table, with the checks indicating which design issues are most relevant to which policy considerations, and vice versa.

| | Policy Considerations | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **FIT Design Issue** | **Investor security** | **Energy access** | **Grid stability** | **Policy costs** | **Price stabilization** | **Electricity portfolio diversity** | **Administrative complexity** | **Economic development** |
| **Integration with Policy Targets** | ✓ | | | | | | ✓ | |
| **Eligibility** | | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| **Tariff Differentiation** | | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| **Payment Based On** | ✓ | | | ✓ | ✓ | ✓ | ✓ | |
| **Payment Duration** | ✓ | | | ✓ | ✓ | | | |
| **Payment Structure** | ✓ | | | ✓ | ✓ | | ✓ | |
| **Inflation** | ✓ | | | | ✓ | | | |
| **Cost Recovery** | ✓ | | | ✓ | | | | |
| **Interconnection Guarantee** | ✓ | | ✓ | | | | | |
| **Interconnection Costs** | ✓ | | ✓ | ✓ | | | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Purchase and Dispatch Requirements** | ✓ | | | ✓ | | | | |
| **Amount Purchased** | ✓ | | | | | | ✓ | |
| **Purchasing Entity** | ✓ | | | | | | ✓ | |
| **Commodities Purchased** | ✓ | | | ✓ | | | ✓ | |
| **Triggers & Adjustments** | ✓ | | ✓ | ✓ | ✓ | | ✓ | |
| **Contract Issues** | ✓ | | | | | | | |
| **Payment Currency** | ✓ | | | ✓ | | | | |
| **Interaction with Other Incentives** | ✓ | | | ✓ | | | | |

**One of the key design options of FITs is tariff differentiation**, which specifies the FIT rates that each renewable energy technology will receive. The issue of tariff differentiation can impact a broad range of policy considerations, including policy costs, energy access, administrative complexity, economic development, and diversification of the electricity mix. Another important design option is tariff setting, where the payment basis has a bearing on renewable energy development, policy costs, price stability, electricity portfolio diversity, and regulatory and administrative oversight, and policy costs have to be balanced with investor costs.

Concerning **FIT payment duration**, generation cost-based rates are higher and shorter, latter having the potential to remove the incentive for projects to continue operating over their entire lifetimes. Cost-based rates involve longer contracts with correspondingly lower rates, and increase the potential for price stabilization impacts. From the ratepayer perspective, short-term contracts cost less over time, but longer-term payment can generate immediate savings. Policy makers should be aware of these two potential effects and how they balance. FITs can serve as a hedge against volatile fossil fuel prices and dampen electricity price spikes. A well-designed FIT may not attract investment if the policy funding source is not judged to be viable over the long-term.

**Policy cost is a critical issue for renewable energy law drafters**, especially in developing countries. FITs have a reputation for being inherently “expensive” policies, largely as a result of the large volume of renewable energy capacity that has been built in Europe under FITs. many developing countries lack the resources to pursue generation projects that will significantly increase ratepayer or taxpayer burdens. As noted throughout this report, countries can adopt (and have adopted) radically different FIT designs to reflect their different policy goals and national circumstances. FIT policies can be designed to limit ratepayer impact and do not necessarily need to be “expensive” from the point of view of ratepayers (Chapter 3).[1] This section discusses key considerations for funding FIT policies in developing countries, with a particular focus on policy cost recovery options.

**Funding issues** related to FITs comprise two main aspects, firstly funding the ‘higher’ cost of renewables and secondly lowering the generation costs of renewables. By reforming fossil fuel subsidies, countries can redirect those subsidies to support low-income households to withstand increasing electricity prices whilst subsidising renewables. Lowering generation costs beyond technology costs, include upfront development costs; financing costs (e.g. the cost of debt and cost of equity); operating costs; transaction costs and administrative costs.

Financing streams which could help lower the FITs costs include technically those which provide support throughout the planning and implementation phases of renewable energy projects, such as the GEF or forthcoming climate funding or NAMAs. **However, current international funding infrastructure has historically not been flexible enough to support national FITs in a broad and programmatic way.**

**Cost recovery remains a critical issue for law makers in developing countries.** Factors such as a country’s policy objectives, available renewable resources, national circumstances, and existing generation portfolio will shape policy design and to a large extent determine the costs that the policy will incur. Policy makers need to determine the most appropriate way to balance the potential costs of the policy against their capability to absorb them domestically**.**

External to the FIT development process yet setting the stage for FITs are technical, policy, and barriers assessments which would guide FIT planning, determine the optimal mix of renewable energy resources and how they interact with the existing generation mix and factor in gird integration issues. Policy makers can use this information to determine appropriate target setting, volume management and rate setting strategies. Countries with small grids, for example, may wish to establish targets that reflect grid integration limitations, whereas countries where renewables are below avoided cost may wish to set generation cost-based rates to realize near-term savings.

**Designing, implementing, monitoring and adjusting FITs require specific skills and competencies** which may not e readily available in most developing countries. Each of the issues may require new expertise, capacity, and resources that were not required prior to the introduction of the FIT. Some countries may be well positioned to accomplish all of these tasks internally. However, there are few developed or developing countries that have not turned to

[1] Several recent reports discuss the issue of policy cost control in detail. *See*, e.g., (DB Climate Change Advisors, 2011b; C. Kreycik et al., 2011).

external resources to accomplish some or all of these tasks. Networking and knowledge sharing among FITs practitioners and policy-makers between developed and developing countries, and through South-South exchange.

The report adopts a flexible toolkit approach to the design of policies and law drafting for feed-in tariffs in developing countries, and uses systematic links to broader development objectives. UNEP will promote the use of this approach through this report with its partners and in future capacity building as well as policy and regulatory support activities.

# Table of Contents

## List of Figures



## List of Tables



## List of Text Boxes

## List of Acronyms

| | |
|---|---|
| CUC | Caribbean Utilities Company, Ltd. |
| CERs | Certified Emissions Reductions |
| CDM | Clean Development Mechanism |
| CORE | Consumer-Owned Renewable Energy |
| COP | Conference of the Parties |
| FIT | Feed-in tariff |
| GEF | Global Environment Facility |
| GET FiT | Global Energy Transfer Feed-in Tariff |
| GAP | Green Africa Power |
| GWh | Gigawatt hour |
| IBRD | International Bank for Reconstruction and Development |
| IDA | International Development Association |
| kWh | Kilowatt hour |
| LRMC | Long-run Marginal Cost |
| MCG | Meister Consultants Group |
| MW | Megawatt |
| NAMAs | Nationally Appropriate Mitigation Actions |
| NREB | National Renewable Energy Board |
| PPA | Power purchase agreement |
| REC | Renewable energy credit |
| REFIT | Renewable Energy Feed-in Tariff |
| RFP | Requests for proposals |
| RPS | Renewable portfolio standard |
| SMUD | Sacramento Municipal Utility District |
| TGCs | Tradable green certificates |
| TRECs | Tradable renewable energy certificates |
| UNDP | United Nations Development Programme |
| UNEP | United Nations Environmental Programme |
| UNFCCC | United Nations Framework Convention on Climate Change |

# 1. Introduction

## 1.1. The overarching framework

Energy is critical for development and for most socio-economic activities. With looming 'peak oil', decoupling economic development from resource use inevitably comprises reduction of fossil fuels use and scaled up deployment of renewables, thereby contributing to sustainable development and climate mitigation objectives.

Globally and across regions, renewable energies represent promising responses to energy security and energy mix diversification of all countries whilst responding to their sustainability ambition. For developing countries, providing access to modern energy services, including in rural and remote areas, can only happen at the scale needed with a significant share of renewables in the supply. Currently, 80% of global energy needs or 66% of power supply are fossil fuel-based, and global energy systems currently represent some 60% of total current greenhouse gas (GHG) emissions. In a business as usual scenario, the world's energy needs will increase by almost 60% in 2030. All climate mitigation scenarios comprise an increase in renewables, and all underscore that policies are needed to accelerate renewable energy capacity installations by helping to overcome various barriers. This is closely linked to the decoupling of traditional growth patterns from energy use.

Many current international processes promote the acceleration of the deployment of renewables as a significant part of the energy revolution package, the four most significant ones being on the MDGs, on climate mitigation, in the context of a green economy and as one of the objectives of the United Nations Secretary General's Sustainable Energy for All initiative[2].

Because clean and affordable energy is a cross-cutting requirement for the realization of most of the Millennium Development Goals (MDGs), the current situation fundamentally hinders efforts to address poverty and sustainability issues.

The Green Economy Report modeling indicates that if around half of total energy investments were directed towards energy efficiency and renewable energy (including the expansion of second generation biofuels), the result would be 20% more in employment than business as usual by 2050, while delivering robust economic growth and reduced emissions. However, policy support is required to manage transitional challenges, and feed-in tariffs constitute a key element

[2] The three objectives of the Sustainable Energy for All initiative by 2030 are (i) ensure universal access to modern energy services, (ii) double energy efficiency and (iii) double the renewable energy share in the overall global energy mix.

in that equation. Globally there are more than 5 million jobs in renewable energy industries, and the potential for job creation continues to be a main driver for renewable energy policies.

> ***Text Box 1. Expansion of Renewables***
>
> In the power sector, renewables accounted for almost half of the estimated 208 gigawatts (GW) of electric capacity added globally during 2011. Wind and solar photovoltaics (PV) accounted for almost 40% and 30% of new renewable capacity, respectively, followed by hydropower (nearly 25%). By the end of 2011, total renewable power capacity worldwide exceeded 1,360 GW, up 8% over 2010; renewables comprised more than 25% of total global power-generating capacity (estimated at 5,360 GW in 2011) and supplied an estimated 20.3% of global electricity. Non-hydropower renewables exceeded 390 GW, a 24% capacity increase over 2010.
>
> (Source : REN21 Renewables 2012, Global Status Report)

In general, developing countries are well endowed with renewable energy resources, mostly as a result of their geographical characteristics, and which are largely untapped. To avoid the 'lock-in' timescales of energy infrastructure whilst addressing the longer term impacts of GHG emissions, with the necessary commitment and will, FITs can contribute to move closer to the IPCC's most ambitious 77% share of renewables by 2050.

In 2011, there was a 32% rise in green energy investment worldwide. Investors injected a record $211 billion into renewables - about one-third more than the $160 billion invested in 2009, and a 540% rise since 2004, and out of which $72 billion was invested in developing countries vs. $70 billion in developed economies. There is the critical need to encourage private sector involvement, and investment security is a sine qua none for this to happen in a meaningful manner.

In the recent years, the United Nations Environment Programme has created a series of successful law drafters' guides for policy makers in developing countries, on topics ranging from freshwater conservation (McCaffrey and Weber, 2005) to clean energy policy (Ottinger and Bradbook, 2007). The current document focuses specifically within the field of renewable energy law on the topic of feed-in tariffs (FITs) as a means to achieve national climate and renewable energy objectives. As will be discussed in greater detail below, FITs are rapidly emerging as one of the primary renewable energy policies enacted by developing countries. Since their introduction more than thirty years ago, FITs have grown more varied and complex as they have diffused around the world and been adapted to different countries' unique contexts.

While a number of in-depth FIT design guides exist, this is the first such effort focused primarily on FIT policy development and implementation in developing countries.

FITs have been used and analysed in many developing countries, much less so in developing countries. Whilst recognising the need for adjustments to adapt FITs to national circumstances, especially in the case of developing countries, this report uses knowledge gathered on the use of FITs.

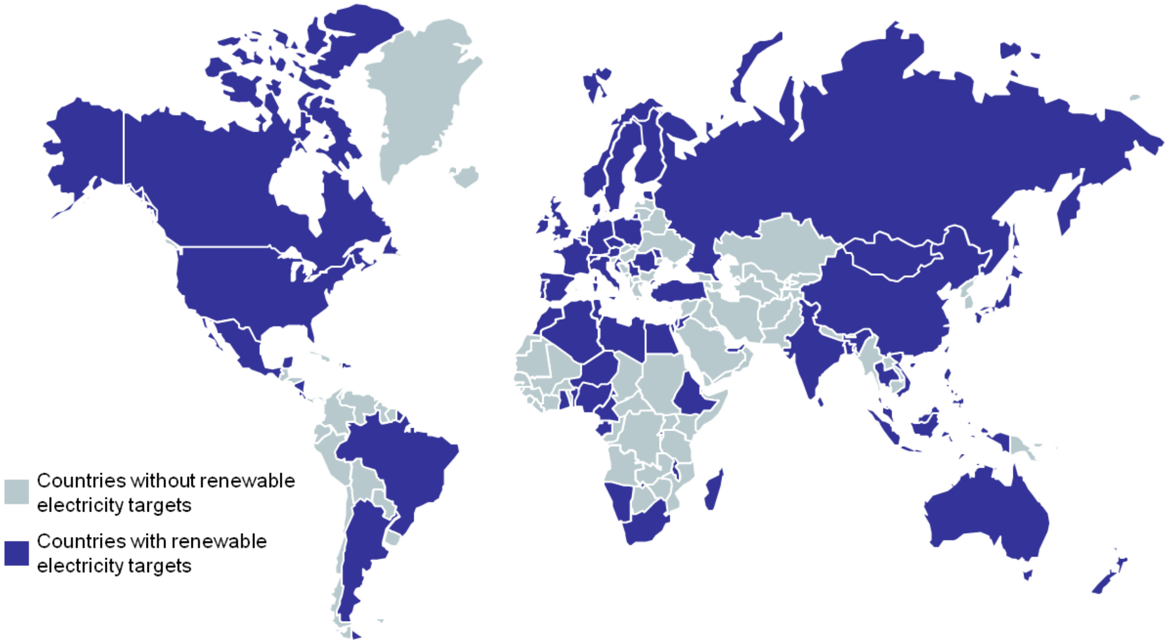
This report is intended as a resource for policy makers and others involved with crafting FIT policies. Rather than identifying a set of rigid best practices, this report instead attempts to outline the range of possible designs that developing country policy makers may wish to pursue and to identify the different drivers that may guide their decisions. This report is dedicated to developing country needs.

## 1.2. FITs in developing countries

There has been a surge in renewable energy policy making during the last decade as countries have sought to respond to energy-related challenges such as climate change, air pollution, volatile fossil fuel prices, and a growing demand for electricity. An indicator of the pace and scale of policy activity is the large number of countries which have implemented renewable electricity targets in just the past several years. As can be seen in the Figure below, there are 73 countries around the world that have implemented policy targets for renewable electricity at the federal or regional levels, up from just 45 in 2005 (see Figure 1 below) (Martinot, 2005; REN21, 2011).[3] The majority of these targets have been set by developing countries.

[3] As of 2011, the total number of countries that have national renewable energy policies, including targets and other policy types, was 119 (REN21, 2011).

**Figure 1. Countries with policy targets for renewable electricity**




Source: MCG research (2011); REN21 (2011)

A key question for policy makers in the expanding community of developing countries with renewable electricity commitments is how best to ***meet*** these new targets. There is a broad spectrum of potential policies that can be used to achieve renewable energy targets (Geller, 2003; Mitchell et al., 2011). The most prevalent national renewable energy policy in the world is the FIT. As of early 2012, 65 countries had some form of FIT in place. Over half of these are in developing countries.

This guide focuses on FIT policy design in developing countries. This is a challenging undertaking, however, because of the breadth of the topic. As will be discussed in Chapter 2, the term "feed-in tariff" encompasses a wide spectrum of policy variations that have evolved as countries have added and subsequently revised their policies over time. At the same time, the definition of "developing countries" is also elusive and varies across different international entities and organizations.

Table 1.1 below classifies developing countries with FIT policies according to their World Bank lending classifications[4] in order to highlight both the geographic and economic diversity of the countries.

[4] *See* http://data.worldbank.org/about/country-classifications. "IDA countries are those that had a per capita income in 2010 of less than $1,175 and lack the financial ability to borrow from IBRD. IDA loans are deeply

Table 1.1 Developing countries with FIT policies

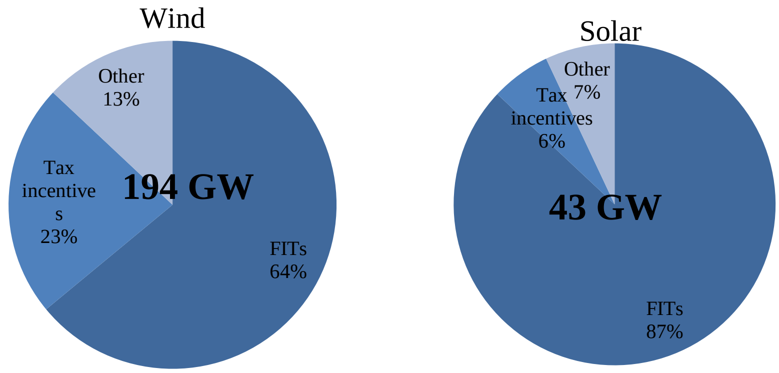
| IDA | IBRD | Blend |
|---|---|---|
| Honduras | Algeria | India |
| Kenya | Argentina | Pakistan |
| Mongolia | Bulgaria | |
| Nicaragua | China | |
| Sri Lanka | Croatia | |
| Tanzania | Dominican Republic | |
| Uganda | Ecuador | |
| | Indonesia | |
| | Kazakhstan | |
| | Macedonia | |
| | Mauritius | |
| | Morocco | |
| | Peru | |
| | Philippines | |
| | Serbia | |
| | South Africa | |
| | Thailand | |
| | Turkey | |
| | Ukraine | |

Source: MCG research (2011)

One of the reasons that FITs have diffused so rapidly around the world has been their success at supporting new renewable electricity generation, particularly in Europe. According to Bloomberg New Energy Finance (see Figure 2 below), FITs have driven 64% of global wind and 87% of global photovoltaics capacity. To date, however, the majority of these installations have been concentrated in developed countries.

concessional—interest-free loans and grants for programs aimed at boosting economic growth and improving living conditions. IBRD loans are non-concessional. Blend countries are eligible for IDA loans because of their low per capita incomes but are also eligible for IBRD loans because they are financially creditworthy."

**Figure 2. Global installed capacity by incentive type**




Source: Tringas (2011)

There are several reasons that explain this discrepancy in policy impact between developing and developed countries to date. First, most developing countries' FIT policies are comparatively new, with many of them having been established during the last five years. By contrast, the European FIT policies that account for the largest share of the capacity in Figure 2 above have been in place for 10-30 years or longer. Another explanation for this difference is that FIT policies in developing countries are designed to reflect their unique national contexts, objectives, and constraints.

## 1.3. Policy Considerations and Constraints

Although some studies focus on policy "best practices," it is difficult to define best practices that hold true for every country around the world. This report instead defines policy considerations[5] that law drafters in developing countries may wish to prioritize. The report then uses these policy considerations to compare the different FIT policy designs.

There is a wide range of policy considerations that law drafters' may pursue (see, e.g. NREL, 2011), but this report focuses on the policy considerations listed below. They have been chosen for their relevance to policy makers in developing countries following both stakeholder discussions and reviews literature reviews (Glemarec, 2011). The policy considerations are not listed in any particular order since different policy makers will weight these differently when considering policy design and implementation

- **Investor security**. The important role of investor security in renewable energy policy design has been highlighted by several recent reports (Corfee et al., 2010; DB Climate Change

[5] The term "policy consideration" refers broadly to both the goals that policy makers may wish to achieve with the FIT policy as well as the consequences (both positive and negative) that it may have.

Advisors, 2009). FITs can minimize key investor risks when compared to other policy types, thereby lowering the cost of capital required to finance projects. The International Energy Agency recently estimated that this reduction in capital costs enables countries with low-risk renewable energy policies to lower the levelised cost of renewable electricity by 10-30% compared to countries without such policies (de Jager and Rathmann, 2008). The degree to which FITs support investor security, however, depends on the specific policy design (Rickerson et al., 2011b).

- **Energy access**. Energy access is an acute problem in many developing countries. Approximately 3 billion people globally rely on solid fuels for cooking and 1.5 billion lack access to electricity. Electrification rates in developing countries vary widely from relatively widespread electricity service coverage in parts of Latin America to only 21% electrification across the least developed countries (Legros et al., 2009). Many developing countries are pursuing energy access programs in order to alleviate poverty, improve human health, create new economic development opportunities, and achieve the Millennium Development Goals. Although a comprehensive discussion of the energy access challenge is beyond the scope of this report, this report does focus on the intersection of energy access and FITs. FIT policies can be designed to target not only on-grid capacity, but also to support off-grid systems (e.g. mini-grids) and increase energy access (DB Climate Change Advisors, 2010a; Moner-Girona, 2008).

- **Grid stability**. The integration of intermittent renewable energy technologies into the grid may pose technical, financial, and administrative challenges, but high penetration scenarios are possible with careful planning (Hossain, 1993; Sovacool, 2008). Denmark, for example, has achieved 22% wind energy penetration, but has had to develop innovative strategies for managing their grids and their electricity supply (Lund et al., 2010). Developing countries may have smaller, more isolated, and/or less reliable grids than their developed country counterparts. As a result, developing countries may wish to complete detailed grid integration studies and to design their FITs to support market growth in bounded, manageable stages based on the studies' results. A strategic approach to renewable energy growth can ensure that both the necessary infrastructure and required technical expertise are in place to ensure grid stability.

- **Policy cost**. The cost impacts of renewable energy policies are of primary concern for both developed and developing countries. Whether the costs are recovered from ratepayers or taxpayers, rising costs can create both political and economic pressures. Citizens in developing countries are particularly vulnerable to increases in the prices of basic commodities such as energy since these commodities comprise a higher share of their incomes than their counterparts in developed countries (International Monetary Fund, 2011).

- **Electricity price stabilization**. Energy prices are volatile and unpredictable. Economies that are exposed to unexpected fuel price volatility can face threats to their national budget, to their balance of trade, and to energy affordability for their citizens. Many renewable energy sources have no- or low-cost fuels whose prices have little to no volatility. When integrated into the electricity mix, renewable energy can help stabilize electricity prices by serving as a systematic and physical hedge against fossil fuel prices increases. Renewable energy can decrease the magnitude of the impact of price fluctuations on ratepayers and/or on the national budget (in countries that subsidize fossil fuel prices).

- **Electricity portfolio diversity**. Related to the issue of electricity price stabilization is the issue of portfolio diversification. Many developing countries rely heavily on a narrow mix of fuels. Such countries are not only exposed to fuel price volatility but also to energy security challenges such as fuel supply disruption. Portfolio diversification is an important consideration in countries that rely heavily on oil (such as the Caribbean), as well as in countries that rely heavily on hydropower. Drought in hydropower-dependent countries such as Albania, Ghana, Venezuela, and Uganda has created significant challenges for energy reliability and supply in the past. Integrating a wider range of renewable resources into national generation portfolios can create more flexible and resilient electricity systems (Biewald et al., 2003). Additionally, it has been shown that a diverse portfolio of renewable energy generators can allow different technologies to balance one another. In Brazil, Costa Rica and Colombia, for example, the hydro and wind resources are complementary on a seasonal basis (see e.g. Vergara et al., 2010).

- **Administrative complexity**. One of the potential benefits of FITs is that they can streamline the administrative burden and transaction costs of renewable energy policy not just for developers but also for program administrators (Haas et al., 2011). Some developing countries lack the technical and administrative resources to manage complex renewable energy policies and therefore may seek to minimize the required administrative costs in order to “free up” limited resources, staff capacity, and expertise (UNDP, 2011). On the other hand, some policy makers may be willing to accept a higher degree of administrative costs in order to introduce a greater degree of regulatory oversight and control into the FIT policy.

- **Economic development and job creation**. As highlighted in a recent report from UNEP and its partners, there is a significant potential for job creation in developing countries. Some developing countries have already successfully positioned themselves to capture the economic benefits of the emerging green energy economy. China, for example, had close to one million renewable energy jobs as of 2006 (Renner et al., 2008), and has since significantly increased its share of both global wind and solar manufacturing. Smaller countries such as Trinidad and Tobago, are also explicitly investigating how to attract and create more domestic green jobs (Alexander et al., 2006). FIT design can influence the degree to which economic benefits from renewable energy development are captured domestically.

These policy considerations are used as framing criteria to discuss specific FIT design issues and options in Chapter 3. Chapter 3 also discusses additional conditions specific to developing countries that may further shape or constrain FIT policy design.

## 1.4. Report structure

This report is intended as a resource for policy makers in developing countries to make informed policy decisions about the "whether," "when" and "how" of FITs and to support nationally appropriate policy measures to scale up renewable energy. The report is also intended to improve the understanding of the potential benefits and challenges for developing countries to design FITs as well as the factors influencing their success.

- Chapter 2 provides a general overview of FIT policies and design elements and draws broad and qualitative comparisons between FITs and other the policy instruments available for scaling up renewables.

- Chapter 3 contains the Law Drafters' Guide. The Guide reviews FIT design issues and options, relevant policy considerations, and text from existing laws as references.

- Chapter 4 discusses strategies for funding a FIT policy, utilizing both domestic and international resources.

- Chapter 5 examines the human, technological, regulatory and institutional capacity that must be in place in order to successfully implement a FIT.

- Chapter 6 provides a short overview of future research topics.

# 2. Policy Instruments to Scale up Renewables: FIT Policy Overview and Major Design Elements

## 2.1. Renewable energy policies

As discussed in the *UNEP Handbook for Drafting Laws on Energy Efficiency and Renewable Energy Resources*, there is a wide range of policies being used to support renewable energy development around the world, including renewables portfolio standards (RPS), economic tools, distributed generation measures, and disclosure and green marketing measures (Ottinger and Bradbook, 2007). This section provides a brief overview of the main policy instruments being used to promote renewable energy as context for a more detailed discussion of FITs. Different policies may be appropriate under different circumstances, depending on factors such as a country's legal tradition and policy history or the maturity of the technologies being targeted. Some policies, for example, may not be institutionally feasible or acceptable to key stakeholders in a given country (Mitchell et al., 2011), whereas others may be best suited for emerging, rather than established, technologies (Midttun and Gautesen, 2007).

The first part of this chapter presents several of the main policy instruments, discusses broad trade-offs from a policy maker perspective, and provides an overview of recent policy making trends. The second part of this chapter introduces FITs at a high level. While we draw distinctions between the different policies, it is important to note that renewable energy policy development remains dynamic: different countries have implemented the same policies in different ways, most countries have updated their policies over time, and policy makers are continually combining distinct policies in new and innovative ways. The continual evolution of renewable energy policies has led increasingly to blended policies that share many of the same design elements.

**Rebates and grants**

Rebates and grants are typically lump-sum incentives based on system capacity or cost that are provided to a generator at or near the beginning of project operation, rather than over time. Similar to FITs, rebates and grants are usually cash payments and the incentive amount provided to generators is administratively determined.

*Policy maker perspective*: Grants and rebates have been used in many developed and developing countries around the world (REN21, 2011). Although their uses vary, they are often selected to support emerging or less mature technologies. A drawback of grants and rebates is that they are typically not performance-based. Developers therefore have less incentive to design efficient systems that perform over the long-term. When the upfront payments are based on the total expense of the system, it is possible that gaming could occur where vendors or developers artificially inflate equipment prices in order to maximize incentive levels, or select poorer quality components, less efficient operations or fall behind on regular system maintenance.

### Tax credits

Tax credits reduce tax liability and are typically calculated based on percentage of project cost or on project output (e.g. $/kWh). Investment tax credits share design features with rebates and grants in that they are received early in the project's life. Production tax credits are similar to FITs in that their payment levels are administratively determined and are also awarded based on electricity output. A primary difference between tax based and cash based incentives is that tax based incentives require the project owner to have sufficient tax liabilities to full take advantage of, or "monetize," the tax credits.

*Policy maker perspective:* Tax credits do not require the collection of government revenues for future disbursement and may be politically more feasible than grants in some jurisdictions. Tax credits create a hurdle, however, for entities without tax liability[6] to invest in renewable energy projects.[7] Tax credits also usually require that the share of equity investment in the project is at least sufficient to capture the tax credit benefit. As a result, project capital structures may include a higher proportion of equity than would otherwise be optimal and may therefore be more costly than structures with a higher amount of debt.

### Renewable Portfolio Standards and Quota Systems

Renewable portfolio standards (RPS) and quota systems require an entity (usually the utility) to source a percentage of the energy they sell from renewable energy. This requirement typically increases over time until it reaches a specified level (e.g. 20% by 2020) (Ottinger and Bradbook, 2007). RPS policies have evolved steadily during the past twenty years since they were first introduced in the United States (van der Linden et al., 2005; Wiser and Barbose, 2008). RPS policies often require the use of renewable energy credits (RECs)[8] to demonstrate compliance with national or state targets. Competitive tenders and credit trading are two of the primary mechanisms through which RECs are procured.

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[6] This could include entities that do not pay taxes, such as governments or non-profits, as well as entities that have not made sufficient income to pay taxes during a given year.

[7] In addition, tax credits exacerbate the impact of economic downturns on project development because of the lower amount of available "tax appetite" resulting from lower taxable profits.

[8] Also called tradable green certificates (TGCs), tradable renewable energy certificates (TRECs), etc.

## Competitive tenders and auctions

Competitive tenders and auctions are often associated with RPS and quota policies, although they can also be utilized outside of the RPS context. A primary difference between a FIT and a competitive tender is how the prices are determined. Under competitive tender or auction processes, developers typically bid for the right to sell electricity at a given price, whereas FIT prices are administratively determined. There are many approaches to structuring competitive processes that range in complexity from requests for proposals (RFPs) that result in a single, low-bid winner to multi-round clock auctions with multiple winners (Maurer and Barroso, 2011).

*Policy maker perspective:* Competitive tenders may create opportunities to put downward pressure on renewable electricity prices and to introduce more transparent price discovery. They are typically offered periodically and require developers to incur transaction costs to compete, which can serve as a barrier to smaller or thinly capitalized projects. As a result, competitive processes may be inappropriate in countries where the policy goals include supporting a diversity of project sizes and/or attracting a broad range of capital providers to participate in the market. Furthermore, auctions may attract unrealistically low or speculative bids that do not result in projects being developed. In Europe, for example, contract failure rates under past competitive tenders for renewable energy ranged from 67%-78% (Wiser et al., 2006). Contract failure rates are no always so high, however, and results are highly dependent upon design.

## Tradable Renewable Energy Credits

Tradable RECs were first developed in the United States as a compliance mechanism for the first wave of state-level RPS policies in the late 1990s (Rader and Norgaard, 1996). A REC represents a measured unit of electricity and can be unbundled from the electricity itself and sold as a separate and tradable commodity. Utilities purchase RECs from eligible renewable generators in order to demonstrate compliance with renewable energy mandates or targets. As originally envisioned, tradable RECs utilize market forces to efficiently deliver the lowest policy costs. As currently implemented, however, RECs are procured using a broad range of mechanisms, including short-term trading, competitive tenders, bilateral negotiations, and standard offers.

*Policy maker perspective:* When traded, RECs are unbundled from electricity and typically sold on the spot market or via short-term agreements. Prices can vary according to supply and demand and may be capped by alternative compliance payment rates or penalties. The variability in REC prices creates significant investor risk and many lenders discount the projected value of tradable RECs when evaluating investments (Baratoff et al., 2007; Ford et al., 2007). Because RECs are sold separately from electricity, generators are exposed to the added risk of having to negotiate and enter into multiple contractual arrangements for different commodities (i.e. electricity and RECs) (Mitchell et al., 2006). As tradable REC markets have evolved, however, policy makers have increasingly introduced price securitization mechanisms, such as price floors and long-term contracts to reduce market price volatility (Bird et al., 2011; Wiser et al., 2010).

**Net metering**

Net metering broadly refers to the practice of crediting onsite generators for electricity they produce and potentially paying them for the excess electricity they produce. Net metering can be distinguished from FITs in several ways. First, net metering typically involves an electricity bill credit at the retail or wholesale levels, rather than an incentive payment or electricity sale contract. Second, net metering offsets behind-the-meter load, whereas FIT generators are typically in front of the meter—even for onsite generation such as rooftop-mounted PV.

*Policy maker perspective:* Net metering does not usually include a long-term contract, and the size of systems is usually dictated by onsite loads. The lack of a long-term contract can make net metering more difficult to finance, whereas the requirement for onsite load can mean that properties with significant potential renewable resources and limited load cannot be developed. Net metering is typically enacted in combination with other incentives such as rebates or grants since net metering on its own has historically been insufficient to drive market growth (Mitchell et al., 2011; Starrs, 1998).

**Competing or combining policies?**

When developing FIT policies, it is useful for policy makers to understand where the borders between these different policy types lie, including where they are similar and where they are different. It is also useful to recognize that while renewable energy policies are sometimes discussed as mutually exclusive alternatives, there are opportunities to merge or combine FIT policies with other renewable policies.

*Comparing policies: The debate in Europe.* There has been vigorous discussion about the comparative merits of different national renewable energy policies during the past two decades. The primary debates have been about FITs and competitive tenders (Hvelplund, 2001; Rickerson and Twele, 2002) and between FITs and tradable credits (Butler and Neuhoff, 2008; Fouquet et al., 2005).

In the late 1990s, there was debate in Europe as to whether countries should adopt FITs or competitive tenders. Countries such as Denmark and Germany used FITs to drive rapid wind energy capacity additions, whereas countries that implemented competitive tenders (e.g. Ireland, United Kingdom and France) installed only a limited amount of new renewables. France and Ireland switched from competitive tenders to FITs, whereas the UK switched to tradable credits under its new Renewables Obligation.

During the 2000s, the European Union initiated an effort to harmonize national renewable energy policies on an EU-wide basis. The debate during this period was primarily between tradable credits and FITs, with arguments centring on the importance of investor security and its impact on policy cost (Commission of the European Communities, 2005; Rickerson and Grace, 2007). Although harmonization was ultimately not successful, the majority of EU countries now use FIT policies.

Some countries have enacted mixed policies. After having switched from tenders to tradable credits, for example, the UK introduced FITs for smaller scale resources in April 2010 (DB Climate Change Advisors, 2010b). Italy, meanwhile, introduced FITs for photovoltaics in parallel with using tradable RECs for other technologies (Italian Ministry for Economic Development, 2010).

*Renewable energy policy in developing countries.* FITs are currently the most common renewable energy policy type in developing countries, aside from tax exemptions (REN21, 2011). There have been debates in developing countries similar to those in Europe, and several countries have recently changed their primary renewable energy policy. Brazil, for example, switched from its PROINFA FIT policy to a system of auctions in 2009-2010 (Dalbem and Gomes, 2010). Argentina, Mexico, Peru, Honduras, China, Morocco, Egypt and Uruguay have also recently held auctions for renewable generation (Tabbush, 2010). Numerous countries have added new FITs in the last two years, however, and China has transitioned away from auctions for onsite wind to FITs (Elizondo-Azuela and Barroso, 2011). Both auctions and FITs have their strengths and weaknesses and it is likely that dialogue about and experimentation with both policies will continue in developing countries.[9]

*Combined policies.* Although renewable energy policies are often discussed and debated as mutually exclusive options, many of the policies discussed above are currently used in parallel. Of all the developing countries with FITs, for example, only Algeria, Serbia and Sri Lanka use FITs alone (REN21, 2011). All of the other countries utilize FITs combined with a mix of quotas, upfront payments, tax credits, net metering, RECs, and/or competitive tenders (REN21, 2011). Many countries are also developing new ways of combining FITs with other policy types:

- *FITs and competitive tenders.* During the past several years, China has experimented with combining FITs and auctions, using the auction to establish a benchmark price and then using that price to establish a FIT on a standard offer basis (Liebreich, 2009). Other countries have implemented FITs and auctions in parallel. Argentina, for example, has established a FIT, but also utilizes a competitive tender system in parallel (Paredes et al.,

[9] The U.S. National Renewable Energy Laboratory is one of several institutions to recently explore auctions, feed-in tariffs and other renewable energy procurement options. *See* (Kreycik et al., 2011)

2011), whereas Peru has established auctions for on-grid renewables and FITs for off-grid renewables.

- *RPS and FITs.* Although RPS and FITs have been discussed as mutually exclusive policies in the past, countries are increasingly introducing combined policies under which the FITs are used as a mechanism to achieve RPS goals. The Philippines, India, and the US, for example, combine renewable portfolio standards, tradable credits, and FITs at the federal and/or state levels (Arora et al., 2010; Rickerson et al., 2008).

- *Net metering and FITs.* Net metering and FITs are typically thought of as mutually exclusive since net metering credits electricity on the customer side of the meter whereas FITs involve a purchase on the utility side of the meter. There is increasing interest in models, however, that provide FIT payments for behind-the-meter consumption, that provide premium payments on top of net metering, or that allow generators to consume power onsite and earn FIT payments for power exported to the grid (so-called net FITs). These types of policies are beginning to blur the line between FITs and net metering regulations.

When developing FITs, policy makers need to evaluate how FITs interact with existing or proposed policies—both how FITs might create synergies with other policies and how their interaction may create unintended consequences (Fischer and Preonas, 2010). The remainder of this report focuses on FIT policies. Renewable energy policy making will remain dynamic, however, as an increasing number of developing countries enact policies designed to meet national and regional renewable energy targets. The interaction between FITs and other policies in developing countries is recommended as a topic for further research.

## 2.2. General FIT requirements

FITs are difficult to define in a single sentence because they are a “package” of different regulatory and incentive policies, rather than just a single, stand-alone policy such as a tax credit or a rebate (Rickerson et al., 2011b). These packages can be combined in a variety of different ways, depending on policy makers’ goals and constraints. For the purposes of this report, the unifying features of FITs include performance-based cash payments ($/kWh) that are determined administratively (rather than through market competition) and available on a standard offer basis. Beyond this basic definition, FITs may encompass the following policy elements:

**Table 2.1 FIT Policy Elements**

| Policy Elements | |
|---|---|
| **Interconnection** | The term "feed-in tariff" derives from the fact that early European FITs established rules for how electricity could feed in to the grid. Although many FIT definitions focus on the price paid to the generator, the rules that govern grid interconnection remain a powerful component of many FITs—particularly in countries that are transitioning from monopoly utilities to markets that allow independent power producers to participate. The interconnection regulations contained in FITs can include interconnection guarantees, streamlined or priority interconnection, and special rules for how interconnection costs are allocated and recovered. |
| **Purchasing** | FIT policies may require that utilities (or other entities) purchase renewable electricity. |
| **Transmission and distribution** | Related to, but distinct from, interconnection and purchasing requirements are requirements that utilities give priority to renewable electricity on the transmission and distribution systems. |
| **Contracting** | FIT policies may specify details of the contracts that are to be signed with renewable generators. These include the term of the contract, the extent to which the contract must be simplified and standardized, the contract currency, etc. |
| **Pricing** | FIT policies typically specify the price(s) that will be paid to renewable generators. Although pricing methodologies and price levels are the focus of many FIT analyses, it is important to realize that pricing is only one component of FIT policy packages. |

This report focuses on how these different policy components can be combined and how they interact, rather that attempting to establish a single, comprehensive FIT definition. Different jurisdictions have combined these packages in different ways around the world and exceptions can be found for most FIT "rules." Some countries, for example, have established FIT payments, but they have not specified purchase requirements or interconnection requirements. Other countries, meanwhile, have implemented FITs that guarantee generators priority access to the grid but do not guarantee them a fixed or long-term price. Even in cases where policy makers have implemented similar "packages," there is wide variation in how the specifics of each policy have been implemented. Given the diversity of conditions and constraints in developing countries, this report focus on how individual policy options apply to specific situations rather than trying to identify a set of best practices that should be broadly applied.

# 3. Law Drafters' Guide: Design Options and Considerations for Adapting FITs to the Developing Country Context

## 3.1. Methodology

There have been several efforts that have defined FIT design practices (Couture et al., 2010; Grace et al., 2008; Klein et al., 2008; Mendonça et al., 2009). This chapter of the report builds on these efforts by:

- Grounding the FIT policy analysis in the context of the conditions and constraints present in developing countries.
- Reviewing FIT designs according to the policy considerations discussed in Chapter 1.
- Providing policy makers and law drafters with sample language from existing FIT policies from around the world to serve as references and guidance.

In preparation for this report, over 60 different national, regional, and local FIT laws were reviewed and characterized using a standard set of design elements. The laws were then analyzed to identify language that reflects the range of options discussed in the report. When reviewing the sample language contained in this report, law drafters' should keep the following points in mind:

- Only laws and policies which were written in English, or that have publicly available English translations, were selected for inclusion in the document.
- In some instances, the translations used were not official (such as Thailand and Croatia) and therefore the original text in the original language should be consulted for the most accurate legal interpretation.
- Examples from national policies in developing countries were prioritized, but balanced with examples from developed countries and from state or local policies in order to best reflect the diversity of current practice and the full range of choices available for policy makers and law drafters.

- While we sought to pull from a broad range of countries, Germany is referenced more often than most countries because it treats the widest range of issues in the greatest amount of detail, following more than 20 years of FIT law making and revisions.

- While we have attempted to be comprehensive, the field of FIT policy has become so broad that not all possible policy issues are covered.

- The sample language included in this report does not represent "best practice" *per se*, and is intended to serve as representative (rather than model) text.

- Language was excerpted not only from FIT legislation, but also from related regulations and policies where applicable and relevant (see Section 3.2 below).

- Laws, regulations, and policies are frequently updated. Although the examples utilized may not represent the most "up-to-date" or current policy in a given country, they still serve as useful benchmarks for law drafters.

Attorneys or other legal experts should be contacted within a specific jurisdiction before adopting or using any of the language found in this chapter of the report.

## 3.2 Developing FITs through Law and Regulation

The approach to developing a FIT policy in any jurisdiction will depend on a number of factors, such as political system, legal tradition, governmental structure, legislative process, market structure, etc. Depending on such factors, policy makers may choose different routes to developing FITs.

- The FIT law may be include a high level of detail about the FIT design and can serve as the ultimate "rule book" for the policy.
- The FIT law may mandate the creation of the FIT, but delegate the development of the specific policy details to a regulatory body[10] or a government agency.
- There may not need to be a specific FIT law passed in order to establish a FIT. This could occur in countries, for example, where a regulatory body or government agency has been given broad and permissive authority to develop regulations related to the electricity industry (e.g. through a general energy law). In such circumstances, the development of a FIT policy could be initiated through a request from an executive branch or regulator, for example.

[10] It is important to note that some developed and developing countries lack a regulatory function entirely.

There are pros and cons to each of these approaches. Figure 3 below presents a high level summary of some of the trade-offs inherent in legislative and non-legislative approaches. Establishing a FIT through detailed legislation, for example, may provide greater investor certainty because the law may be viewed as more difficult to change than a policy enacted as a result of an executive branch or regulatory agency initiative. On the other hand, developing and passing FIT legislation may be a lengthier and more challenging process than if a government agency develops and promulgates FIT regulations.

**Figure 3. FIT policy development pathways**

**Legislative pathway**

- Feed-in tariffs are often established in law. The language of the legislation can be very narrow or very broad in its scope. For example, the legislation can include the specifics of a FIT policy including terms like price, contract length, and technology, or the legislation can be very general, only specifying that a FIT is authorized and grant authority to a utility commission or regulatory body to promulgate the specifics of the FIT policy in the form of regulations.

Pros
- Strength of law
- Greater investor confidence and security

Cons
- Difficult to include all relevant details in law alone
- Less opportunity for stakeholder consultation and buy-in

**Non-legislative pathway**

- Regulatory bodies (e.g. utility commissions) may have constitutional or legal authority to develop rules and regulations. Assuming that authority over renewable electricity is properly established, they may have the power to develop a FIT program independent of FIT legislation or upon direction from the executive branch (e.g. a President or Minister).

Pros
- Potentially streamlined policy development
- Creates opportunity for regulatory process and stakeholder buy-in

Cons
- Not a law
- Less investor confidence

The feasibility of these or other pathways will vary depending on the constitutional and legal frameworks that exist within any given country and there are many examples internationally of different pathways being used to establish and design FIT policies. For the purposes of this report, we will draw lessons and relevant language from examples of both legislative and non-legislative pathways.

## 3.3 FIT Design Issues & Options and Law Drafter's Guide

This section provides sample language from existing FIT legislation, regulations, and policies, organized by design issue. The purpose of this section is to provide examples of how FITs have been adopted within specific jurisdictions. To the extent possible, the descriptions of FIT design issues and options are structured using the following format[11]:

- Definition of the design issue
- Description of key options
- Sample legal text reflecting the major options
- Discussion of how the design options relate to the policy considerations identified in Chapter 1. Each issue and option is mapped to the policy considerations using the following table format.

**Table 3.1 Example FIT design issue & policy considerations chart**

| | Policy Considerations | | | | |
|---|---|---|---|---|---|
| **FIT Design Issue** | **Investor security** | **Policy costs** | **Price stabilization** | **Electricity portfolio diversity** | **Administrative complexity** |
| **Payment Based On** | ✓ | ✓ | ✓ | ✓ | ✓ |

The table on the following page provides a high-level summary of the design issues and policy considerations discussed in this report. The checks indicate which design issues are most relevant to which policy considerations, and vice versa.

[11] The exception to this presentation is "Policy Objectives in Law" (Section 3.3.2). For this design issue a box is not a relevant tool for describing the issues because of their range of variation.

| Policy Considerations | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| FIT Design Issue | Investor security | Energy access | Grid stability | Policy costs | Price stabilization | Electricity portfolio diversity | Administrative complexity | Economic development |
| Integration with Policy Targets | ✓ | | | | | | ✓ | |
| Eligibility | | ✓ | ✓ | ✓ | | ✓ | | ✓ |
| Tariff Differentiation | | ✓ | | ✓ | | ✓ | ✓ | ✓ |
| Payment Based On | ✓ | | | ✓ | ✓ | ✓ | ✓ | |
| Payment Duration | ✓ | | | ✓ | ✓ | | | |
| Payment Structure | ✓ | | | ✓ | ✓ | | ✓ | |
| Inflation | ✓ | | | | ✓ | | | |
| Cost Recovery | ✓ | | | ✓ | | | | |
| Interconnection Guarantee | ✓ | | ✓ | | | | | |
| Interconnection Costs | ✓ | | ✓ | ✓ | | | | |
| Purchase and Dispatch Requirements | ✓ | | | ✓ | | | | |
| Amount Purchased | ✓ | | | | | | ✓ | |
| Purchasing Entity | ✓ | | | | | | ✓ | |
| Commodities Purchased | ✓ | | | ✓ | | | ✓ | |
| Triggers & Adjustments | ✓ | | ✓ | ✓ | ✓ | | ✓ | |
| Contract Issues | ✓ | | | | | | | |
| Payment Currency | ✓ | | | ✓ | | | | |
| Interaction with Other Incentives | ✓ | | | ✓ | | | | |

### 3.3.1 INTEGRATION WITH POLICY TARGETS

Numerous countries have set targets for renewable energy (including electricity, transportation, and thermal energy) and many have also set specific targets for renewable electricity. Different countries have taken different approaches to structuring and integrating these targets:

- Some of these policy goals are binding targets, whereas others are voluntary goals or statements of intent.
- Some countries have renewable electricity targets that are directly tied to both their renewable energy and climate change targets, whereas some countries do not explicitly link their parallel energy and climate goals.

FIT policies can contribute to the achievement of both renewable energy and climate targets. Policy makers can use FIT legislation to specify the degree to which FITs are explicitly integrated with – or separate from – other national targets.

**Design Options**

The two key policy issues are whether to integrate FITs with national policy targets and if so, how to do so. It is important to link the FIT policy to existing targets, when they exist.

- No linkage to targets. Some countries have established FIT policies without having a national renewable energy policy in place. Tanzania and Nicaragua, for example, have implemented FITs but have not enacted national renewable energy targets. Other countries have established national targets and FITs in parallel but do not have explicit rules or regulations for how the two policies interact.
- Explicit linkage to targets. As shown in the examples below, some countries have explicitly linked their FITs to the achievement of national renewable energy targets.

When FIT policies are explicitly integrated with other renewable energy targets, the key policy issues include whether the target is a binding mandate or a voluntary goal, whether the FIT is intended to meet part or the entire national target, and whether the national target is set as a floor for renewable energy market growth or a ceiling. Targets that function as ceilings are explored in Section 3.3.16 (adjusting FIT policies) and Section 3.3.15 (what commodities are purchased under the FIT).

*Example 1. Germany*
The German FIT is explicitly linked the countries' mandatory national renewable electricity target, which is in turn linked to broader renewable energy and climate policies (DB Climate Change Advisors, 2011b). The 2008 law, moreover, specifies that the FIT is the primary mechanism for meeting the national target and that the national target is a *floor* rather than a ceiling: "this Act aims to increase the share of renewable energy sources in electricity supply to at least 30 per cent by the year 2020 and to continuously increase that share thereafter."
Renewable Energy Sources Act of 25 October 2008 (Federal Law Gazette I 2008, 2074) as last amended by the Act of 11 August 2010 (Federal Law Gazette I 2010, 1170)(Germany)

*Example 2. South Africa*
South Africa's FIT law explicitly links the FIT policy to the country's national renewable energy goals, but does not specify how the two policies interact: "The REFIT will support the Government's 10,000 GWh 2013 Renewable Energy Target and deliver sustained long-term growth in order to promote competitiveness for renewable energy with conventional energies in the medium and long-term."
South Africa Renewable Energy Feed-in Tariff (REFIT) - Regulatory Guidelines 26 March 2009 (N.E.R.S.A. 2009)(South Africa)

*Example 3. California*
California established its FIT as one of several procurement options for meeting the state mandatory RPS policy. The FIT is therefore not the sole mechanism for RPS compliance, but it is explicitly linked to state targets: "Every kilowatt-hour of renewable energy output produced by the electric generation facility shall count toward the electrical corporation's renewable portfolio standard annual procurement targets."
An Act to Add Section 399.20 to the Public Utilities Code, Relating to Energy – Assembly Bill No. 1969 (C.S.L. 2006)(California, United States)

## Option Analysis

FIT integration with national policy targets can have implications for investor security and for the amount of administrative complexity.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Investor security | Administrative complexity |
| Integration with Policy Targets | ✓ | ✓ |

*Investor security.* Integrating FITs into broader climate and energy targets can increase investor confidence in renewable energy markets because the target represents a formal government commitment – particularly if the targets are binding mandates with the power of law, rather than, voluntary goals (DB Climate Change Advisors, 2011b). In addition, some form of compliance requirement or penalties, create additional investor confidence and security (DB Climate Change Advisors, 2009). Since renewable energy has the potential to be a transformational technology, targets acknowledge that electricity market and supply transformation is intentional and supported by policy makers. Structured targets and specific policy timelines can further provide investors with a sense of expected renewable energy market size and growth potential. Targets that serve as policy ceilings (i.e. caps on market growth) introduce their own set of investor concerns, which are discussed in Section 3.3.3.

*Administrative complexity.* The linkage of FITs with national targets can create additional administrative complexity for policy makers and staff since progress toward the target then has to be tracked. However, monitoring can also guide a country towards measurable results and make it possible to evaluate the effectiveness of a FIT policy in meeting targets. Tracking renewable energy market growth typically requires some type of monitoring and verification system, such project registries, progress reporting and verification protocols, and/or automated tracking systems.

### 3.3.2 POLICY OBJECTIVES IN LAW

As discussed in Chapter 1, FIT policies are often designed to achieve specific policy objectives. Policy makers often describe the policy objectives in the text of the legislation in order to provide context for a piece of legislation and clarify its intent.

*Example 1. Germany*
Germany's 2004 FIT law states that: "The purpose of this act is to facilitate a sustainable development of energy supply, particularly for the sake of protecting our climate, nature and the environment, to reduce the costs of energy supply to the national economy, also by incorporating long-term external effects, to protect nature and the environment, to contribute to avoiding conflicts over fossil fuels and to promote the further development of technologies for the generation of electricity from renewable energy sources."
Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz) (BMU 2004)(Germany)

*Example 2. Kenya*
Kenya's 2010 FIT policy states that:
"The objectives of the FiTs system are to:
a) Facilitate resource mobilization by providing investment security and market stability for investors in electricity generation from Renewable Energy Sources.
b) Reduce transaction and administrative costs and delays by eliminating the conventional bidding processes.
c) Encourage private investors to operate their power plants prudently and efficiently so as to maximize returns."
Source: (Ministry of Energy, 2010b)

**Design Options**

The range of possible options is broad and a comprehensive catalogue of the types of policy objectives and constraints that can be recognized in legislation is beyond the scope of this paper. For a more comprehensive discussion of the range of policy objectives and a discussion their tradeoffs, see Grace and Donovan (2011).

**Option Analysis**

The inclusion of policy objectives in legislation may or may not have a direct impact on policy implementation, depending on the policy making process of the country in question. In countries where the passage of the FIT law is the final stage in policy development, the effect of including policy objectives in legislation is to provide context.

Policy objectives can influence policy development, however, if the law and considerations set the stage for subsequent rounds of policy making.  For example, the FIT law in the US state of Vermont requires that the state regulatory[12] body evaluate the proposed rates and adjust them periodically. The law states that the intent of the FIT is to "ensure that the price provides sufficient incentive for the rapid development and commissioning of plants and does not exceed the amount needed to provide such an incentive."[13] In the Vermont context, these two objectives are effectively in conflict. Ensuring the rapid development of plants appears to be an argument for more aggressive rate setting, whereas ensuring that the rates do not exceed the "amount needed" appears to be an argument for more conservative rate setting. This issue became a central point of debate among stakeholders during Vermont's regulatory proceedings with some stakeholders arguing that the law calls for higher rates and other arguing that the law calls for lower rates (Vermont Public Service Board, 2010). In specifying policy objectives, law drafters' should keep in mind whether the objectives will be used as guidance for further policy making (e.g. during subsequent policy reviews) and whether the objectives are complementary or potentially in conflict.

### 3.3.3 ELIGIBILITY

Eligibility defines the type of generation that can participate in the FIT policy. FIT eligibility can be defined broadly or narrowly, depending on policy goals. Internationally, eligibility definitions vary widely, from policies that focus on only one technology type to policies that are open to all project types. An exhaustive catalogue of options is beyond the scope of this report since policy makers can define eligibility however they deem fit. This section focuses on some of the more

[12] The Vermont Public Service Board (PSB)
[13] No. 45. An act relating to renewable energy and energy efficiency (H.446)

common eligibility decision points for the sake of illustration: technology, vintage, ownership, size, and grid connection.

## Technology and resource eligibility

Technology and resource eligibility determines the type of generation that can participate in the FIT policy.

### Design Options

The key policy decision related to technology eligibility is whether to restrict the type of technologies that can participate in the policy and if so, how. Some law drafters include the full spectrum of renewable generation as eligible, whereas others limit eligibility narrowly to one target technology. Another key distinction is how policy makers define "renewable" or "clean" generation. Some law drafters explicitly exclude fossil fuels from policy eligibility, whereas others define eligibility to include "clean" (but not necessarily renewable) technologies such as non-renewable co-generation, municipal solid waste, or non-renewable fuel cells.

*Example 1. Czech Republic*
The Czech Republic's FIT broadly defines eligibility, but explicitly excludes fossil fuels: "Renewable sources" shall mean renewable non-fossil natural energy sources, i.e. wind energy, solar energy, geothermal energy, water energy, soil energy, energy of the air, biomass energy, landfill gas energy, energy of sewage treatment plant gas and energy of biogases (Article 2(1)).
Act on the Promotion of the Use of Renewable Energy Sources (Act No. 180/2005 Coll)(M.I.T. 2005)(Czech Republic)

*Example 2. Estonia*
Estonia defines eligible generation as both "renewable energy sources" as well as "efficient cogeneration" if the source of energy is "waste…peat or oil-shale processing retort gas."
Electricity Market Act (M.E.A.C. 2003)(Estonia)

*Example 3. South Australia*
South Australia defines "qualifying generator" very narrowly as "a small photovoltaic generator…that is operated by a qualifying customer."
Electricity (Feed-In Scheme—Solar Systems) Amendment Act (S.A. 2008)(South Australia)

### Option Analysis

Technology eligibility decisions primarily impact portfolio diversity. When decision makers narrow the definition of eligible technologies, they can reduce the ability of the FIT to support a diverse portfolio of generation sizes and technologies (e.g. small rooftop solar versus centralized geothermal plants).

Technology eligibility decisions are also linked to the achievement of other policy objectives, such as:

- *Grid stability*: Defining eligibility to include only technologies that can be easily integrated into the electricity grid can support grid stability.
- *Policy costs*: Limiting eligibility to comparatively cost-competitive technologies can result in lower policy costs.
- *Economic development*: Restricting eligibility to only those technologies with the highest job creation potential can support economic development and industrial policy.

| | Policy Considerations | | |
|---|---|---|---|
| **FIT Design Issue** | **Grid stability** | **Policy costs** | **Economic development** |
| **Technology Eligibility** | ✓ | ✓ | ✓ |

It is important to note, however, that definition of technology eligibility is a threshold issue that does not typically determine a policy’s impact. Eligibility, for example, will not support renewable energy market growth if reasonable payment rates are not also included for eligible technologies. Similarly, eligibility for higher cost technologies will not result in high ratepayer and taxpayer impacts if market growth is controlled by caps or other mechanisms. Eligibility decisions can open the door to different policy outcomes, but it does not ensure them.

## Eligibility of new vs. existing projects

“Vintage eligibility” determines the age of generators that can participate in the FIT policy.

### Design Options

The key design trade off is whether to allow only “new” generation. In many countries, only generators that come online after the effective date of the law are eligible for the FIT. This is not always the case, however. In some countries, a certain date in the past is fixed as the threshold after which generation can qualify for the FIT; in some countries, all generation is eligible no matter how old they are; and in some countries, existing generators are eligible for the FIT policy only if they have expanded, repowered, or otherwise fundamentally changed.

*Example 1. Ontario, Canada*
In its 2006 FIT, Ontario defined eligible generation as generation that had been established after the date of the Province's electricity restructuring. "To be eligible to participate in the Program, a Project…shall not have achieved Commercial Operation, unless Commercial Operation was achieved on or after November 7, 1998, the date of proclamation of the Electricity Act."
Standard Offer Program Renewable Energy – Final Program Rules (O.P.A. 2006)(Ontario, Canada)

*Example 2. Uganda*
Uganda defines existing generators as eligible if they have recently upgraded or expanded their plants: "Qualifying renewable energy generators shall be defined as...Plant including additional capacity resulting from project modernization, repowering and expansion of existing sites, but excluding existing generation capacity."
Source: (Electricity Regulatory Authority, 2010)

**Option Analysis**

The choice of vintage eligibility could impact electricity mix diversity and economic development opportunities.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Electricity portfolio diversity | Economic development |
| Vintage Eligibility | ✓ | ✓ |

*Electricity portfolio diversity*. Allowing only new generators to take advantage of the FIT encourages the development of new renewable energy capacity and contributes to both renewable energy market growth and to increased portfolio diversity. Enabling existing generators to participate in the program – without requiring them to repower or modernize -- by contrast, can limit market growth if the total FIT program amount is capped and new generation must "compete" with existing generation.

*Economic development*. Limiting eligibility to new generators can create opportunities for new investment and job creation. Enabling existing generators to take advantage of FIT rates, on the other hand, can be viewed as a maintenance strategy for plants that would otherwise fail. In the US State of Vermont, for example, existing biogas generators were allowed to transition from an existing and uneconomic rate to the new FIT rate. The transition avoided bankruptcy and secured local jobs.

## Ownership eligibility

Ownership eligibility defines the types of entities that can own generation under the FIT whether that is a private entity, state agency, corporation, utility, or individual.

### Design Options

The primary decision is whether or not to restrict FIT eligibility only to certain ownership types. Some FIT policies make no restrictions, whereas others include specific ownership requirements.

*Example 1. Thailand*
Thailand defines a broad range of eligible ownership types, stating that a renewable energy generator can be: "private entity, state agency, state-owned enterprise or an individual with his own generating unit."
Regulations for the Purchase of Power from Very Small Power Producers (for the Generation Using Renewable Energy)(EPPO 2002)(Thailand)

*Example 2. Nova Scotia*
The Nova Scotia FIT limits eligibility only to generators that are community owned. The definition of community ownership is specifically outlined: "In order to qualify for a tariff…the generation facility…must be owned by one or a combination of the following:
(i) a municipality or a wholly owned subsidiary of that municipality, provided the generation facility proposed is located within the boundaries of that municipality or the boundaries of an immediately adjacent municipality;
(ii) a Míkmaq band council provided the generation facility is located on reserve lands or lands leased or owned by a band controlled entity,
(iii) a cooperative where a majority of the members reside in Nova Scotia and at least 25 of which reside in the municipality where the generation facility is located;
(iv) a not-for-profit body corporate where a majority of its members reside in Nova Scotia and at least 25 of which reside in the municipality where the generation facility is located;
(v) a community economic development corporation where at least 25 of its shareholders or members reside in the municipality where the generation facility is located**;** or 13
(vi) a university"
Nova Scotia Community Feed-in Tariff (U.A.R.B. 2011) (Canada)

### Option Analysis

Restricting eligibility to certain types of ownership structures can influence policy costs and economic development opportunities.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Policy costs | Economic development |
| Ownership Eligibility | ✓ | ✓ |

*Policy costs.* As discussed in Section 3.3.4 on differentiation, there can be a trade-off between economic development and policy cost goals. Ownership eligibility restrictions that focus on more expensive types of projects may boost domestic expenditures and income (and therefore support economic development) but they can also place a correspondingly heavier burden on ratepayers. This trade off depends on a range of other variables such as rate setting approach, tariff differentiation, and the relationship of renewable energy costs to conventional fuels.

*Economic development*. Restricting eligibility to domestic or community ownership can increase the economic development value of a project. As with technology eligibility, however, this impact will depend heavily on other design decisions. If the FIT rates are not sufficient to support community-owned generation, for example, then economic benefits will not be captured.

## Size eligibility

Size eligibility, also referred to as project caps, defines the project sizes that are eligible for the FIT.

### Design Options

The primary decisions with size eligibility are whether to restrict size, and if so, whether to apply a size cap or to apply a size floor.

*Example 1. Kenya*
Kenya defines both project floors and project ceilings on a technology-by-technology basis: "This tariff shall apply to individual wind power plants (wind farms) whose effective generation capacity is above 500kW and does not exceed 100 MW… For the purposes of this tariff, Small hydro power plant means the hydro based power plants whose installed capacity is greater or equal to 500kW but less than or equal to 10 MW"
Source: (Ministry of Energy, 2010b)

*Example 2. South Africa*
South Africa establishes uniform floors, but no size caps, for certain resources: "A qualifying renewable energy power generator under Phase II of REFIT shall for the time being be defined as a new investment in electricity generation using the following technologies:
a) biogas (≥ 1 MW);
b) biomass solid (≥ 1 MW);
c) CSP trough without storage (≥ 1 MW);
d) large scale grid connected photovoltaic systems (≥ 1 MW); and
e) CSP tower with storage of six hours per day (≥ 1 MW)."
Review of Renewable Energy Feed-In Tariffs (N.E.R.S.A. 2011)(South Africa)

*Example 3. Cayman Islands*
The Cayman Islands FIT policy restricts system size based on customer load: "Residential customers on this tariff will be allowed to install generating capacity no greater than CUC's estimate of the customer's peak load or 20 kW AC, whichever is less. Commercial customers on this tariff will be allowed to install generating capacity of up to 50 kW AC, or CUC's estimate of their peak load, whichever is less. In the absence of available demand readings, CUC will estimate the customer's peak load."
Consumer-Owned Renewable Energy (CORE) Credit Agreement (C.U.C. 2011)(Cayman Islands)

**Option Analysis**

Restricting eligibility to certain project sizes can influence grid stability, policy costs and economic development opportunities. It should be noted, however, that project size caps often need clear accompanying regulations defining the boundaries of a "project." Developers may try to game project size caps by breaking a large project that exceeds the cap into several smaller, contiguous projects that each meet the cap.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Grid stability | Economic development |
| Size Eligibility | ✓ | ✓ |

*Grid stability*. In developing countries, some grids cannot support large amounts of renewable energy development either because of their size or their relative instability. By restricting project sizes, policy makers can encourage more "manageable" development – particularly when program caps that reflect grid limitations are also introduced.

*Economic development*. As with ownership eligibility, there may be a trade-off between economic development and policy costs, depending on how eligibility interacts with other design choices. Generally, larger projects are likely to be more cost effective because of economies of scale, but are less likely to be domestically owned and financed, whereas smaller projects tend to be more expensive (i.e. on a $/watt basis), but more likely to be domestically owned and financed. Limiting project size to larger projects may decrease economic development impacts and policy costs whereas limiting project size to smaller projects may have the opposite effect.

## Grid connection eligibility

Grid connection eligibility defines how systems need to be connected to the grid in order for them to be eligible for the FIT.

### Design Options

The policy options for grid connection eligibility are whether to restrict on-grid interconnection to certain voltage levels, and whether to allow mini-grid or isolated grid systems to participate in the FIT.

*Example 1. Germany*
Germany utilizes a broad definition of eligible interconnection points by specifying that the FIT applies to generators that are connected to: "the interconnected facilities used for the transmission and distribution of electricity for general supply."
Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz EEG) (BMU 2004)(Germany)

*Example 2. Kenya*
In Kenya, the FIT for solar is targeted to supply power in off-grid and mini-grid applications. "To attract private sector capital in solar energy resource electricity generation, the Ministry of Energy hereby issues the Feed-in-Tariff for Solar Energy Resource generated electricity. Due to the relative high cost of this technology, it is intended to be used to supply the isolated/off-grid stations, to partly displace the thermal generation. These isolated power stations are at Lamu, Lodwar, Mandera, Marsabit,Wajir, Merti, Habasweni, Elwak, and Baragoi."
Source: (Ministry of Energy, 2010b)

*Example 3. Tanzania*
In Tanzania, eligibility is limited to distribution-interconnected generators defined as "embedded generators." Importantly, Tanzania has rates that explicitly target generators connected to the national grid system and to distribution systems in mini-grids or isolated grids.
"Embedded Generator is defined as a single generator or a group of generating plant with a total export capacity between 100 kW and 10 MW, connected to a Distribution Network in Tanzania, at 33 kV or below."
Source: (Tanzania 2009b)

**Option Analysis**

Defining eligibility according to grid connection can support a range of policy considerations. Restricting interconnection to distribution grids, for example, can be another route to limiting project sizes.[14]

| FIT Design Issue | Policy Considerations<br>Energy access |
|---|---|
| Grid Connection Eligibility | ✓ |

*Energy access.* Of primary interest to a developing country, however, is whether the FITs are restricted to on grid applications or whether they can also be used to support energy access in mini-grid or off-grid applications. Although it is assumed that FITs in developed countries are grid-connected, there is an emerging trend in developing countries for enabling FITs to apply in mini-grids as well (Moner-Girona, 2008; Solano-Peralta et al., 2009). As discussed above, Tanzania defines FIT eligibility to include both on-grid and mini-grid interconnected generation. Ecuador also allows mini-grid interconnection and Peru's FIT targets only off-grid applications (Rickerson et al., 2010a). The topic of off-grid feed-in tariffs is a topic recommended for further research.

***Text Box 2. Local Content***

As discussed in Chapter 1, economic development is a key driver for the creation of renewable energy policies. Implementing renewable energy policy on its own, however, is not a guarantee that significant local industries will be created. Instead, renewable energy policy may encourage the importation of foreign technology and expertise without the creation of in-country capacity or jobs.

In order to encourage in-country economic development and job creation, different countries have added requirements to their energy policies designed to encourage "local content." These include, for example, minimum thresholds that projects must meet in order to be

[14] In Nova Scotia, for example, the COMFIT policy is limited to distribution interconnected systems. The Nova Scotia Department of Energy states that projects will likely be limited to under two megawatts in size as a result of this requirement, but that projects could be up to five or six megawatts, depending on the location on the distribution grid. It is also estimated that the distribution interconnection requirement will limit total program capacity to 100 MW overall (Nova Scotia Department of Energy, 2010a, 2010b).

eligible to participate in a given policy and additional incentives that projects can receive if they satisfy local content requirements.

Ontario's feed-in tariff, for example, currently requires that wind projects must achieve a domestic content requirement of 50% and that PV projects must achieve domestic content of 60%. Qualifying domestic content includes both manufactured goods and services (e.g. labour). Ontario has successfully attracted new manufacturers to the province, but the requirement has also proved controversial with Japan and the European Union each launching cases against the requirement in front of the World Trade Organization (WTO) (Wilke, 2011).

Local content requirements can also raise concerns related to cost and complexity, depending on how they are structured. Local content may be more expensive than imported goods and services, for example, and may raise the rates required under the feed-in tariffs. They may also create bottlenecks that delay the achievement of national goals. The PROINFA FIT program in Brazil, for instance, faced challenges because there was only one wind manufacturer that could satisfy the policy's 60% local content requirement (Elizondo-Azuela and Barroso, 2011).[15]

An alternative to local content thresholds is to provide incentives for local content. Turkey, for example, provides higher FIT payments for generators that utilize locally manufactured components instead of requiring all generators to incorporate local content. Sri Lanka also offers higher feed-in tariff rates for wind and hydro facilities that use locally manufactured turbines.

Local content strategies will likely continue to be a topic of intense discussion internationally. Countries will need to identify appropriate strategies for balancing their national economic development objectives with the cost and complexity of local content policies and with international trade regimes. There may also be opportunities to develop regional strategies that would ensure that each country participates in the renewable energy value chain without needing to locate a fully integrated industry within its own borders.

Sources: (Elizondo-Azuela and Barroso, 2011; Wilke, 2011)

### 3.3.4 TARIFF DIFFERENTIATION

The issue of tariff differentiation is closely related to the issue of eligibility. Both design issues target the technologies that are supported by the FIT. Tariff eligibility specifies which technologies can participate in the FIT, whereas tariff differentiation specifies the FIT rates that each technology will receive.

[15] Although Brazil no longer requires local content to participate in its new auction scheme, generators must include local content in order to qualify for low-cost financing from the national development bank (BNDES). These types of incentives provide

**Design Options**

FIT policies range from undifferentiated (i.e. only one rate is available for all eligible technologies) to highly differentiated rates that reflect a broad range of different factors. As described in Section 3.3.5, value based rates are typically undifferentiated, whereas differentiation is typically associated with generation cost-based rates.[16] In practice, FIT rates have commonly been differentiated by:

- Renewable energy type (wind, PV, etc.)
- Project size
- Resource quality (strong wind regime vs. weak wind regime)
- Technology application (e.g. ground mounted PV, roof-mounted PV, building-integrated PV, etc.)
- Ownership type (e.g. publicly owned vs. privately owned)
- Geography (e.g. mainland vs. island locations)
- Local content

The text that defines tariff differentiation in a country's law can be extensive, and this report does not attempt to reproduce the entirety of each country's differentiation language. The tariff differentiation language in Germany's 2008 FIT law, for example, is 17 pages long. The examples below are limited excerpts. Law drafters are encouraged to review specific laws or comparative reports on different pricing levels (Fouquet, 2009; Rickerson et al., 2010a).

[16] This rule does not always hold true, however. Some value based rates, for example, are differentiated by technology (such as Germany's FIT from the 1990s and Portugal's FIT (Heer and Langniß, 2007; Jacobs, 2010). Some generation cost-based rates are only for a single technology and therefore not differentiated. Finally, some FITs are differentiated based on characteristics such as whether they produce firm or intermittent energy or whether they generate at on-peak times or off-peak times. In these cases, the differentiated rates are intended to encourage certain behaviors or certain types of generation, rather than to reflect generation cost.

*Example 1. Greece*

Greece differentiates its FIT rates by technology, by size, and (for resources such as wind) according to whether the technology is located on the mainland or on islands: "The pricing is…based on the price, in euro per megawatt (MWh), of the electrical energy absorbed by the System or by the Network, including the Network of Non Interconnected Islands…The pricing of electrical energy…is carried out on the basis of the following table:"

| Production of electrical energy from: | Price of Energy (€/MWh) | |
|---|---|---|
| | Interconnected System | Non Interconnected Islands |
| (a) Wind energy exploited through land facilities with capacity greater than 50 kW | 87,85 | 99,45 |

Law 3851/2010: Accelerating the development of Renewable Energy Sources to deal with climate change and other regulations addressing issues under the authority of the Ministry of Environment, Energy and Climate Change (M.E.E.C.C. 2010)(Greece)

*Example 2. Sri Lanka*

Sri Lanka differentiates its rates by technology and also by whether the components are manufactured domestically: "Tariffs for electricity produced using Non-conventional Renewable Energy (NCRE) sources…would be as follows….All prices are in Sri Lanka Rupees per kilowatt-hour (LKR/kWh)…this [three tier tariff] will consist of a fixed rate, operations and maintenance (O&M) rate and a fuel rate…'Mini-hydro – Local' and 'Wind – Local' are plants that use locally manufactured turbine equipment:

| Technology | Escalable | Escalable | Non-escalable fixed rate | Escalable Year 16+ Base rate | Escalable Year 16+ Base rate |
|---|---|---|---|---|---|
| | Base O&M rate | Base fuel rate | Year 1-8 | Year 9-16 | |
| Mini-hydro | 1.61 | None | 12.64 | 5.16 | 1.68 |
| Mini-hydro - Local | 1.65 | None | 12.92 | 5.28 | 1.68 |

Source: (Public Utilities Commission of Sri Lanka, 2010)

*Example 3. Croatia*

Croatia differentiates its payments by technology type and project size, and also differentiates between several different type so biomass: "This tariff system [is]…expressed in HRK/kWh for the delivered electricity from the plants using renewable energy sources for the following groups of plants:

| Type of plant | Rate |
|---|---|
| solid biomass from forestry and agriculture (branches, straw, kernels…) | 1.20 |
| solid biomass from wood-processing industry (bark, saw dust, chaff…) | 0.95 |
| biogas power plants from agricultural plants (corn silage…) and organic remains and waste from agriculture and food processing industry (corn silage, manure, slaughterhouse waste, waste from the production of biofuel…) | 1.20 |
| liquid biofuel power plants | 0.36 |

Tariff System for the Production of Electricity from Renewable Energy Sources and Cogeneration (G.R.C. 2007)(Croatia)

### Option Analysis

The issue of tariff differentiation can impact a broad range of policy considerations, including policy costs, energy access, administrative complexity, economic development, and diversification of the electricity mix.

| | Policy Considerations | | | | |
|---|---|---|---|---|---|
| FIT Design Issue | Energy access | Policy costs | Electricity portfolio diversity | Administrative complexity | Economic development |
| Tariff Differentiation | ✓ | ✓ | ✓ | ✓ | ✓ |

*Energy access.* Rates can be differentiated to not only specifically support off-grid and mini-grid systems, but also to support specific types of off-grid systems. Peru's rural electrification tariff rates, for example, range from between $0.09-$0.33/kWh and are differentiated by region, system size, and ownership (i.e. public vs. private investors).[17]

[17] OSINERGMIN – Supervisory Agency for Investment in Energy and Mining (Organismo Supervisor de la Inversion en Energia y Mineria, Peru). (2007). *Ley que crea el Fondo de la Compensación Social Eléctrica Ley Nº 27510*.

*Policy costs.* Policies that target comparatively more expensive technologies will create a higher degree of ratepayer impact, and vice versa.

*Electricity portfolio diversity*. Tariff differentiation is one of the primary tools to ensure portfolio diversification. Policy makers can use tariff differentiation to selectively target specific technologies in order to ensure that they are developed.

*Administrative complexity.* Although highly differentiated tariffs can accomplish specific policy objectives, they also add to greater administrative complexity. The administrative burden of setting and adjusting the City of Gainesville, Florida's two PV FIT rates, for example, is far less than in European countries (e.g. Germany) that have 20-30+ individual rates.

*Economic development.* Policies can be differentiated to support projects that have a higher impact on renewable energy job creation – such as small-scale and community-owned projects. Since these projects typically have higher costs than larger, commercially-owned projects, however, there can be a tradeoff between economic development and ratepayer impact goals.

### 3.3.5 SETTING THE FIT RATE

There are many different approaches to setting FIT rates and they can be broadly grouped into two main categories: value-based and cost-based. [18]

**Design Options**

Cost-based approaches establish the FIT payments according to the cost of renewable energy generation, plus a targeted return. Some FIT laws explicitly state the assumptions that must be taken into account in the generation cost calculation (e.g. the minimum return on equity) whereas others simply state that the rate must be cost based.

Value-based approaches, establish the rate based on the value of the energy delivered to the system, which can be pegged to avoided cost, retail prices, or other benchmarks (Grace et al., 2008). Value-based approaches may also take into account externalities such as climate change,

[18] For the sake of simplicity, this report omits consideration of approaches without methodological foundation or approaches that utilize a competitive benchmark (e.g. an auction) to set the FIT rates (Couture et al., 2010). Although the use of competitive benchmarks to set FIT rates is a topic that merits additional research, empirical evidence to date has been limited. China, for example, has used competitive benchmarks to set FIT rates for both wind and solar but there are few other international examples.

health impacts of air pollutants, agricultural yield loss, material damage, and energy supply security (Schell, 2010).[19]

*Example 1. Philippines*

The FIT regulation in the Philippines states that FIT payments should be set in order to "cover the costs of the plant, including the costs of other services that the plant may provide, as well as the costs of connecting the plant to the transmission or distribution network, calculated over the expected lives of the plant and provide for market-based weighted average cost of capital (WACC) in determining return on invested cost of capital."

Resolution No. 16, Series of 2010: Resolution adopting the feed-in tariff rules (E.R.C. 2010)(Philippines)

*Example 2. Tanzania*

Tanzania has FITs for both grid-connected systems and mini-grids. Both rates are set based on the avoided cost. The tariff for mini-grids: "is calculated to reflect both the costs of investment and operation of diesel power plants in mini-grids…As the mini-grids would eventually be merged with the main-grid (except in special cases), the *Long-run Marginal Cost (LRMC)* of Tanzania's main grid would be the basis for the calculation of the avoided costs in the long-term." (Energy and Water Utilities Regulatory Agency, 2009b)

*Example 3. Sacramento Municipal Utility District (SMUD), California, USA*

The Sacramento Municipal Utility District set its rates based on the value of the electricity, including greenhouse gas mitigation and natural gas hedge value: "For customers with CHP generation facilities, the Feed-In Tariff prices for energy delivered to SMUD are based on the following cost components:

- Market Energy Price including losses.
- Ancillary Services.
- Generation Capacity.
- Transmission.
- Sub-Transmission Capacity

For customers with eligible renewable generation facilities, the Feed- In Tariff prices for energy delivered to SMUD will include the above cost components and the following additional premiums:

- Projected cost offsets associated with avoided greenhouse gas mitigation.
- Estimates of risk avoidance from future natural gas price increases." (Sacramento

[19] The World Bank uses the term "social avoided cost" to describe value-based rate setting methods that incorporate externalities and "private avoided cost" to describe value-based rate setting methods that do not incorporate externalities (Sustainble Energy Department, 2010).

| Municipal Utility District, 2011a) |
|---|

### Option Analysis

The payment basis has a bearing on renewable energy development, policy costs, price stability, electricity portfolio diversity, and regulatory and administrative oversight, as outlined in the simplified matrix below.

| | Policy Considerations | | | | |
|---|---|---|---|---|---|
| **FIT Design Issue** | **Investor security** | **Policy costs** | **Price stabilization** | **Electricity portfolio diversity** | **Administrative complexity** |
| **Payment based on** | ✓ | ✓ | ✓ | ✓ | ✓ |

*Investor security.* Generation cost based rates are more likely to provide developers and investors with their required return and therefore support market growth for the target technologies. Value-based rates, by contrast, will only support renewable energy market growth if the values selected happen to coincide with the rate that eligible technologies require. Value based rates have not supported significant amounts of renewable energy growth internationally (Elizondo-Azuela and Barroso, 2011), although there are some notable exceptions.[20]

*Policy costs.* Generation cost rates for technologies that are above a country's avoided costs clearly create higher ratepayer impacts than rates set at avoided cost. Depending on how value-based rates are determined, however, they may actually be higher than the generation costs of certain technologies. This could occur, for example, in countries that rely heavily on oil for electricity generation (e.g. small island states). Value-based rates in these countries could create excessive profits for renewable energy generators that have lower costs than the cost of oil generation.

*Price stabilization.* FIT rates that are based on generation cost are not linked to electricity prices and stay the same even as electricity and fossil fuel prices rise. As a result, FITs can have a stabilizing effect during periods of electricity market price volatility. Rates that are linked to the

[20] Germany and Denmark's FIT rates in the 1990s, for example, were indexed to the retail price of electricity and supported what was comparatively rapid wind energy market growth for that time. Portugal's value-based rates have also driven new renewable energy capacity (Heer and Langniß, 2007).

market price for electricity, such as some types of value-based rates, will not capture the potential hedge value of renewable generation.

*Electricity portfolio diversity*: Generation cost-based rates can be readily differentiated by technology, and can therefore be a tool to achieve portfolio diversity. Value-based rates, by contrast are a blunter instrument for achieving portfolio diversity because they are less easy to target to specific technologies.

*Administrative complexity*. Cost-based rates require time and expertise to calculate. Depending on the regulatory process of the country in question, cost-based rate calculations can be a lengthy process. Value-based rates are easier to establish and administer since the main challenge is to identify the value upon which to base the rate.

### 3.3.6 PAYMENT DURATION

Payment length, or payment duration, refers to the amount of time that a generator receives the FIT incentive. It also refers to the length of the power purchase agreement (PPA) if the FIT utilizes a contract.

**Design Options**

FIT payments can be categorized as short-term (e.g. 3 to 7 years), medium-term (e.g., 8 to 14 years), and long-term (e.g., 15 to 20+ years) (Grace et al., 2008). The FIT policy may also specify what occurs to project revenue streams at the end of the policy term.[21]

*Example 1. Croatia*
Croatia's FIT law specifies a medium-term contract.
"The contract on the purchase of electricity produced in plants using renewable energy sources and cogeneration plants shall be concluded for the period of 12 years."
Tariff System for the Production of Electricity from Renewable Energy Sources and Cogeneration (G.R.C. 2007)(Croatia)

*Example 2. Ontario, Canada*
Ontario specifies a long-term contract.
"(b) The "Term" mean that period of time commencing at the beginning of the hour ending in 01:00 hours (EST) of the date that is the Commercial Operation Date, and ending at the beginning of the hour ending 24:00 hours (EST) on the day before:

[21] For example, the project may be able to sell all its electricity and/or other attributes into the open market, it may be eligible to receive an alternative incentive at the end of the FIT contract life, etc. (Grace et al., 2009)

(i) in the case of Facilities utilizing Renewable Fuels other than waterpower, the 20th (twentieth) anniversary of the date that is the earlier of (A) the Milestone Date for Commercial Operation and (B) the Commercial Operation date…"

Standard Offer Program Renewable Energy – Final Program Rules (O.P.A. 2006)(Ontario, Canada)

*Example 3. Philippines*

The Philippines specifies a long-term contract and clarifies generator options at the end of the contract term. "Eligible RE Plants shall be entitled to the applicable FITs to them for a period of twenty (20) years. After this period, should these plants continue to operate, their tariffs shall already be based on prevailing market prices or whatever prices they should agree with an off-taker."

Resolution No. 16, Series of 2010: Resolution adopting the feed-in tariff rules (E.R.C. 2010)(Philippines)

**Option Analysis**

Payment duration has a bearing on investor security, price stability, and policy costs, as illustrated by the matrix below.

| | Policy Considerations | | |
|---|---|---|---|
| **FIT Design Issue** | **Investor security** | **Policy costs** | **Price stabilization** |
| **Payment Duration** | ✓ | ✓ | ✓ |

*Investor security*. Investor perspective on contract length is closely related to whether the payment is value-based or generation cost-based (Section 3.3.5).

- Value-based. If the FIT payment is value-based (and not linked to the investors required return), investors may prefer a long-term payment in order to reduce the chance that the payment stream will end before the generator has had a chance to recover its investment. Longer-term payments reduce the risk of having to secure revenue from other sources at the end of the policy term to ensure profitability.
- Generation cost-based. If the FIT payment is generation cost-based, investors have greater confidence that they will receive their target return whatever the payment length is. Under these circumstances, investors may prefer a shorter contract in order to meet their return expectation in a shorter period of time. This is also true for biomass generators who are able

to sign only short-term fuel supply contracts. FIT payment terms that match the lengths of fuel supply contracts insulate generators from fuel price risk.[22]

*Policy costs.* Ratepayer and taxpayer impact is also linked to whether the payment length is value-based or generation cost-based. In both cases, a shorter payment length equates to a lower policy cost.

- Value-based. The shorter the payment term, the lower the amount of money is paid to generators and the lower the policy cost.
- Generation cost-based. A shorter payment term means that the $/kWh payment amount must be increased to provide generators with the same targeted return. From a ratepayer perspective, however, this higher payment amount is offset by the shorter period of time that the FIT must be paid.[23] However, it is important to note that shorter-term contracts may remove the incentive for projects to continue operating over their entire lifetimes.

*Price stabilization.* For cost-based rates, longer contracts increase the potential for price stabilization impacts. Longer contracts provide a greater period of time over which the capital costs of renewable energy projects can be levelised. As a result, the $/kWh payment rate can be correspondingly lower. The lower the rate, the more likely it is that renewable generation can serve as a hedge against volatile fossil fuel prices and/or generate savings if fossil fuel prices rise above the payment rate. Given this dynamic, there is a strategic tension as to whether a long-term or short-term payment is best from the ratepayer perspective. Short-term contracts cost less from a ratepayer perspective. If a longer-term payment term lowers the FIT rate below to the market price, however, this can generate immediate savings for the ratepayer. Policy makers should aware of these two potential effects and how they balance.

### 3.3.7 PAYMENT STRUCTURE

Payment structure refers to the characteristics of FIT revenues, primarily whether they are fixed or variable and how they interact with electricity market prices. This section is relevant primarily

[22] An alternative to shorter contracts for biomass is to include a fuel price adjustment clause in the FIT contract. In Nova Scotia, for example, the biomass FIT includes a provision that fuel price escalates according to inflation and to the cost of diesel. Since this escalator would not mitigate fuel price risk sufficiently to make the projects bankable, the FIT also includes provisions for a fuel price adjustment. Every second year there is a “re-opener” during which the fuel price is reviewed and existing biomass contracts are adjusted accordingly (Nova Scotia Utility and Review Board, 2011).

[23] As contract length increases, the cost of providing the generator with the target return increases from the perspective of the ratepayer. Upfront payments (i.e. grants) can be a more cost effective way for ratepayers to provide incentives to generators if targeting a given return than payments which occur over time (DB Climate Change Advisors, 2011d; NYSERDA, 2012; Project Catalyst, 2009).

to cost-based rate setting approaches (Section 3.3.5).[24] Two related, but distinct, issues are whether FIT rates vary over time with inflation (Section 3.3.8) and whether or not the FIT includes a contract (Section 3.3.17).

**Design Options**

The three primary generation cost-based FIT payment structures that are currently in use include fixed price, premium price, and spot market gap approaches.[25]

- Under fixed price design, the FIT price is a guaranteed payment for a pre-established period of time and this price is unaffected by fluctuations in the market price of electricity (Klein et al., 2008).[26]
- Premium approaches involve a payment on top of the wholesale market price. Given that wholesale prices are variable, some countries have included floor prices and/or ceiling prices for the total incentive (i.e. the wholesale price plus the premium) that a generator can receive.
- The "spot market gap" approach combines elements of both the fixed price and premium designs (Couture and Gagnon, 2010). A total guaranteed payment level is set, similar to the fixed price design. The generator must also sell electricity into the wholesale market, however. The FIT payment is equal to difference between the guaranteed payment level and the wholesale market price. As wholesale electricity prices rise, the amount of the FIT payment decreases, and vice versa.

*Example 1. Philippines*
The Philippines law explicitly establishes that the FIT is a fixed rate, but leaves door open to premium tariffs at a later date. "The FIT to be established shall be a fixed tariff, instead of a premium, and shall be set and approved in accordance with the methodologies and procedures outlined in these Rules. When already appropriate, the ERC shall issue the rules for the adoption of premium-based FITs."
Resolution No. 16, Series of 2010: Resolution adopting the feed-in tariff rules (E.R.C. 2010)(Philippines)

*Example 2. Spain*
Spain allows most generators the option to choose either a fixed price option or a premium option. The Spanish premium "consists of an additional payment to the price resulting from the organised market or the price freely negotiated by the owner or representative of the

[24] The structure of value-based incentives is dictated primarily by the value they are indexed to.
[25] It should also be noted that some countries, such as Kenya and Indonesia, specify a ceiling price for FIT electricity (Ministry of Energy, 2010a; MEMR, 2011). Generators must then compete for and/or negotiate a rate that is at or below this ceiling price. Ceiling prices, however, are not formally explored in this report.
[26] There can be different structures for fixed price designs. Some jurisdictions such as Sri Lanka, for example, utilize a "front loaded" tariff whereby a higher FIT rate is paid during the early years of the payment period and a lower rate is paid during the latter years (Couture et al., 2010). The intent of this design is to allow generators to pay off debt more quickly.

power plant." Article 27.1
Feed-in Tariffs for Electricity from Renewable Energy Sources (Royal Decree 661/2007)(N.E.C. 2007)(Spain)

*Example 3. Finland*
Finland's law sets out a "guide price" for generators. Generators are paid the difference between the guide price and wholesale market prices. "The guide price for electricity from a wind power plant, biogas power plant and wood fuel power plant approved for the tariff system shall be euro 83.50 per megawatt hour… In a feed-in tariff for electricity production...the guide price minus the average for the market price for electricity for three months at the place where the power plant is located shall be paid."
Feed-in Tariffs for Electricity from Wind, Biogas and Wood Chip (Act 2010/1396)(M.E.M. 2010)(Finland)

## Option Analysis

Payment structure has an impact on price stability, policy costs, investor security, and administrative complexity, as outlined in the simplified matrix below.

| | Policy Objectives | | | |
|---|---|---|---|---|
| **FIT Design Issue** | **Investor security** | **Policy costs** | **Price stabilization** | **Administrative complexity** |
| **Payment Structure** | ✓ | ✓ | ✓ | ✓ |

*Investor security.* The fixed price and spot market gap designs provide investors with a high degree of revenue certainty since the price paid to projects is known in advance (Couture et al., 2010). Premium payments provide comparatively less investor security since they vary over time. To mitigate the risk to investors, policy makers can establish minimum floor payments.

*Policy costs.* Both the fixed price and spot market gap approaches provide policy makers with a degree of certainty as to the magnitude of the FIT policy's potential impact on ratepayers. Premium policies, however, have a greater potential for unexpected ratepayer impact since they vary with wholesale rates. Premium payments, for example, can magnify the impact of wholesale price spikes. To mitigate this risk, ceilings can be placed on the total payment that a generator can receive.

*Price stabilization.* Both fixed price and spot market gap designs create opportunities for renewable energy to serve as a hedge against volatile fossil fuel prices. The hedge benefit of renewables, however, may be eroded by FIT premium approaches since the total incentive amount rises as wholesale electricity prices rise.

*Administrative complexity.* The fixed price approach requires the least regulatory oversight and guidance, and is the easiest option to pursue in terms of regulator involvement. Premium and spot market gap models demand greater regulatory oversight to monitor wholesale price levels and compensate generators accordingly.[27]

***Text box 3. Feed-in tariffs and power market structure***

When designing feed-in tariffs, it is important for policy makers to consider the interaction between the FIT and the existing market structure. It is also important to consider how the FIT will interact with potential future electricity market structures as well since many countries are currently making changes to the policies that govern their current power industries.

Developing countries represent a broad range of different electricity market structures, including state-owned monopoly utilities (e.g. in much of the Caribbean), single buyers that purchase power from IPPs (e.g. eastern European countries), and countries where wholesale power markets have been introduced (e.g. countries like Argentina and Chile) (Besant-Jones, 2006). Although some countries have maintained their market structure without any change, other countries have initiated or completed significant market transformations. For example, some countries have introduced greater privatization and market competition, some have moved to re-introduce greater public ownership and regulation, and some have put hybrid structures in place that have both private and public elements (Gratwick and Eberhard, 2008).

There are several key FIT design considerations that may have important implications for electricity markets. In order to have a functional wholesale electricity market, for example, there needs to be competition between generators. Some developing countries have found it difficult to introduce wholesale electricity competition because a large percentage of their generation is purchased under long-term contracts (Woolf and Halpern, 2001). Countries that are attempting to transition to competitive wholesale markets or to increase participation in wholesale markets may opt for FITs that utilize premium and spot market gap instead of fixed price approaches (Section 3.3.7). Premium and spot market gap models require generators to sell their power in the wholesale market in order to receive the FIT payment and therefore increase wholesale market participation. Fixed price approaches, by contrast, remove the

[27] Under the spot market gap model, for example, settling the "difference" between the spot price and the required FIT price could require a separate oversight function in order to ensure that hour-by-hour generation claims are accurately reported, and transparently compiled.

incentive for generators to compete in the wholesale market.

As another example, some countries are using their feed-in tariffs to support the initial entry of independent power producers into markets that previously did not enable private sector participation. In such circumstances, the FIT policy may only be available to new, private sector generation and may include guaranteed interconnection and purchase requirements. Other countries, by contrast, may enable existing, state-owned generators to participate rather than focusing entirely on IPPs.

There are no prescriptive answers as to how FIT designs should be matched to different power sector structures. Some countries, for example, have no plans to introduce wholesale electricity price competition, but have still opted to pay a premium on top of some measure of avoided cost. Other countries may have established competitive markets but have not utilized premium payments. Germany, for example, has liberalised its electricity market but has relied on long-term contracts for its FITs to date.

The potential interactions between different FIT designs and different market structures, and the pros and cons of these interactions are topics worthy of additional and deeper research. These issues could be explored against the backdrop of renewable energy market integration in developing countries more broadly, taking into account issues such the status of ancillary services markets to balance intermittent renewable power and the integration of renewable energy into the generation planning process, among other issues. Full consideration of these issues, however, is beyond the scope of this report.

Sources: (Besant-Jones, 2006; Gratwick and Eberhard, 2008; Woolf and Halpern, 2001)

### 3.3.8 INFLATION

Law drafters may wish to explicitly address inflation in the FIT policy, depending on other factors such as the rate setting methodology, the payment structure, the contract length, etc. Increases in inflation reduce the real value of project revenues. If the FIT is intended to provide investors with a target rate of return, for example, then policy makers may wish to take inflation into account in order to ensure that the expected returns are realized.

Renewable energy projects are capital intensive, which means that a large percentage of a project’s cost occurs at the beginning of a project’s life. These costs are not exposed to inflation risk. Instead, inflation can impact the costs that a project incurs over time, such as operations and maintenance expenses, fuel purchases, land lease payments, insurance, etc.

**Design Options**

One way to account for inflation is in the rate setting model itself. Many jurisdictions utilize spreadsheet tools to calculate the FIT rate that provides a reasonable return to investors (Gifford et al., 2010). Assumptions about inflation can be built into these models and used to calculate the FIT rate. In other words, a "fixed" FIT rate may have the projected impact of inflation built into it. Accurate projections of inflation over the long-term, however, can be challenging – particularly in developing countries where inflation rates can be high and/or volatile (Mendonça et al., 2009).

A second alternative to accounting for inflation is to adjust the rate that the generator gets paid annually. There are several policy decisions involved with establishing an annual adjustment:

- Which technologies have annual adjustments? Some policy makers have made the argument that the operating costs for renewable energy generators like wind and solar are "negligible" and that inflation adjustments may therefore not be necessary (Boonin, 2008). In Ontario, for example, the rate for PV is not adjusted annually, although all other technologies are.
- What should the adjustment be pegged to? The obvious answer to this question is "inflation," but different countries define inflation in different ways. In some countries, inflation is defined as the Consumer Price Index. In France, the annual rate is adjusted annually according to two different indices, the hourly labour costs of the French electrical and mechanical industry (ICHTTS)[28] and the production cost of industry and business services across the entire sector (PPEI).[29]
- What percentage of the rate should be adjusted? In order to reflect the fact that not all of a project's cost are operating costs, some countries apply their inflation adjustments only to a portion of the rate. Ireland adjusts 100% of each FIT for inflation, whereas Uganda uses a separate percentage for each technology, based on the share of O&M in total project costs (Electricity Regulatory Authority, 2010).

*Example 1. Ireland*
Ireland adjusts 100% of project costs by the CPI. "5.2 The…prices will be adjusted by way of indexation annually by the annual increase, if any, in the consumer price index in Ireland commencing 1 January 2007." Section 5.2
Renewable Energy Feed-in Tariff (REFIT) (D.C.E.N.R. 2005)(Ireland)

*Example 2. Ontario, Canada*
The 2006 Ontario Renewable Energy Standard Offer Program adjusted 20% of non-PV

[28] Indice du coût horaire du travail dans les industries mécaniques et électriques
[29] l'indice des prix à la production de l'industrie et des services aux entreprises pour l'ensemble de l'industrie

rates annually by the CPI:
"The Contract, other than for PV Contract Facilities, includes an escalation on 20% of the Base Rate (but not the On-Peak Performance Incentive Payment) on the basis of increases in the Consumer Price Index commencing on and effective as of May 1, 2007 and thereafter on May 1 of each year of the Program."
Standard Offer Program Renewable Energy – Final Program Rules (O.P.A. 2006)(Ontario, Canada)

*Example 3. Uganda*
Uganda defines the O&M costs: "The tariff will be paid for a guaranteed payment period of 20 years, with O&M costs adjusted on an annual basis for inflation. The O&M weighting of the overall tariff is defined in Appendix 1:"

| Technology | % of rate adjusted for inflation |
|---|---|
| Hydro 9 MW > <=20 MW | 7.61% |
| Hydro 1 MW> <=8 MW | 7.24% |
| Hydro 500 kW> <=1 MW | 7.08% |
| Bagasse | 22.65% |
| Biomass | 16.23% |
| Biogas | 19.23% |
| Landfill gas | 19.71% |
| Geothermal | 4.29% |
| Solar PV | 5.03% |
| Wind | 6.34% |

Source: Electricity Regulatory Authority (2010)

### Option Analysis

The approach to inflation impacts investor security and price stabilization.

| | Policy Considerations | |
|---|---|---|
| **FIT Design Issue** | **Investor security** | **Price stabilization** |
| **Inflation** | ✓ | ✓ |

*Investor security.* Adjusting the FIT rate annually for inflation reduces the risk that inflation will erode future revenues and improves investor security. The greater the degree of inflation adjustment, the more investor certainty is reinforced. Although the era of hyperinflation that occurred in the 1990s in Latin America and Eastern Europe has subsided, inflation risk remains a concern in developing countries (Reinhart and Savastano, 2003).

*Price stabilization*. Although inflation adjustments increase investor certainty, they also allow the contract price to rise over time. As discussed in Chapter 1, one of the potential benefits of FITs is that they can serve as a hedge against volatile fossil fuel prices and dampen electricity price spikes. Long-term fixed price contracts maximize the hedge value of renewable generation. Allowing for inflation adjustments therefore erodes the ability of FIT contracts to help stabilize electricity prices. If the goal is to use FIT contracts to achieve price stabilization, law drafters' may elect to forgo inflation adjustments.

### 3.3.9 COST RECOVERY

If the FIT policy is designed in a way that it will incur additional costs, policy makers need to specify mechanisms to recover those costs. These mechanisms must be credible, transparent and sustainable in order to support renewable energy market growth (Elizondo-Azuela and Barroso, 2011). A well-designed FIT will not attract investment, for example, if the policy funding source is not judged to be viable over the long-term. This issue is closely related to the issue of the choice of purchasing entity (Section 3.3.14).

**Design Options**

The primary design options are to recover costs from ratepayers or to recover costs from the national budget (i.e. from taxpayers). Other options, such subsidy reform and international funds, are discussed in Chapter 4.

In many developing countries, ratepayers cannot or do not pay for their electricity. Low bill collection rates, and high technical and non-technical losses (e.g. electricity theft) contribute to the poor financial health of utilities in some countries. Under such circumstances, recovering funds from ratepayers exacerbates the financial strain on both the utilities and their customers.

When evaluating whether to recover costs from ratepayers or taxpayers it is also important to take into account that there is not always a clear line between the two. Some countries, for example, keep retail electricity rates artificially low. In order to sustain artificially low rates, utilities require subsidies (e.g. from the national treasury) in order to remain solvent. Under such circumstances, recovering FIT costs from ratepayers would put upward pressure on electricity prices, which would require higher government subsidies and therefore increase the policy impact taxpayers.

*Example 1. Kenya*

Kenya specifies that electricity consumers will bear the majority of the burden of cost recovery. The cost recovery mechanism for the remainder is not specified in the policy: "Grid operators shall recover from electricity consumers 70% of the portion of the feed-in tariff except for solar which will be 85%, or as may be directed by the Energy Regulatory Commission at the time of the approval of the PPA or review thereafter. This in other words, will be a pass-through cost." Source: (Ministry of Energy, 2010b)

*Example 2. Ghana*

Ghana recently published a draft FIT bill,[30] which would recover FIT rates from a variety of potential sources: "There is hereby established a Renewable Energy Fund which shall be used for…the promotion of grid interactive renewable electricity by means of…feed-in-tariffs. The moneys for the fund shall be derived from levies, grants, loans and other moneys as may be determined by the Cabinet and approved by Parliament (PricewaterhouseCoopers, 2009)."

*Example 3. South Africa*

South Africa's FIT legislation specifies that the policy costs will be recovered from ratepayers: "The objectives of these regulations are…the full recovery by the buyer of all costs incurred by it under or in connection with the power purchase agreement and an appropriate return based on the risks assumed by the buyer thereunder and, for this purpose to ensure the transparency and cost reflectivity in the determination of electricity tariffs."

South Africa Renewable Energy Feed-in Tariff (REFIT) - Regulatory Guidelines 26 March 2009 (N.E.R.S.A. 2009)(South Africa)

*Example 4. Sri Lanka*

Sri Lanka's policy initially called for the creation of an energy fund to pay for renewable energy incentives. The fund would have been able to receive monies from private donations as well as Climate Development Mechanism funds.[31] "To make available the incentives for NCRE technologies, the Government will create an 'Energy Fund', which will be managed by the ECF. This fund will be strengthened through… grants received from donors and well wishers, as well as any funds received under CDM. This fund will be used to provide incentives for the promotion of NCRE

[30] This bill has not been passed into legislation as of the writing of this report.

[31] The fund is not currently utilized. Instead, the Public Utilities Commission of Sri Lanka decided that the costs should instead be recovered from ratepayers. This ratepayer recovery was first implemented in 2011.

technologies and strengthen the transmission network to absorb the NCRE technologies into the grid."
National Energy Policies and Strategies of Sri Lanka (M.P.L. 2006)(Sri Lanka)

**Option Analysis**
The issue of cost recovery has implications for investor security and policy costs.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Investor security | Policy Costs |
| Cost Recovery | ✓ | ✓ |

*Investor security.* Although many studies focus on the level of the FIT rate, the levels themselves are irrelevant if they cannot be paid.[32] When evaluating the bankability of a policy, investors will review, among other things, the source of the cost recovery and the process through which the costs are recovered. In terms of the source, ratepayer recovery is preferable to taxpayer recovery since taxpayer recovery may be subject to (and vulnerable to) annual budget appropriations (Morgan, 2008). In terms of process, it is important that the recovery mechanism be transparent and sustainable and that recovery occur in a streamlined, reliable, and timely fashion.

*Policy costs.* The choice of cost recovery mechanism clearly has a direct impact on the constituencies chosen to bear the burden of the costs. If costs are recovered from ratepayers, then this will increase ratepayer impact.

### 3.3.10 INTERCONNECTION GUARANTEE

Interconnection refers to the technical requirements and legal procedures whereby an electric generator interfaces with the electricity grid (Fink et al., 2010). A lack of standardized and transparent interconnection protocols for independent power producers has been identified as one of the key barriers to renewable energy development (Alderfer et al., 2000). In the absence of clear rules and requirements for interconnection, utilities can block or otherwise delay viable

[32] Under the original cost recovery scheme in Sri Lanka, for example, the Ceylon Electricity Board had been invoicing the Sustainable Energy Authority to recover the costs of the national FIT, but the Sustainable Energy Authority had been unable to pay the bills because it did not have sufficient funds (Elizondo-Azuela and Barroso, 2011).

renewable energy projects. In order to address interconnection concerns, many FIT policies contain provisions for guaranteed interconnection.

**Design Options**

Interconnection guarantees can imply different procedures in different jurisdictions. In some countries, the interconnection guarantee shifts much (or all) of the risk associated with interconnection from generators to the utilities and their ratepayers. The interconnection guarantee provisions not only require that grid operators interconnect eligible generators in a streamlined and timely fashion, but that the grid operators make the grid upgrades necessary to accommodate the renewable generators – such as building new substations or adding new transmission and distribution capacity. Additionally, interconnection guarantees can be coupled with interconnection cost recovery rules that can be highly favourable to the generators (Section 3.3.11, Interconnection costs).

Guaranteed interconnection, however, can also have more limited connotations. Guaranteed interconnection may require that monopoly utilities interconnect private generators to the grid, but not make any grid upgrades. In other countries, the interconnection guarantee may be contingent upon studies being conducted that demonstrate that renewables can be feasibly integrated into the grid without requiring significant upgrades. Finally, some countries omit interconnection guarantees from their FIT policies altogether because they have separate laws governing their interconnection procedures.

*Example 1. Germany*

Germany's law includes an interconnection guarantee and explicitly states that the guarantee applies even if the grid needs to be upgraded: "(1) Grid system operators shall immediately and as a priority connect installations generating electricity from renewable energy sources…to that point in their grid system (grid connection point) which is suitable in terms of the voltage and which is at the shortest linear distance from the location of the installation if no other grid system has a technically and economically more favourable grid connection point…(4) The obligation to connect the installation to the grid system shall also apply where the purchase of the electricity is only made possible by optimising, boosting or expanding the grid system. Renewable Energy Sources Act of 25 October 2008 (Federal Law Gazette I p. 2074) as last amended by the Act of 11 August 2010

*Example 2. China*

China's Renewable Energy Law requires grid operators to interconnect renewable energy generators and encourages grid upgrades to accommodate renewables:

- "Grid enterprises shall enter into grid connection agreement with renewable power generation enterprises that have legally obtained administrative license or for which filing has been made, and buy the grid-connected power produced with renewable energy within the coverage of their power grid, and provide grid-connection service for the generation of power with renewable energy." China Renewable Energy Law 2005, Article 14

- "Power grid enterprises should vigorously undertake power grid design and research according to the planning requirements, and conduct power grid construction and renovation based on the progress and needs of renewable energy power generation projects to ensure supply of electricity to power grids at full load." Management Guidelines, Clause 11

The Renewable Energy Law of the People's Republic of China (D.C.C.N.D.R.C. 2005)(China)

*Example 3. Thailand*

Thailand's FIT for Very Small Power Producers (VSPP) does not have a guaranteed interconnection requirement and instead requires generators to submit an application which is reviewed by the distribution utility: "A prospective VSPP who wishes to sell electricity to the Distribution Utility must submit a completed Application for Sale of Electricity and System Interconnection at the district office of MEA or at the provincial office of PEA [Provincial Electricity Authority] where the VSPP plans to make the interconnection to buy/sell electricity… 2. The respective Distribution Utility will consider purchasing power from the VSPP based on the details provided in the aforementioned application form…E(3). The amount of net power each VSPP dispatches into the distribution system at the connection point shall not exceed 10 MW. The Distribution Utility will, however, consider the capability and security of the distribution system in determining the level of net power acceptable on a case-by-case basis, in accordance with the Technical Regulations."

Regulations for the Purchase of Power from Very Small Power Producers (for the Generation Using Renewable Energy)(E.P.P.O. 2002)(Thailand)

**Option Analysis**

Interconnection guarantees have implications for grid stability and investor security. Many of the issues associated with interconnection guarantees are closely related to issues of interconnection costs (Section 3.3.11).

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Investor security | Grid stability |
| Interconnection Guarantee | ✓ | ✓ |

*Investor security*. Depending on how it is defined, guaranteed interconnection can significantly decrease development risk for generators and increase investor security. By contrast, lengthy and opaque interconnection procedures can deter potential developers and investors.

*Grid stability*. Many developing countries have comparatively small grids either because of their geography (e.g. small island states) or because transmission and distribution infrastructure is not well developed. In such cases, interconnection may need to be more closely integrated with generation and T&D system planning, rather than guaranteed. Put another way, guaranteed interconnection is less useful if the number of generators applying for interconnection quickly exceeds the ability of the grid to absorb them. Similarly, guaranteed interconnection rules that require grid upgrades are impractical for developing countries where available resources exceed the technical and financial resources required to connect them. The German interconnection guarantee regulations could not be implemented in Africa, for example, because of the size and remoteness of the available renewable resources. The Sahara desert alone could support enough PV generation to equal global electricity consumption (Meisen and Pochert, 2006). Guaranteed interconnection may be possible in some developing countries, but must be balanced by practical considerations such the ability of the grid to absorb new generation and/or the technical feasibility (or necessity) of extending the grid to accommodate all available renewable resource.

### 3.3.11 INTERCONNECTION COSTS

The costs of grid interconnection can include both the costs associated with connecting a specific generator to the transmission or distribution system (e.g. interconnection studies, onsite equipment, etc.), as well as the costs to modify or upgrade the grid in order to accommodate the additional generation. The costs to connect to the grid typically benefit only the specific generator, whereas the costs to upgrade the grid may benefit a broader group of generators and consumers.

**Design Options**

In almost all FIT policies, the generator is responsible for paying the costs of connecting to the grid. If the FIT is generation cost-based, policy makers must decide the extent to which the interconnection cost will be built into in the rate. Building a large amount of interconnection costs into the rate will enable a broader range of generators to participate, whereas assuming lower interconnection costs in the rate will geographically constrain generation to those areas where interconnection is the easiest and/or cheapest.

A key decision point is whether the cost of the required grid upgrades will be borne by the ratepayers, of whether it must be borne by the generator. When generators must pay for connecting to the grid, but not for the grid upgrades, this is referred to as a “shallow” approach to interconnection costs. When generators must pay for both the grid connection and associated grid connections, this is referred to as a “deep” approach (Klein et al., 2008).

*Example 1. Germany*
In Germany, generators bear the cost of connection, whereas the grid operator pays for any grid upgrades (with costs recovered from the ratepayers): “The costs associated with connecting plants generating electricity from renewable energy sources…to the technically and economically most suitable grid connection point and with installing the necessary measuring devices for recording the quantity of electrical energy transmitted and received shall be borne by the plant operator. The costs associated with upgrading the grid…that solely result from the need to accommodate new, reactivated, extended or otherwise modernized plants generating electricity from renewable energy sources...for the purchase and transmission of electricity produced from renewable energy sources shall be borne by the grid system operator whose grid needs to be upgraded.”
Renewable Energy Sources Act (Erneuerbare-Energien-Gesetz EEG) (BMU 2004)(Germany)

*Example 2. Cyprus*
In Cyprus, generators are responsible for the costs of connection, but these costs are shared 50% with the grid operators: “All Generators using Renewable Energy Sources will be charged for their connection to the Transmission System or the Distribution System with cost estimation based on a Shallow Connection methodology…The Generator using Renewable Energy Sources will bear only 50% of the shallow connection cost (CAPEX). The remaining 50% will be borne by the Transmission System Owner or the Distribution System Owner and will be recovered by the Transmission Use of System Charges through the TSO or by the Distribution Use of System Charges through the DSO.”
Source: (Transmission System Operator - Cyprus, 2006)

*Example 3. Sacramento Municipal Utility District (SMUD), California, USA*
SMUD requires that generators pay for all expenses related with interconnection, including grid upgrades: “extensions of electric distribution lines needed to make connection to Applicant owned generators, as well as all required system upgrades, will be constructed at Applicant expense. This includes line and service extension costs…where applicable .”
Source: (Sacramento Municipal Utility District, 2011b)

**Option Analysis**

The issue of interconnection cost allocation has implications for investor security, policy costs, and grid stability.

| | Policy Considerations | | |
|---|---|---|---|
| FIT Design Issue | Investor security | Grid stability | Policy costs |
| Interconnection Costs | ✓ | ✓ | ✓ |

*Investor security*. Shifting interconnection costs away from renewable energy projects increases investor security. This can be accomplished by requiring that ratepayers bear a portion of the cost to connect the generator to the grid, such as under the shallow approach described above. Another strategy for increasing investor security is to include the costs of interconnection in the FIT rate. Assuming a higher interconnection cost under generation cost-based FIT rates increases the FIT payment and therefore provides investors with greater security that they would recover their interconnection costs.

*Grid stability*. Recovering grid upgrade costs from ratepayers can help support expansion of the grid and provide benefits beyond the project in question – such as greater capacity for other generators, and greater stability and access for consumers (depending on the type of upgrades undertaken). Law drafters should keep in mind, however, that grids in many developing countries are relatively small compared to the geographic area they cover, the type of renewable resources available, and energy access needs. As a result, allocating interconnection costs to generators or ratepayers on an open-ended basis may be impractical given the high cost of "upgrading" the grid to accommodate generation in areas of the country lacking (or with limited) grid interconnection.

*Policy costs*. Shifting interconnection costs to ratepayers, or building significant interconnection cost assumptions into generation cost-based rates, increases policy costs.

### 3.3.12 PURCHASE AND DISPATCH REQUIREMENTS

In addition to requiring that generators be interconnected to the grid (Section 3.3.10), policy makers can also require utilities to purchase power from interconnected generators and dispatch the power into the transmission and distribution system. Purchase and dispatch are distinct issues, but are grouped together for the purposes of this report since they are closely related.

## Design Options

A guaranteed purchase requirement is similar to a "must-take" clause in a power purchase agreement. Utilities are not able to refuse any renewable electricity that is offered for sale under the FIT, even if there is conventional generation available that could be purchased at a lower price.

Priority dispatch means that the system operator must feed the power into the power system ahead of other generation as a "must run" plant. Priority dispatch can have pronounced effects on wholesale electricity prices, depending on the market structure.[33]

Priority dispatch can also create technical challenges across different electricity market structures. Baseload power plants, for example, can take several days to restart if they are shut down. Priority dispatch of renewables may not be feasible, therefore, if it would push baseload generation offline. The baseload plant would then not be able to ramp back up in time to follow the intermittent resources. In the mid- to long-term, this raises questions about the future of baseload generation and the need for flexible electricity systems and markets that can effectively support intermittent renewables (Janzing, 2010). In the near term, it raises questions about how priority dispatch policy should be implemented when confronted with real technical limitations. In some countries, generators are curtailed without compensation when priority dispatch conflicts with technical constraints. In other countries, generators are compensated for the generation that they otherwise would have sold (i.e. similar to a "take-or-pay" clause in a PPA) (Rogers et al., 2010).

*Example 1. Slovak Republic*
The Slovak Republic guarantees purchase, transmission and distribution:
"(1) An electricity producer…is entitled to
a) a priority connection to the distribution system, priority electricity transmission, priority electricity distribution and priority electricity supply, provided that the electricity generating facility complies with the technical requirements of the system operator…and does not pose a threat to the security and reliability of the system operation…
b) the offtaker of electricity… to the regional distribution system operator…"
Decree No. 02/2010 of the Regulatory Office of 23 June 2010 amending and complementing Decree No. 2/2008 of the Regulatory Office of 28 July 2008 on price regulation in the power grid sector (U.R.S.O. 2010)(Slovak Republic)

[33] In Europe, for example, the priority dispatch of renewable electricity has put downward pressure on wholesale electricity prices (Andor et al., 2010; Ray et al., 2010), which (along with oversupply) has resulted in negative power prices on the power exchange during certain periods (Beneking, 2010). The impact of wholesale electricity price suppression in developing countries needs to be better understood. In developing countries that do not have power exchange markets, the economic impacts of priority dispatch may be more difficult to predict or track.

*Example 2. Philippines*
The Philippines law requires that rules for priority purchase and transmission of renewable energy be developed. The law also defines intermittent renewable energy as "must dispatch":
"§7…the ERC [Energy Regulatory Commission] shall…formulate and promulgate feed-in tariff system rules…which shall include:
(a) Priority connections to the grid for electricity generated from emerging renewable energy resources…
(b) The priority purchase and- transmission of, and payment for, such electricity by the grid system operators;
§20. Qualified and registered RE generating units with intermittent RE resources shall be considered "must dispatch" based on available energy and shall enjoy the benefit of priority dispatch. All provisions under the WESM [Wholesale Electricity Spot Market] Rules, Distribution and Grid Codes which do not allow "must dispatch" status for intermittent RE resources shall be deemed amended or modified."
Resolution No. 16, Series of 2010: Resolution adopting the feed-in tariff rules (E.R.C. 2010)(Philippines)

*Example 3. Germany*
The 2008 FIT in Germany requires priority purchase, transmission and distribution. The utility may curtail generators for technical reasons[34], but generators must be compensated for their curtailed generation at the FIT rate:
"§ 8(1) grid system operators shall immediately and as a priority purchase, transmit and distribute the entire available quantity of electricity from renewable energy sources and from mine gas…
§ 11(1)…grid system operators shall be entitled…to take technical control over installations connected to their grid system with a capacity of over 100 kilowatts…if
- the grid capacity in the respective grid system area would otherwise be overloaded on account of that electricity
- they have ensured that the largest possible quantity of electricity from renewable energy sources and from combined heat and power generation is being purchased, and
- they have called up the data on the current feed-in situation in the relevant region of the grid system.

§12(1) The grid system operator whose grid system gives rise to the need for the assumption of technical control under section 11(1) shall compensate those installation operators who, on account of the measures under section 11(1), were not able to feed in electricity to the extent agreed upon.
Renewable Energy Sources Act of 25 October 2008 (Federal Law Gazette I p. 2074) as last amended by the Act of 11 August 2010

[34] This is viewed as an interim step, however, since the law also requires that the grid be upgraded to accommodate renewable electricity.

**Option Analysis**

Priority purchase and dispatch have implications for investor security and ratepayer impact.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Investor security | Policy costs |
| Purchase and dispatch requirements | ✓ | ✓ |

*Investor security.* Guaranteed purchase, transmission and distribution requirements all support investor security. In terms of dispatch, greater transparency about the technical limitations of the grid and clear protocols for curtailment and compensation also improve investor security.

*Policy costs.* Several studies cite the ability of priority dispatch to suppress wholesale electricity prices as a benefit of FIT policies to ratepayers (Sensfuß et al., 2008). As discussed above, however, it is unclear how the net benefits of wholesale price suppression actually pass through to end-users in the form of savings and for how long this benefit lasts.

### 3.3.13 AMOUNT PURCHASED

FITs typically entail the purchase of 100% of a generator's electrical output (and of other commodities, as applicable) for centralized, off-site and onsite generators. In recent years, however, some FITs have been established for the purchase of only a portion of an onsite generators' output.

**Design Options**

In some cases (Japan and some states in Australia), the FIT applies only to the generation produced above the amount consumed onsite or "behind the meter." In other cases (the state of California in the US), the generator can choose whether to enrol in a 100% purchase program or choose to utilize some of the power onsite. These programs have led analysts to draw distinction between "gross" FITs, under which 100% of electricity is purchased from onsite generators, and "net" FITs under which only excess electricity is purchased.

*Example 1. Queensland, Australia*

The FIT in the Australian state of Queensland provides generators with a payment for any generation in excess of their onsite consumption: "It is also a condition…that the distribution entity…credit against the charges payable by the small customer…the amount of $0.44 per kilowatt hour for electricity that is…:

(i) being produced by the qualifying generator; and

(ii) being supplied to the network; and

(iii) in excess of the amount of electricity being used by the small customer, not including electricity supplied through a circuit controlled by the distribution entity"

Clean Energy Act 2008: Act No. 33 (Q.P.C. 2008)(Queensland, Australia)

*Example 2. Pakistan*

In Pakistan, the renewable energy law requires that utilities purchase 100% of the electrical output (rather than just a percentage). "8.2.1 Guaranteed Market: Mandatory Purchase of Electricity It shall be mandatory for the power distribution utilities to buy all the electricity offered to them by RE projects established in accordance with the provisions given."

Source: (Government of Pakistan, 2006)

**Option Analysis**

The amount purchased has implications for investor security and administrative complexity.

| | Policy Considerations | |
|---|---|---|
| **FIT Design Issue** | **Investor security** | **Administrative complexity** |
| **Amount Purchased** | ✓ | ✓ |

*Investor security.* Gross FITs are usually preferable to net FITs from an investor and financing perspective. The portion of electricity consumed onsite under a net FIT is riskier to finance than the portion sold at wholesale because the on-site energy consumption from the renewable energy system is not secured by a contract. Furthermore, the host facility may not be as creditworthy as a wholesale purchaser such as the utility of government entity. Finally, project revenues under a net FIT are at least partially tied to the rate classification or retail rate of the host entity, both of which can change over time. The amount of power that will be consumed onsite versus exported can vary significantly by facility output and by onsite load. These uncertainties can complicate financing and decrease investor security.

*Administrative complexity.* Depending on the metering and monitoring arrangements, net FITs may involve a greater degree of administrative complexity in order to determine how much of the power was consumed onsite, how much was consumed offsite, and what the compensations should therefore be.

### 3.3.14 PURCHASING ENTITY

Different entities can be assigned to purchase electricity (and/or other commodities) or provide long-term incentive payments under FITs depending on considerations such as the electricity market structure, entity credit-worthiness, and national policy objectives. This issue is closely related to the issue of cost recovery (Section 3.3.9).

**Design Options**

The possible entities that could serve as FIT counterparties include utilities, transmission system operators, government agencies, and/or third party entities. This report focuses on three different entities that can each serve an "off-taker" or purchaser of the power:

- Utility. Different countries have different electricity market structures. Many countries have a monopoly structure where the utility owns all generation, transmission and controls distribution. In countries that have unbundled generation, transmission, and distribution functions, the FIT law might specify that the distribution companies act as the purchasers. Other countries may designate the transmission system operator(s) the primary purchaser.
- Third Party. Policy makers may choose to designate a non-governmental and non-utility entity to serve as the purchasing entity for the FIT.
- Government. Policy makers can also designate or create governmental (or quasi-governmental) agencies to serve as the FIT procurement entity.

*Example 1. Malaysia*
In Malaysia, the distribution companies purchase the electricity: "the distribution licensee shall…enter into a renewable energy power purchase agreement with the feed-in tariff approval holder."
Renewable Energy Act of 2011 (P.O.M. 2011, 17)(Malaysia)

*Example 2. Slovenia*
In Slovenia, the power market operator, Borzen d.o.o., has a division called the Centre for RES/CHP Support which is responsible for purchasing and managing electricity under the feed-in tariff: "Pursuant to this support, irrespective of the price of electricity on the market, the Centre for RES/CHP Support buys all the acquired net electricity produced, for which the RES generating plant has received guarantees of origin, at guaranteed prices set out in this Decree."

Regulation on supports for the electricity generated from renewable energy sources (M.O.E. 2009)(Slovenia)

*Example 3. Cayman Islands*
In the Cayman Islands, the vertically integrated utility is the purchaser of the electricity: "This tariff provides for the sale and exchange of electric energy between Caribbean Utilities Company, Ltd. (CUC) and residential or commercial customers with Consumer-Owned Renewable Energy (CORE) generating facilities (Caribbean Utilities Company, 2011)."

**Option Analysis**

The choice of purchasing entity can have implications for investor security and administrative complexity.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Investor security | Administrative complexity |
| Purchasing Entity | ✓ | ✓ |

*Investor security.* Whether or not the purchasing entity option creates investor security will depend on the creditworthiness of the off-taker, or purchaser of the power (Corfee et al., 2010). The creditworthiness of utilities, transmission operators and even governments themselves varies significantly by country and can change rapidly, especially in developing countries. Some governments lack the necessary credit rating to attract private investment and this holds true for some utilities as well. The creditworthiness of the purchaser or off-taker is closely related to the effectiveness and sustainability of their cost recovery mechanism (Section 3.3.9).

*Administrative complexity*. The public administrative burden is the highest if the government (or a state-owned utility) is the FIT off-taker. When the off-taker is the utility or a third-party, public administrative requirements shift from management functions to less intensive regulatory and oversight functions.

## 3.3.15 COMMODITIES PURCHASED

FITs are primarily considered a vehicle for purchasing electricity. Depending on the national (and international) policy environment, the generation of renewable electricity may also be associated with additional commodities, such as renewable energy credits (RECs), greenhouse gas emissions credits (e.g. Certified Emissions Reductions – CERs - under the Clean Development Mechanism), air emission credits, or thermal energy (for combined heat-and-power plants). In jurisdictions that associate multiple commodities with renewable electricity generation, policy makers can specify whether some or all commodities transfer to the purchaser or remain with the seller. Some countries, for example, require their utilities to demonstrate compliance with national targets by procuring RECs equal to the obligation (e.g. 20% by 2020). Utilities use a wide range of mechanisms to purchase RECs, including competitive bidding (e.g. tenders and auctions), bilateral negotiations, and short-term trading. In jurisdictions that use FITs in parallel with RECs, policy makers must decide if the FIT is also a procurement mechanism for RECs.

**Design Options**

The two primary design options are:

- FITs purchase only electricity and generators retain ownership of all other commodities and environmental attributes
- The rights to other commodities are bundled with electricity and transferred to the FIT "purchaser" (e.g. the utility).

There are other possible variations. Some FITs, for example, are paid even if the electricity is consumed onsite (see Section 3.3.13), whereas some policy makers have contemplated long-term contracts for RECs alone (without the purchase of electricity). For the sake of simplicity, this report focuses on the two primary design options described above.

*Example 1. Philippines*
In the Philippines, compliance with the national RPS must be demonstrated through the procurement of RECs. The feed-in tariff is one of the mechanisms to procure RECs under the RPS. "The PEMC [Philippine Electricity Market Corporation] shall… issue, keep and verify RE Certificates corresponding to energy generated from eligible RE facilities. Such certificates will be used for compliance with the RPS…The feed-in tariff to be set shall be applied to the emerging renewable energy to be used in compliance with the renewable portfolio standard as provided for in this Act."
Resolution No. 16, Series of 2010: Resolution adopting the feed-in tariff rules (E.R.C. 2010)(Philippines)

*Example 2. Gainesville, Florida, USA*
The City of Gainesville, Florida in the US requires that all commodities transfer to the utility: "Energy generated from qualified solar photovoltaic generated distributed resources shall be purchased through a Standard Offer Contract at non-negotiated rates set forth in the Standard Offer Contract. All Renewable Energy Credits (RECs) or any other environmental attributes that accrue as a result of operation of this solar photovoltaic system qualifying for the Feed-In-Tariff shall be the property of the utility."
Ordinance No. 0-08-88 (C.C.C.G. 2009)(Gainesville, Florida, United States)

*Example 3. Vermont, USA*
The State of Vermont in the US requires that RECs transfer to the utility when electricity is purchased under a FIT – except for RECs associated with agricultural biogas. "It shall be a condition of a standard offer…that tradable renewable energy credits associated with a plant that accepts the standard offer are owned by the retail electric providers purchasing power from the plant, except that in the case of a plant using methane from agricultural operations, the plant owner shall retain such credits to be sold separately at the owner's discretion."
No. 45 (H466): An act relating to renewable energy and energy efficiency (G.A.V. 2009)(Vermont, United States)

## Option Analysis

The issue of which commodities are purchased and transferred under the FIT has implications for investor security, policy costs, and administrative complexity.

| | Policy Considerations | | |
|---|---|---|---|
| **FIT Design Issue** | **Investor security** | **Policy costs** | **Administrative complexity** |
| **Commodities Purchased** | ✓ | ✓ | ✓ |

*Investor security.* A single contract that transfers all commodities to the purchase and provides investors with their required financial return maximizes investor security. Having a single contract counterparty is less risky than needing to conclude multiple contracts with multiple counterparties for different commodities. If the FIT is not generation cost-based and does not provide generators with the rates required for economic viability, then investors would prefer to retain the rights to other commodities in order to sell them for additional revenue streams.

*Policy costs.* The transfer of all commodities to the purchaser is in the best interest of ratepayers, particularly if the FIT rate is generation cost-based. If the FIT rate provides generators with their required financial return, generators will capture excess profits if they are permitted to sell additional commodities into other markets.

*Administrative complexity.* A proliferation of separate commodity markets can create a proliferation of regulatory and oversight requirements. Less monitoring and verification infrastructure is required if all commodities are bundled and sold under a single contract, rather than each commodity sold separately in separate markets.

### 3.3.16 TRIGGERS AND ADJUSTMENTS

Policy makers need to build adjustment mechanisms into FIT policies in order to ensure that their policy objectives continue to be met as market conditions change over time. There are a number of different approaches to policy adjustment currently in practice, including automatic decreases in FIT rates (i.e. degression), the introduction of annual or overall hard caps, periodic reviews, etc. These adjustment mechanisms can be utilized to give policy makers greater control over market growth, policy cost, the impact of renewables on grid stability, etc.

**Design Options**

For the purposes of this paper, we categorize the mechanisms used for FIT adjustments as:[35]

- Triggers. Triggers are thresholds that initiate an adjustment when crossed. Triggers can include: the passage of a specified period of time (e.g. 1 year), achievement of certain capacity (MW) or generation (MWh) levels, or total policy cost.
- Adjustments. Adjustments are the policy changes that occur when a trigger is reached. These can include an automatic adjustment (such as a decrease or increase in the rate), a hard stop, or the initiation of a policy review.

[35] This characterization scheme was recently developed and published by DB Climate Change Advisors (DB Climate Change Advisors, 2011a, 2011c).

- Reviews. Reviews are formal regulatory analyses to determine if any adjustments are required and if so, what kind.

Different countries have combined triggers, adjustments and reviews in different ways:

*Example 1. Philippines*

The Philippines FIT policy includes a review process that occurs automatically after the passage of time. The review can also be triggered, however, by the achievement of MW capacity targets, a failure to achieve the targeted capacity targets after a period of time, or other changes in the market:

"7. Review of FITs

The NREB shall monitor and review regularly the development of RE generation and the impact of FITs and report to ERC within three (3) years and every two (2) years thereafter.

The ERC may review and re-adjust the FITs, in the following case:

a. When the installation target per technology as defined by NREB is achieved;

b. When the installation target per technology is not achieved within the period targeted;

c. Where there are significant changes to the costs or when more accurate cost data become available that will already allow NREB to calculate the FITs based on such methodology that shall later on be adopted by the ERC; and

d. Other analogous circumstances that justify review and re-adjustment of the FITs.

In such cases, the NREB shall inform the ERC of the necessity of reviewing the FITs. The ERC suo muto shall initiate the proceedings for Rule-making for the review and re-adjustment of the FITs, in accordance with the procedure outlined in these Rules and in the ERC RPP.

Resolution No. 16, Series of 2010: Resolution adopting the feed-in tariff rules (E.R.C. 2010)(Philippines)

*Example 2. Malaysia*

Malaysia utilizes an automatic downward adjustment of the rate that is triggered after each year. This degression is coupled with a formal review of the FIT rates that is triggered by the passage of three years. Rates cannot be adjusted retroactively: "…the feed-in tariff rate shall be reduced progressively each year based on the applicable degression rate commencing on 1 January every year after the date of coming into operation of this Act…

§ 18 (1) The Authority shall review the degression rates in respect of any category of renewable energy installation at least once every three years after the date of this Act…for the purposes of improving the overall performance of the feed-in tariff system to better achieve the objective of this Act….

(6) The revised degression rates shall not apply to feed-in approval holders existing before the revised degression rates come into effect.

Renewable Energy Act of 2011 (P.O.M. 2011, 17)(Malaysia)

*Example 3. Uganda*
Uganda adjusts its FIT utilizing a review triggered every 2-3 years, with the option of introducing automatic degression after four years. The scope of the review is specified in the policy. In addition, the policy has capacity limits for each technology that result in a hard stop.
" For the first four years of the REFIT, a comprehensive review shall take place every two
(2) years, after which reviews shall take place every three (3) years. The review shall comprise:
· Assessment of the tariffs and to recommend the need to increase or reduce in line with projected levelised costs of production
· Assessment of key assumptions
· Assessment of the list of priority technologies to either add or remove technologies
· Review of capacity limits and adjustment if required
· Consultation with key stakeholders
Following the initial four years of the REFIT, a pre-defined tariff rate degression may be put in place for certain technologies, determined from international best practice annual degression rates adjusted to local conditions in the Republic of Uganda. These shall not be to provide mandated tariffs, but shall provide an indication of future tariffs and projected reductions."
Source: (Electricity Regulatory Authority, 2010)

### Option Analysis

The issue of how to adjust the policy has important implications for grid stability, investor security, price stabilization, policy costs, and administrative complexity.

| | Policy Considerations | | | | |
|---|---|---|---|---|---|
| **FIT Design Issue** | **Investor security** | **Grid stability** | **Policy costs** | **Price stabilization** | **Administrative complexity** |
| **Triggers & Adjustments** | ✓ | ✓ | ✓ | ✓ | ✓ |

*Investor security*. From an investor perspective, the adjustment process is important for preserving policy durability. If the policy is not adjusted, it may not keep pace with changing market conditions (e.g. reductions in system costs) and may be vulnerable to being revoked. The approach to adjusting the rate, however, can also introduce uncertainties which may impact investor security. To the extent possible, triggers and adjustments should be transparent and known in advance because sudden and/or unforeseen policy changes undermine investor confidence.

- Triggers. Time-based triggers are the most transparent. Capacity-based triggers can also be transparent if progress towards the triggers is actively monitored (e.g. using a project registry) and publicly available for developers to see. Generation-based and cost-based triggers are less transparent since they can only be determined retroactively, rather than known in advance.
- Adjustments. Adjustments can reduce investor security if they are overly frequent, unexpected, or non-transparent. Automatic adjustments are the most transparent option, especially if the adjustment schedule is known and published in advance.[36] Hard caps are less transparent but (as with capacity triggers) can be improved through transparent and publicly available tracking systems. Hard caps also introduce the need for queuing. If the FIT is available for a limited quantity of projects, then clear rules need to be established for how those projects get "in line" and stay in line. Transparent rules and process for queuing – such as deposit payments to get in line and milestone requirements to stay in line – can increase investor security even in a capped policy environment.
- Reviews. A key policy decision related to reviews is the extent to which the "rules of the game" are known. For some reviews (such as Uganda above), the range of issues that are under consideration are known in advance whereas in other reviews every part of the policy could potentially be up for discussion and amendment.

*Grid stability.* Many developing countries face technical limitations with their grids related to reliability, system security, and system stability. The peak demand in the country of Tonga, for example, was 9.5 MW in 2010 (Government of the Kingdom of Tonga, 2010). An uncapped FIT such as Germany's would clearly not be possible in Tonga given the size of the grid. Triggers and adjustments can therefore help create a staged approach to renewable energy market growth that can preserve grid stability. Reviews, meanwhile, can be used to measure a country's proximity to potential technical limitations. In order to use adjustments to support grid stability, appropriate grid studies must be conducted.

*Policy costs.* Policy adjustment is one of the key tools that policy makers can use to manage ratepayer impact. By utilizing triggers, adjustments and reviews, policy makers can control the volume of projects that accesses the FIT at a given prices, control the total number of projects developed, and adjust the policy over time to reflect changing market conditions and technology costs.

[36] A key question for automatic adjustments is how to determine the magnitude of the automatic adjustment. The adjustments can be set according to reflect the projected experience curve of a given technology or set according to uniform steps (Grace et al., 2008). Degression can also be set to be "responsive" to market growth such that the amount of the adjustment depends on the amount of market growth during a prior period (Couture et al., 2010; DB Climate Change Advisors, 2011b; Jacobs and Pfeiffer, 2009).

*Price stabilization.* FIT adjustments can be used to reflect cost decreases and they can be used to encourage cost decreases.[37] Downward adjustments of FIT rates can create greater potential for FIT rates to serve as a hedge against fossil fuel prices and to stabilize rates.

*Administrative complexity.* An uncapped and unadjusted FIT clearly requires the lowest amount of regulatory oversight, but cannot be controlled. As policy makers layer in more complex policy control systems, the requirements for administrative infrastructure and resources increase. The introduction of capacity based triggers or caps, for example, may require the introduction of tracking systems and queuing procedures. The use of reviews means that the staff and resources must be available to manage the review however frequently it occurs.

### 3.3.17 CONTRACT ISSUES

A bankable power purchase agreement (PPA) is usually a prerequisite for successful renewable energy development. FIT laws typically do not dictate power purchase language, and a comprehensive discussion of what contractual elements make a PPA "bankable" are beyond the scope of this report (Ferrey, 2004). Many FITs laws do specify, however, whether or not a contract is required and whether the contract is standard or not.

**Design Options**

*Contract in place*. Many FIT policies specify that renewable electricity be purchased under contract. This is not always the case, however. In Germany, for example, no contract is required and generators can sell (and have sold) power under the terms of the FIT policy based on the terms of the law alone (Tweedie and Doris, 2011).[38] Contracts are also not typically utilized for premium FITs. As discussed in Section 3.3.5, premium payment policies enable generators to compete in the wholesale markets, rather than selling power under long-term contract.

*Standard and negotiated contracts.* If contracts are utilized in the FIT policy, then policy makers may decide to require that standard contracts be developed for use by generators that reflect other elements of the FIT design (e.g. guaranteed purchase and dispatch requirements). Some countries (e.g. Ecuador), however, require FIT generators to negotiate their contracts bi-laterally

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[37] Whereas some costs are subject to global market conditions (e.g. PV panels), other costs are based on conditions in local markets (e.g. labor costs). Large markets may be able to use FIT price decreases to impact global prices, whereas smaller markets may only be able to encourage price decreases in local markets.

[38] Generators can simply write an invoice to the utility/grid operator every month including the amount of electricity that was fed into the grid. This procedure was implemented because utilities/grid operators sometimes prolonged the development time for renewable energy projects by not signing contracts for various reasons. Although this provides generator with a degree of flexibility, many generators opt for contracts and a variety of organizations have published model contracts for generators to use (e.g. Eisner, 2005)

on a case-by-case basis. Standard contracts can streamline the project development process by avoiding the lengthy and expensive process of negotiating power purchase contracts with the utility.

*Example 1. Malaysia*
Malaysia's FIT requires the use of power purchase contracts, with terms to be developed by the Sustainable Energy Development Authority of Malaysia. The Authority has the option to develop different contracts for different technologies: "the renewable energy power purchase agreement shall take the form as may be prescribed by the Authority and any deviation from such form shall require the prior written approval of the Authority" (Article 12, 3)… The Authority may prescribe different forms of renewable energy power purchase agreements having regard to the renewable energy resource to be used and the capacity of the proposed renewable energy installation."
Renewable Energy Act of 2011 (P.O.M. 2011, 17)(Malaysia)

*Example 2. Uganda*
Uganda's FIT policy specifically requires the use of a standard contract: "Under its mandate as Single Buyer, the System Operator will issue and sign standardised Power Purchase Agreements (PPA) with qualifying renewable energy generators.[39]"
Source: (Electricity Regulatory Authority, 2010)

*Example 3. Kenya*
Kenya sets a price ceiling for its FIT payments, rather than a fixed rate. Generators must then negotiate with the utility on a case-by-case basis: "Grid operators shall pay a tariff agreed upon between them and the power producer subject to the maximum tariffs and maximum capacities specified in this document ."
Source: (Ministry of Energy, 2010b)

## Option Analysis

The different options of contractual relations influence investor security.

| | Policy Consideration |
|---|---|
| **FIT Design Issue** | **Investor security** |
| **Contract Issues** | ✓ |

[39] Currently, the model purchase agreement included in the 2007 renewable energy policy document is utilized as the template for the standard PPA (Ministry of Energy and Mineral Development, 2007).

*Investor security*. FITs that are based on a contract between an off-taker and a generator create investor security. Policies that do not utilize a contract may make it difficult for projects to secure financing. Policies that require standardized contracts – instead of negotiated contracts – increase investor security by reducing transaction costs and development risk.

### 3.3.18 PAYMENT CURRENCY

The FIT payment currency becomes a consideration if projects must conduct transactions in foreign currency. Projects that are exposed to significant foreign exchange risk may be unable to attract commercial financing.

**Design Options**

The choice for law drafters is whether to specify that the FIT payment is to be paid in local currency or whether the FIT payments should be denominated in and/or indexed to a foreign currency. A key driver for this decision is whether the project developers are likely to be engaging in transactions that expose them to foreign exchange risk.

This could occur, for example, if the developer borrows money to finance the project in foreign currency (e.g. in Euros).[40] If the domestic currency depreciates against the debt currency, then the project may be unable to repay the loan (Ferrey, 2004). Similar currency risk would be present if the developer had to pay foreign currency to import fuel (which is unlikely in the case of renewables). Moreover, if the developer imports equipment (e.g. wind turbines), the project may also be unable to be completed if currency devalues between when the FIT is set and when the project is ready for equipment delivery (DB Climate Change Advisors, 2010a).

It is possible that all project transactions could be conducted in local currency. In other words, the project can secure financing, equipment, labour, replacement parts, and fuel (if any) domestically. Smaller-scale projects such as those envisioned under the FIT in Thailand (which denominates its FIT in domestic currency) may be able to secure domestic financing, equipment, etc. In such cases, there will be no risk from paying the FIT in domestic currency since all costs will also be in domestic currency.

When foreign currency is involved in a project, then currency exchange risk needs to be mitigated in order to secure financing. For example, many renewable energy projects in

[40] If the country is designated as a Heavily Indebted Poor Country (HIPC), there may be pressure to avoid excess levels of debt in hard currency in case the domestic currency devalues (DB Climate Change Advisors, 2010a)

developing countries – especially larger projects – seek financing at least partially from international commercial banks. In order to secure these loans, it is necessary to demonstrate that currency exchange risk can be mitigated. Currency risk can be mitigated by denominating the FIT payments in hard currency or by indexing the payment to foreign currency exchange rate.

*Example 1. Gujarat, India*
The Indian state of Gujarat denominates its FIT payments in Rupees: "The Commission determines the tariff for generation of electricity from Solar PV Power project at Rs.15 per kWh for the initial 12 years starting from the date of Commercial operation of the project and Rs.5 per kWh from the 13th year to 25th year."
Order No. 2. of 2010 and Suo Moto Order No. 8 of 2010. (G.E.R.C. 2010)(Gujarat, India)

*Example 2. Philippines*
The Philippines specifies that the FIT payment should not only be adjusted for inflation, but should also be adjusted for applicable foreign exchange rate variations: "The ERC shall adjust the FITs annually for the entire period of its applicability to allow pass-through of local inflation and foreign exchange (FOREX) rate variations."
Resolution No. 16, Series of 2010: Resolution adopting the feed-in tariff rules (E.R.C. 2010)(Philippines)

*Example 3. Kenya*
The Kenya FIT sets rates in USD: "To attract private sector capital in wind resource electricity generation, the Ministry of Energy hereby establishes the Feed-in-tariff (FiT) for Wind Energy Resource generated electricity…A fixed tariff not exceeding US Cents 12.0 per Kilowatt-hour of electrical energy supplied in bulk to the grid operator at the interconnection point."
Source: (Ministry of Energy, 2010b)

**Option Analysis**

The choice of payment currency can impact investor confidence and policy costs.

| | Policy Considerations | |
|---|---|---|
| **FIT Design Issue** | **Investor security** | **Policy costs** |
| **Payment Currency** | ✓ | ✓ |

*Investor security*. As discussed above, the risk of domestic currency devaluing against foreign currency can prevent international investment if not adequately mitigated.

*Policy costs.* Although paying the FIT in hard currency can mitigate investor risk, doing this effectively shifts currency exchange risk to ratepayers. If domestic currency does devalue against foreign currency and FIT rates adjust accordingly, then ratepayers will bear the burden of paying the higher incentive rates.

### 3.3.19 INTERACTION WITH OTHER INCENTIVES

Some countries utilize the FIT as their only renewable energy policy incentive. Other countries have a more complex renewable energy policy landscape in which the FIT functions in parallel with other local, state, national and/or international incentives. Policy makers can utilize FIT legislation to specify how FITs and other incentives interact. This issue is closely related to, but distinct from, the issue of what commodities are purchased or transferred under the FIT (Section 3.3.15). The interaction between FITs and RPS and the distinction between a FIT and net metering is discussed in Chapter 2.

**Design Options**

The primary policy choices are whether to enable generators to take advantage of other policy incentives and, if so, whether the FIT rates are calculated taking the potential revenue streams from other incentives into account.

*Example 1. Slovak Republic*

The Slovak Republic's FIT payments are reduced if a project receives other state subsidies, according to a sliding scale based on the amount of additional subsidy received:

"5) If support from the supporting programmes financed from the state budget was
provided during the construction of the electricity generating facility1), the electricity price
shall be reduced as follows:

a) up to, and inclusive of, 30% of the total acquisition costs, by 4 %,
b) up to, and inclusive of, 40% of the total acquisition costs, by 8 %,
c) up to, and inclusive of, 50% of the total acquisition costs, by 12 %,
d) of more than 50% of the total acquisition costs, by 16 %."

Act No. 309/2009 Coll. on the Promotion of Renewable Energy Sources and High-efficiency Cogeneration and on Amendments to Certain Acts (U.R.S.O. 2009)(Slovak Republic)

*Example 2. Gujarat, India*

The Indian state of Gujarat requires that the FIT rates be reduced if generators receive additional incentives. The exceptions are the Accelerated Depreciation –

which generators can claim in addition to the FIT rate – and Certified Emissions Reductions (CERs). The proceeds from CERs must be shared 50% with the FIT purchaser. "Any subsidy/incentive received by SPG [Solar Power Generator] developer from any source shall be reduced from the above mentioned rate for purchase of power from SPG developers except the benefit of Accelerated Depreciation under Income Tax Act…The Solar Power Project Developer will pass on 50% of the gross benefits of CDM to the Distribution licensee with whom the PPA is signed."
Solar Power Policy (E.P.D. 2009)(Gujarat, India)

*Example 3. Vermont, United States*
The US State of Vermont requires that the FIT rate setting model take other incentives into account when setting the cost-based FIT rates, stating that the rates should: "Include a generic assumption that reflects reasonably available tax credits and other incentives provided by federal and state governments and other sources applicable to the category of generation technology."
No. 45 (H466): An act relating to renewable energy and energy efficiency (G.A.V. 2009)(Vermont, United States)

*Example 4. Finland*
Finland requires that generators only claim the FIT and no other incentives: "A wind power plant may only be approved for the tariff system if 1) it has not received State aid."
Act No. 1396 of 30.12.2010 on the Promotion of Renewable Energy Generation (M.E.E. 2010)(Finland)

**Option Analysis**

The choice of how FITs interact with other incentive payments has implications for policy costs and investor security.

| | Policy Considerations | |
|---|---|---|
| FIT Design Issue | Investor security | Policy costs |
| Interaction with other incentives | ✓ | ✓ |

*Investor security.* If generators receive cost-based rates, then they should theoretically not require additional incentives. Cost-based rates may be set, however, assuming that other incentives will be available. In the US, for example, state and local FITs have been set assuming that generators will monetize the 30% federal Investment Tax Credit. If this approach is utilized, then the actual availability of the other incentives will become the limiting factor for market development under the FIT. If the FIT rates are set assuming that all projects will receive additional revenue streams through the Clean Development Mechanism, then investor uncertainty over the future of CDM would translate directly into investor uncertainty about the FIT. If the FIT is value-based and the rates are below what generators need for economic viability, then access to additional incentives may enable projects to be built.

*Policy costs.* Ratepayer impact is reduced if cost-based FIT rates reflect other incentives funded from other sources, although the net effect may be to shift the cost burden to other constituencies within the country (e.g. from ratepayers to taxpayers). For developing countries, it would be preferable if the FIT rates were able to be reduced because of incentives provided by external sources such as development finance institutions and/or climate finance (Chapter 4).

## 3.4 Rate Setting Methodology

The approach to setting the FIT rate is a critical component of FIT design. The full details of the rate setting process are typically not incorporated into legislative or regulatory language, but this section presents a high-level overview of some of the key rate setting considerations in order to provide policy makers with a basic background on the issue. As discussed in Sections 3.3.4 and 3.3.6, rates are typically set based on either on a measure of value or based on generation cost. A comprehensive investigation into rate setting in developing countries is beyond the scope of this report but is recommended for additional research. In order to bound the discussion, this section focuses on cost-based rates since they are used in the majority of the world's FITs.

FIT rates that are based on generation costs are typically set through an administrative or regulatory process. The key policy maker considerations for generation cost based rate setting include:

- *Rate setting model.* Most jurisdictions utilize some form of spreadsheet model to develop their FIT rates. Rate modelling approaches generally fall into two families: cash flow forecasts and recovery factor analyses (Kahn, 1991). While cash flow methods allow for greater transparency and more precise tax treatments, recovery factor analyses are simpler calculations. A related consideration when building a rate setting model is whether to calculate the FIT without taking the impacts of taxes and tax incentives into account (a "pretax" model) or whether to calculate the FIT after calculating the impact of taxes (an "after tax" model). The choice of whether or not to take taxes into account when setting the rates depends on factors such as the complexity of the tax code and the degree to which policy makers wish to take the tax profiles of different entities into account under the FIT.

- *Level of detail of input data.* Rate setting models require cost, financing, and performance data as inputs to calculate FIT rates (Gifford et al., 2010). When selecting inputs, rate designers must consider the level of input detail required. Investment costs, for example, can be expressed as a single figure (e.g. $4/watt installed costs for PV), or they can be disaggregated into subcategories (e.g. labour costs, equipment costs, inverter costs, etc.). Greater granularity can provide more transparency about cost assumptions, but there is a trade-off between being "precise" about a single project and being "representative" of a broad class of technologies. FIT models tend to utilize more aggregated and less granular inputs in order to be more representative and minimize unnecessary complexity and effort.

- *Data sources.* A related issue is how to gather the data. Renewable energy project data is available in many forms and from many different sources. Policy makers need to decide which sources of data are appropriate and in what level of detail. Some jurisdictions utilize data developed in other countries, while other jurisdictions insist on utilizing only domestic data. Some jurisdictions utilize aggregate data gathered from published sources and interviews, whereas other jurisdictions conduct intensive "bottom up" analyses of component costs for each technology. The approach utilized depends both on regulatory philosophy of the jurisdiction and the quantity and quality of data available.

- *Input selection.* For each input, there is a reasonable range of values that could be considered "representative." There is no "right" value and policy makers have a choice as to whether they will set the rates conservatively by using only lower range values, aggressively by using upper range values, or somewhere in the middle. In India, for example, the regulator chose a 28% capacity factor for wind out of a reasonable range of 22%-32%. These types of choices have a direct bearing on the amount of capacity that will be brought online since conservative rates may only permit a few generators to enter the market, whereas aggressive rates could permit a broader range of generators to enter the market.

- *Rate setting process.* The rate setting process often depends on the legal or regulatory tradition in each country. The key considerations include the degree of transparency to the process, the degree to which stakeholders are engaged and consulted, and the type of stakeholders consulted. Some countries rely heavily on public regulatory proceedings open to all stakeholders to set rates, whereas others utilize "closed door" processes that minimize public participation. The design of the rate setting process can have important implications for how the inputs are gathered. The FIT laws in Vermont in the US and Nova Scotia in Canada, for example, required the FIT rates to be developed through highly transparent regulatory proceedings which relied heavily on public stakeholder participation in order to source model inputs. The models employed by Germany and Ontario to set their final FIT rates, by contrast, were not made available to the public.

- *Country specific considerations.* The possible approaches to FIT rate setting are the same for both developed and developing countries. Gathering input data for some countries, however, can be more challenging due to the limited deployment of renewable energy. There may not be an existing set of domestic project data to reference. The lack of available data, for example, was one of the primary reasons that Tanzania opted to set rates based on avoided cost rather than on generation costs. Developing countries with a shortage of such data can use renewable energy data from neighbouring countries or from developed countries as benchmarks, but policy makers should keep in mind the differences in domestic conditions. Installed costs in developing countries may be higher than in developed countries, for example, if both equipment and expertise must be imported. Similarly, the cost of capital in developing countries can be significantly higher than developed countries because of various country risks. Deutsche Bank recently reported, for example, that equity return expectations for infrastructure investments in developed countries can be near 8%, but that the return expectations for a comparable project in a developing country may be higher than 20% because of political, counterparty, legal, and currency risks (DB Climate Change Advisors, 2011d). This differential in the cost of capital can have a significant impact on FIT calculation. Another issue that developing countries may encounter is the availability of the technical and administrative capacity necessary to complete the rate setting process. This is discussed in greater detail in Chapter 5, along with other capacity requirements.

# 4. Funding FITs

Policy cost is a critical issue for renewable energy law drafters, but particularly so in developing countries. FITs have a reputation for being inherently "expensive" policies, largely as a result of the large volume of renewable energy capacity that has been built in Europe under FITs. In 2009, Germany spent approximately Euro 13 billion for electricity from FITs, of which close to 5 billion represented incremental costs above average wholesale prices (Van Mark, 2010). Some developing countries may have an appetite to try to follow Germany's example. China, for example, has emerged as a leading international wind market and has installed more renewable energy capacity per unit of GDP than the US, Germany, and Spain (Gordon et al., 2010). China is an exceptional case, however, and many developing countries lack the resources to pursue generation projects that will significantly increase ratepayer or taxpayer burdens. As noted throughout this report, countries can adopt (and have adopted) radically different FIT designs to reflect their different policy goals and national circumstances. FIT policies can be designed to limit ratepayer impact and do not necessarily need to be "expensive" from the point of view of ratepayers (Chapter 3).[41] This section discusses key considerations for funding FIT policies in developing countries, with a particular focus on policy cost recovery options.

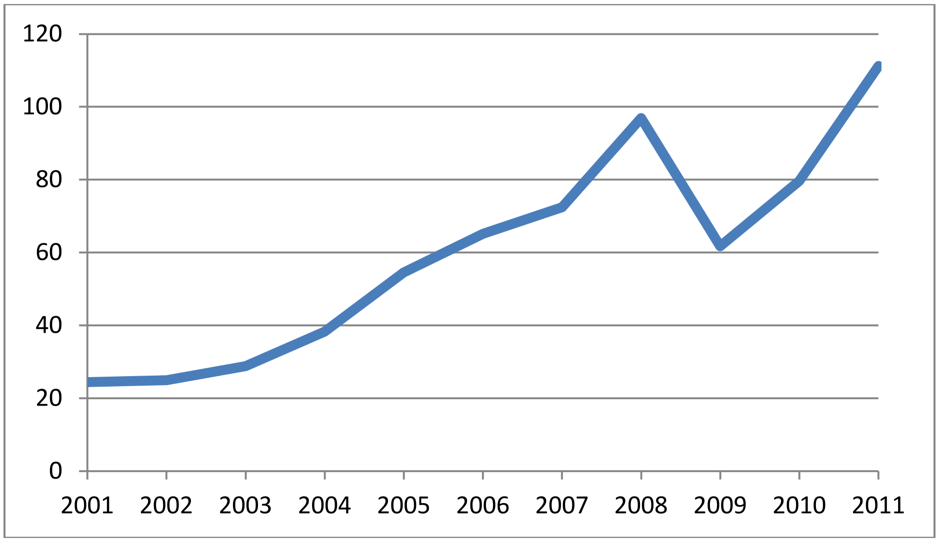
## 4.1. FITs may not require cost recovery

The cost of renewable energy policies is driven by a wide range of factors, including policy design and the comparative cost of existing generation. A policy that supports small photovoltaic installations in a country powered by low-cost hydropower, for example, would have a higher additional cost than a policy which supports landfill gas as a replacement for oil-fired generation.

Policy makers should not to assume that a FIT policy will incur significant additional costs over conventional alternatives. In many countries, renewable energy may represent the lowest cost power option. African countries such as Uganda and Tanzania, for example, have introduced an increasing amount of diesel generation to compensate for falling hydropower output and to meet increasing electricity demand. Most Caribbean countries, meanwhile, are 90-100% dependent on oil for all of their energy needs (KEMA, 2008). Although oil prices have been historically volatile, prices have trended upward over the last 20 years, increasing from $20/barrel during the 1990s to over $60/barrel by 2006 (Figure 4). During 2011, the price of oil averaged over $100 per barrel (International Monetary Fund, 2011; US Energy Information Administration, 2012).

[41] Several recent reports discuss the issue of policy cost control in detail. *See*, e.g., (DB Climate Change Advisors, 2011b; C. Kreycik et al., 2011).

**Figure 4. Oil spot price (unweighted) (US dollars per barrel)**




Source: US Energy Information Administration (2011)

Countries that rely on oil for electricity (or other high-cost conventional fuels) will have comparatively high generation costs. If these costs are not subsidized (discussed below), then the utility's avoided cost of electricity will likely be high as well. In such circumstances, a FIT set avoided cost may be sufficient to support new renewable energy. Tanzania's avoided cost FIT has supported 24.4 MW of power purchase agreements with biomass and hydropower plants to date (Rickerson et al., 2010b).

As discussed in Chapter 3, an alternative to value-based rate setting approaches is to set rates based on generation cost. When avoided costs are higher than renewable energy costs, purchasing renewable electricity under a cost-based FIT would generate immediate ratepayer savings. One of the reasons that the US state of Hawaii introduced a generation cost-based FIT, for example, was that the rates required for renewable generators were below the utility's avoided costs.

In jurisdictions where renewable energy can be developed in a cost neutral manner—or can generate immediate savings—FIT policy development will likely focus more on the non-price FIT design elements (i.e. access to the grid). The number of countries where renewables are broadly cost competitive is currently limited, but will likely expand if fossil fuel prices continue to rise and if renewable energy prices continue to decline in the future.

## 4.2. Cost recovery options

Policy makers have two primary[42] options for cost recovery, as discussed in Section 3.3.9. The first is to pass the costs through to ratepayers through a surcharge on electricity (or a similar mechanism). The second is to pay for the costs using the national budget, thereby passing the costs along to taxpayers. It is also possible to employ hybrid approaches wherein a portion is recovered from ratepayers and a portion is recovered from taxpayers.[43] Of the options, policy makers and investors appear to prefer ratepayer recovery because it is perceived as more secure and reliable way to ensure cost recovery (and therefore to ensure FIT revenues). As noted in a recent UNEP publication: "Governments like to keep subsidies "off-budget" for political reasons, since "on-budget" subsidies are an easy target for pressure groups interested in reducing the overall tax burden (Morgan, 2008)."

Both approaches, however, can create political risk. Increases in the prices for basic commodities have touched off popular protests around the world in recent years. FIT policies that result in significant ratepayer increases may be politically challenging. In the past, contracts with IPPs in several developing countries have been abrogated or have been renegotiated (to the detriment of the generator) when their ratepayer impact raised concerns (Woodhouse, 2005). When developing renewable energy cost recovery strategies, policy makers need to balance support for investment with what is economically and politically feasible.

One possible mechanism for supporting this balance is to exempt certain groups from cost recovery. Malaysia, Thailand and the Philippines, for example, each exempt low-income ratepayers from paying the surcharges related to FIT cost recovery.

## 4.3. Lowering the required FIT rates

Renewable energy costs have fallen dramatically during the last several decades as markets have expanded and technologies have matured. These trends have allowed governments to set progressively lower FIT rates.[44] Costs for technologies such as PV, wind (offshore and onshore), and geothermal are projected to continue to decline for the next few decades (German Advisory Council on the Environment, 2010). As fossil fuel prices rise, the "gap" between conventional

[42] There are also variations on these primary approaches. In Taiwan, for example, the primary mechanism for recovering FIT costs is through a tax on nuclear and coal generation.
[43] A related strategy is to utilize tax benefits in parallel with FITs. As described in Section 3.3.19, for example, the FIT rates in India are set to assume that generators claim the accelerated depreciation benefit. The amount of the FIT that must be recovered from ratepayers is therefore reduced by the value of the accelerated depreciation.
[44] Or support a broader range of projects under technology-neutral rates

and renewable energy sources will narrow and the amount of "above market" FIT payments will decrease.

The "gap," however, is not only attributable to the differential in technology costs between renewable and fossil fuel generation. To make renewable energy more competitive, policy makers can also explore strategies to raise the cost of fossil fuels and to lower the non-technology costs of renewable energy.

### Raising the price of fossil fuel electricity

Many developing countries have deep conventional energy subsidies which artificially suppress the market price of electricity that renewable energy must compete against. There have long been calls to "level the playing field" by removing fossil fuel subsidies in order to prevent the need to stack new subsidies on top of existing fossil fuel subsidies when supporting renewable energy. As discussed above, increases in electricity commodity prices may be politically difficult—even if the existing subsidies represent a significant drain on national resources. Nevertheless, some countries are moving forward with subsidy reform. In 2005, for example Iran's subsidies for oil, natural gas, and electricity totalled approximately $37 billion (Morgan, 2008). At the end of 2010, Iran launched a five-year plan to phase out subsidies and saved $20 billion during the initial 12 months of cuts. Eighty percent of the savings will be redirected to subsidies for low income residents in order to soften the impact of higher energy bills (Glemarec, 2011).

Other countries, faced with the dual challenge of the need to support renewable energy and reduce the financial burden of fossil fuel subsidies are considering similar reforms. Trinidad and Tobago, for example, subsidizes both oil and electricity in order to keep the price to consumers artificially low. The Ministry of Energy and Energy Affairs' recent renewable energy policy framework acknowledges the need to "[rationalize] electricity tariffs to reduce and ultimately remove subsidies and thereby reflect the 'true' costs of production (Renewable Energy Committee, 2011)."

In addition to raising fossil fuel prices and enabling renewables to be more competitive, subsidy reform also generates savings which can be used for other purposes, such as creating renewable energy incentives and/or creating programs to support low-income electricity consumers as they adjust to higher prices.

### Introduce policies that lower the generation cost of renewable energy

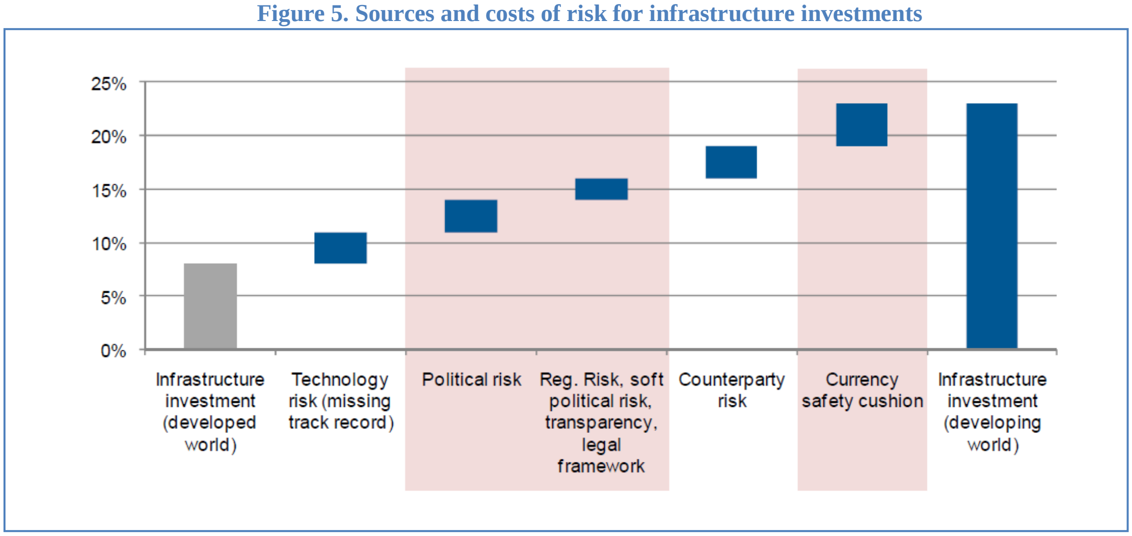
A second approach to "closing the gap" is to lower the payment rate that renewable generators require. Renewable energy generation costs are driven by factors beyond technology costs, including upfront development costs; financing costs (e.g. the cost of debt and cost of equity);

and operating costs. To the extent that these costs can be reduced, the required FIT payment can be lowered.

- *Development costs.* Although generating technology (e.g. wind turbines or PV panels) drives a project's capital costs, there are a range of other factors which can raise the upfront cost or renewable technology, such as the cost of securing permits, applying for interconnection agreements, paying import tariffs on equipment, completing inspections, etc. Countries can reduce upfront costs by streamlining administrative procedures (e.g. simplifying interconnection applications and educating inspectors), lowering the costs of securing permits, conducting energy resource assessments, etc. Countries can also provide grants or rebates to projects in order to reduce their upfront costs and lower the required FIT rates. The trade-offs between a payment that occurs upfront versus a payment that occurs over time are discussed in Section 3.3.6.

- *Financing costs.* Project capital cost can significantly impact project economics. The higher the cost of debt and/or equity, the higher the generation cost of the project and the higher the FIT needs to be. Although FIT design itself can lower capital costs (Rickerson et al., 2011b), there are factors external to policy design that will impact the cost of financing. The graphic below from Deutsche Bank illustrates the potential sources of risk that may drive the cost of equity in the developed world (at the left of the Figure) and in a developing country (at the right of the Figure). Strategies for reducing the cost of debt and equity include the use of lower cost public money for financing (including concessional loans, green bonds, public co-investment, etc.), and products which protect against unexpected loss of project revenues, such as loan guarantees, political risk insurance, first loss funds, etc. (DB Climate Change Advisors, 2011d; Glemarec, 2011; Global Climate Network, 2010).

**Figure 5. Sources and costs of risk for infrastructure investments**




Source: DB Climate Change Advisors (2011d)

- *Operating costs.* Operating costs include fuel costs, operations and maintenance, property taxes, insurance, and other costs that occur on an annual or periodic basis. Similar to upfront costs, there are opportunities for governments to reduce operating costs by identifying and streamlining complicated or redundant regulations and administrative requirements.

While the strategies outlined above could lower the FIT payments required, they require financial resources and technical capacity to implement. Many of these strategies are therefore out of reach of resource constrained developing countries.

Several recent policy proposals have suggested that international funds be created to support FITs in developing countries (AtKisson, 2009; DB Climate Change Advisors, 2010a; International Renewable Energy Alliance, 2009; Jacobs et al., 2009; Teske et al., 2010). These funds would seek to "close the gap" for renewable energy in different ways: by providing payments above avoided costs, by providing technical assistance to reduce costs, and/or by providing risk mitigation strategies that would reduce the cost of capital. None of these concepts have yet been implemented and the structure of international support for renewable energy in developing countries remains dynamic. The next section briefly reviews current trends in international support for renewable energy in developing countries.

## 4.4. International funding options

International support may be available to developing countries that do not have the resources to recover the costs of their FIT policies or to pursue the other strategies for supporting renewable energy described above. Some countries have explicitly anticipated this in their FIT policies. Uganda's FIT policy, for example, states that policy costs can be recovered domestically or from international sources such as development assistance funds and climate finance (Electricity Regulatory Authority, 2010). At present, however, there is no dedicated set of funds to support FITs in developing countries and support for renewable energy development tends to occur on a case-by-case and project-by-project basis.

**Existing international funds**

Globally, the total amount of resources available to support renewable energy from multi-lateral, regional, and bilateral sources has increased significantly. Funds such as the Global Environment Facility (GEF) have successfully supported the development of renewable energy projects in developing countries. FITs fit into the paradigm of results-based financing, which is of increasing interest for international development agencies and donor countries. Results-based financing, and related concepts such as results-based and output-based aid (see, e.g. GPOBA, 2011; Mumssen et al., 2010), can provide incentives for national and sub-national actors to create new markets for renewable energy deployment. FITs effectively represent a form of advanced market commitment for renewable power (VividEconomics, 2010). International development efforts have employed results-based funding to great effect in the health sector and FITs could represent a way to similarly target international assistance at the sectoral level, rather than on a project by project basis. Although there are emerging opportunities to use international aid to support FITs, there remain challenges with regard to how to best link international assistance to national FIT programs:

- *The amount of available funding.* The amount of capital required to support renewable energy in developing countries is significant. A recent study from UN Department of Economic and Social Affairs, for example, calculated that the total amount required to support a global fund for FITs in the developing countries would be up to $200-$250 billion annually (DeMartino and Le Blanc, 2010). This amount significantly exceeds the amount of funding that international organizations are currently able to deploy. Given the limited availability of public resources, some international organizations have argued that public sector funds should be deployed primarily as technical assistance to attract private sector finance to fund renewables in developing countries (Glemarec, 2011).

- *Finding the "right" funding source.* The number of international funding mechanisms dedicated to clean energy and climate change projects in developing countries has proliferated. The United Nations Development Programme (UNDP) and the World Bank's Climate Finance Options web platform[45], for example, lists 36 sources of funds that can support energy projects. There can be a significant amount of complexity involved with navigating the international funding landscape. Different funds have different rules as to the regions or countries they can serve, the type of support they can provide (e.g. technical assistance, grants, loans, etc.), the amount of support they can provide, and the process by which funds can be accessed. Determining which funds would be the most appropriate match and whether these funds can be accessed is a challenging exercise for developing countries.

- *Transaction costs of accessing funds.* Even if the "right" source of funding can be identified, it can take time and resources to apply for and receive funding from international sources. The potential delays in accessing these funds may disrupt and delay the project development cycle and complicate financing.

Current international funding infrastructure has historically not been flexible enough to support national FITs in a broad and programmatic way—for example, the creation of a fund dedicated

[45] http://www.climatefinanceoptions.org/

to providing grants on a standard offer basis to all projects that apply for a certain national FIT. Law drafters in developing countries cannot assume that international support will be available when they need it and in the form they need it to support the implementation of national policies. In the near-term, it seems more likely that international support will be arranged on a case by case or project by project basis.

### Emerging trends in international climate finance

An alternative source of funding beyond traditional official development assistance from development organizations and from the established climate and energy funds (e.g. GEF) is support through international greenhouse gas reduction agreements. Although there is currently uncertainty about the future structure of international climate finance, there may be opportunities for developing countries to position their national FIT policies in a way that links with emerging climate finance mechanisms.

- *Climate finance.* Under the Kyoto Protocol, renewable energy projects in developing countries can sell Certified Emissions Reductions (CERs) credits to entities in developed countries through the Clean Development Mechanism (CDM). At the United Nations Climate Change Conference in Durban, South Africa in December 2011 (Conference of the Parties, or COP-17), the Kyoto Protocol was extended for a second commitment period. Although a final decision about continuing the CDM has been delayed until COP-18 (in Qatar in November 2012), it appears likely that CDM will continue beyond 2012 although uncertainties remain (van Melle et al., 2011).

- *Nationally Appropriate Mitigation Actions (NAMAs) and the Green Climate Fund.* NAMAs are a concept that emerged from the United Nations Framework Convention on Climate Change's (UNFCCC) Bali Climate Change Conference (COP13) in 2007. Developing countries agreed to commit voluntarily to take NAMAs that reduce greenhouse gas emissions. These NAMAs could comprise of policies, programs or projects implemented at national, regional, or local levels. UNFCCC has invited developing countries to submit details of their NAMAs. The NAMAs outlined by responding developing countries could be eligible for support under new international climate finance regimes. The Green Climate Fund, for example, could be one of the key financial sources to support NAMA implementation. The Green Climate Fund was announced as part of the Copenhagen Climate Change Conference in 2009 and will provide up to $100 billion in climate finance annually by 2020. Although NAMAs and the Green Climate Fund have the potential to be vehicles to support national FITs in a broader and more programmatic way than CDM, many of the details of both NAMAs and the Green Climate Fund are not yet complete and need to be worked out in future international negotiations. The Green Climate Fund, for example, was approved at the Durban conference. However, it remains unclear how the new facility will be funded.

**The emergence of innovative models**

In parallel with the UNFCCC proceedings, there are several ongoing efforts to align international resources to support national FIT policies in developing countries. Three ongoing examples are briefly outlined here.

- *Global Energy Transfer Feed-in Tariff (GET FiT).* The GET FiT Program was developed by Deutsche Bank in response to a request from the UN Secretary General's High Level Advisory Group on Climate Change Financing. The GET FiT concept and its companion report, GET FiT Plus, outline potential structures under which public sector resources can be used to "de-risk" renewable energy investments in developing countries (DB Climate Change Advisors, 2010a, 2011d). GET FiT envisions that public sector resources (e.g. grants, loans, guarantees, and risk insurance as necessary) could be used to support national FITs and catalyze massive private sector investment. The GET FiT concept envisions a flexible framework within which a range of different types of support could be provided to developing countries. To date, no concrete initiative based explicitly on the GET FiT concept have been developed. Deutsche Bank has reached out to public sector entities such as the World Bank, the UNDP, UNEP, the Inter-American Development Bank and others, and dialogue is ongoing.

- *Indonesia Feed-in Tariff Fund.* The Indonesia Feed-in Tariff Fund is a concept developed by FMO and NL Agency in the Netherlands to support geothermal development in Indonesia. Indonesia has the world's largest geothermal resource, much of which remains untapped. The Fund would seek to invest private equity in the form of $/kWh payments to geothermal developers. The payments would be structured to "close the gap" between the PPA contracts that the generators are awarded and the rates they need to meet their return expectations. The Fund concept hinges on the Indonesian government and utilities approving a PPA with the geothermal generator indexed to the price of fossil fuels. As fossil fuel prices rise over time, the $/kWh amount paid to the generator would eventually exceed the fixed flat guaranteed by the fund. The generator would then repay the Fund and the Fund would earn a return for its investors. The generator would also transfer income from CER sales to the Fund as an additional source of revenue (Rickerson et al., 2011a).

- *Green Power Africa.* Green Africa Power (GAP) is a proposed funding facility conceived by the Public Infrastructure Development Group. GAP would utilize official development assistance funds to provide guarantees and payments to "close the gap" for renewable energy projects in sub-Saharan Africa under long-term contract in exchange for CERs. Under certain circumstances, GAP would also purchase and resell electricity from the projects as well (Anderson, 2010). The GAP program is currently attempting to identify pilot projects.

Although none of these three concepts are operational, they illustrate the innovative thinking that is currently occurring at the intersection of renewable energy policy, finance, and international development.

**Discussion**

The issue of cost recovery remains a critical issue for law makers in developing countries. As discussed in this chapter, factors such as a country's policy objectives, available renewable resources, national circumstances, and existing generation portfolio will shape policy design and to a large extent determine the costs that the policy will incur. Policy makers need to determine the most appropriate way to balance the potential costs of the policy against their capability to absorb them domestically**.**

The international community continues to commit significant funds to renewable energy in developing countries through technical assistance programs and financial mechanisms. However, the funding landscape remains complex and dynamic, and international climate finance is undergoing a transition as the world looks beyond the Durban conference. There are currently few existing programs that could be utilized to support FIT cost recovery (or cost reduction) for a given country in a broad and programmatic way. However, ambitious new fund proposals and the emergence of new public private partnership models could create new opportunities for developing countries to share the burden of renewable energy policy costs and support rapid renewable energy scale-up.

Going forward, there will likely be opportunities for international development organizations and their network of client and donor countries to think through how existing and emerging funding mechanisms at the international and national levels could be sequenced and staged. During the next several years, for example, it could be possible for international resources—either through existing channels of international support focused on results-based financing or through the emerging climate finance mechanisms—to be coordinated and focused in support of national FIT policies in developing countries. Ghana, for example, recently listed a national FIT as a focus of its NAMA (Ministry of Environment Science & Technology, 2010). These international resources, however, would be a bridge to targeted national strategies. In parallel with international support, for example, national governments could gradually but steadily phase out fossil fuel subsidies while strengthening the domestic enabling environment for renewable development. In the final stage of the sequence, international and domestic financial incentives for renewables could be removed altogether. The design of plans like these would require a cooperative effort not only between international organizations and national governments, but also between the public and private sectors. Commercial financiers would need to be integrated into the dialogue in order to provide a perspective on how such a sequenced transition could be structured in order to be most readily financed.

# 5. Capacity Requirements

This report has elaborated on some of the key decisions that policy makers and law drafters will encounter when crafting FIT policies. As discussed throughout, the renewable energy policy process is highly complex and policies must be adapted appropriately to each country's conditions, constraints, and policy objectives. Policy makers—whether in developed or developing countries—often lack the resources, expertise, and/or capacity to navigate the FIT policy making process without assistance. This section briefly reviews some of the key areas where policy makers may require technical assistance either before or during the FIT policy making process. This section first discusses the technical, policy, and barriers assessments that set the stage for FITs but are external to the FIT development process, and then discusses capacity issues which relate directly to FIT implementation.

*Technical assessments.* FIT policies should reflect and account for a country's physical resources and limitations. Relevant assessments could include:

- Renewable energy resource surveys to characterize the strength, availability, and location of renewable energy within the country.
- Cost of generation studies to determine not only the levelised cost of the renewable resources, but also to confirm the current avoided cost of electricity and identify the financial gap between new renewable energy and non-renewable alternatives.
- Grid integration studies to determine the technical realities of interconnecting renewable energy to the grid, and identifying areas that could be constrained and/or in need of upgrades.
- Load forecasts to determine future demand and capacity requirements that could be met by renewable energy.
- Generation planning in order to determine the optimal mix of renewable energy resources and how they interact with the existing generation mix.

These and related technical issues can form the basis for FIT policy making. Policy makers can use this information to determine appropriate target setting, volume management and rate setting strategies. Countries with small grids, for example, may wish to establish targets that reflect grid integration limitations, whereas countries where renewables are below avoided cost may wish to set generation cost-based rates to realize near-term savings.

*Policy assessment.* As discussed above, FITs can encompass a broad range of policy interventions, from interconnection protocols to pricing. There are many complementary policies and institutional initiatives which are not typically part of FIT policy packages, but which may lay the foundations for FIT success. They include topics such as permitting, zoning, land use policy, electricity market integration studies, environmental regulations and other basic legal and regulatory preconditions to enable renewables. Policy makers can conduct assessments of the policy "sequencing" in order to identify supportive policies that should be passed in advance of FITs in order to prevent bottlenecks (Elizondo-Azuela and Barroso, 2011). France, for example, set an aggressive FIT, but did not initially streamline its highly complex and costly permitting and application processes in which generators had to contact 27 different authorities in order to install wind turbines (Mendonça et al., 2009). Many countries have implemented FIT policies without other policies in place, and so there is often a process of "backfilling" the enabling environment.

*Barriers assessment.* In addition to supplementary policies, there are a broad range of non-policy barriers which may require additional programs or initiatives to address. These may include informational barriers, behavioural barriers, institutional barriers, regulatory barriers, and financial barriers (ECORYS, 2010; IEA-RETD, 2011). Depending on the nature and extent of these barriers, policy makers can consider a range of training and education programs, stakeholder engagement strategies, research efforts, and risk mitigation schemes. For example, the lack of a strong regulator (or the absence of a regulator altogether) may pose a significant barrier to a FIT design that requires an administrative oversight. Policy makers may therefore need to focus on regulatory structure and function in order to enable FIT policy success (KEMA, 2010). A ratepayer impact assessment, meanwhile, could help to determine whether the proposed FIT would be politically or financially feasible. A full description of these types of interventions is beyond the scope of this report but has been addressed in details by other recent publications (DB Climate Change Advisors, 2011d; Glemarec, 2011).

## 5.1 FIT capacity requirements

The choice of a renewable energy policy is a critical step in the development of a country's low-carbon planning. This report is intended to be a design resource for policy makers that have already chosen FITs, rather than an argument for or against the choice of FITs. When policy makers choose to move forward with FIT development, they encounter many of the same challenges no matter what design path they are taking. Countries will need to cultivate their own internal capacity to address these challenges, or seek external advisory services.

*Identify objectives.* Different countries enact FITs to achieve different objectives. It is often useful to explicitly identify these objectives in order to create buy-in—or at least understanding—from governmental, utility, industry, and civil society stakeholders. These objectives can then serve as a reference point for the FIT design process.

*Set targets.* Recent studies have concluded that successful deployment of renewables is linked to ambitious targets and the presence of a well-designed incentive scheme (Ölz, 2008). It is also important to make sure that the well-designed incentive scheme is explicitly linked to the ambitious targets and can meet them. The technical assessments described above should be used to help set national targets, FIT targets, and/or caps that can reasonably be achieved by the FIT.

*FIT design.* With objectives and targets at guideposts, policy makers can then embark on the broader FIT design process utilizing resources such as this guide. Policy makers should seek to identify which FIT design issues are relevant and that they wish to pursue. It may not be necessary to consider every issue address in this report as part of a given FIT design. Once the priority list of issues has been identified, policy makers can then walk through each of the issues and select the choice that most clearly matches and balances the countries' objectives. This design process can be conducted internally, or it can be conducted as part of a public stakeholder process (see, e.g. Grace et al., 2009; 2008).

*International benchmarking.* As part of the design process, policy makers may wish to actively and iteratively benchmark against the experience, policy designs and payment rates of other countries. With more than 50 FITs in place and a track record stretching back over three decades in some countries, there is a rich body of experience upon which to draw. Most of the options in this report (and many not in this report) have been implemented somewhere at some point. Moreover, FIT policies have continually been adjusted and updated and it is useful to explore when, why, and how policy makers altered their FITs.

*Law drafting.* Once the policy design is selected, it needs to be translated into draft legislation or regulation. Although this guide has provided illustrative examples from around the world, the precise text adopted in each country will need to reflect the national context and fit appropriately within the existing body of law and legal tradition. It may also be beneficial for "official" versions of the legal text to be drafted in multiple languages given the global reach of renewable energy companies, investors, and developers.

*Regulatory and administrative issues.* After the law is passed, there may be a host of regulatory and administrative concerns not addressed in the law that will need to be developed. For laws that leave many of the primary policy decisions to a subsequent regulatory process, there may be a significant regulatory capacity requirement to interpret the law and develop regulations around it. Even when laws have explicitly addressed most of the major policy issues, there may still be significant regulatory and administrative infrastructure to put into place, including application procedures and forms, the review of project applications, the development of standard power purchase agreements, and the development and publication of policy handbooks in order to provide additional clarity to developers and investors.

*Rate setting.* As discussed in Section 3.4, the rate setting process can be complex. Whether the process is closed or open to the public, governments will still need expertise to set the rates and adjust them over time. Many governments also have a need for current regional or global renewable energy project data since in-country data may not be available.[46] Although generation cost based rates are generally more complex, there is also complexity associated with selecting and then setting value based rates. Rates based on avoided cost rates, for example, require a definition and calculation of avoided cost—which is not always a straightforward process.

*Monitoring and adjustment.* Depending on the complexity of the policy, countries may also need to set up monitoring and verification systems in order to track progress towards caps and to manage generation queues. There will also be a need to manage the adjustment and policy review process over time to reflect changing market conditions and respond to shifting policy objectives or stakeholder concerns. Finally, there may be a need to evaluate the impact of the policies over time on key indicators such as ratepayer impact, job creation, market growth, etc.

Each of the issues may require new expertise, capacity, and resources that were not required prior to the introduction of the FIT. Some countries may be well positioned to accomplish all of these tasks internally. However, there are few developed or developing countries that have not turned to external resources to accomplish some or all of these tasks. Germany and the Netherlands, for example, each rely on consultants and research institutes to collect market data and develop proposed FIT rates (Corfee et al., 2010). Identify and helping to coordinate technical assistance resources will be a key next step moving forward as described in the next chapter.

[46] At present, there are not many widely or publicly available datasets for renewable energy project costs in developing countries. This is something that international organizations could collect and publish in aggregated form.

# 6. Next steps

This report is part of a broader toolkit of resources that UNEP is developing to strengthen and refine FIT policies in developing countries. Using this and other resources, UNEP aims to support the development of local capacity and provide advice to developing countries in designing and implementing nationally appropriate FIT frameworks. UNEP intends to conduct country-specific gap and needs assessments and support technical assistance efforts to address the identified gaps, draft and amend legal instruments as appropriate, and advise countries in designing bridge funding mechanisms whilst they develop the required regulatory, institutional and financial mechanisms for a sustainable FIT policy (United Nations Environment Programme, 2011). In order to support this effort and provide the appropriate technical expertise, UNEP will work with its partners to consider the following resources:

*The development of a South-South exchange.* There are now a significant number of FIT policies in place in developing countries and a growing cadre of FIT experts and policy practitioners in the global South. There is value in North-South exchange on FIT practice and many FITs in developing countries have benefited from consultation and policy advice from experts in Europe. There is also value, however, in supporting dialogue between developing countries about FIT design in order to explore how FIT lessons were adapted to different national contexts and how the unique challenges facing developing countries were addressed. UNEP will work to develop structured opportunities for this type of dialogue and exchange.

*The development of FIT networks.* In order to support FIT implementation, UNEP also plans to support the development of several international networks.

- A connectivity network to connect policy makers, other national/regional institutions, experts and program administrators in developing and developed countries with each other in order to share experiences on everything from policy design to contract structures and administrative procedures. Such a platform would allow existing policies to be refined and new policies to be implemented in a more streamlined manner. Experiences could be shared through virtual or physical workshops and online tools, as well as working partnerships. Recent examples of this include a trip by Tanzanian regulators to Thailand in order to learn from the Thai experience with FITs (Greacen, 2010) and a FIT workshop hosted by UNEP in Paris in February 2012.[47]
- An alignment network to convene the broad range of international multi-lateral institutions, non-governmental organizations, and foundations that are currently focusing on FIT policy,

[47] Germany, Spain and Slovenia have already launched the International Feed-in Tariff Cooperation in order to explicitly compare experiences, share best practices, and contemplate next steps in Europe. *See* http://www.feed-in-cooperation.org/

design, and technical assistance in a developing country. As explored at the Cancun World Climate Summit in 2010 and at other events, there is ample opportunity for dialogue between public and private sector institutions on FITs in developing countries. There is also significant opportunity to align public sector efforts around FITs. Such an alignment network would identify areas for collaboration, leverage different institutions' resources, and avoid redundancy of FIT technical assistance assignments and FIT project expenditures.

- A production network to provide coordinated international technical assistance on FITs in developing countries. Although the number of countries with FITs has expanded rapidly during the last several years, the number of international experts available to provide technical assistance to stakeholders in these countries has remained limited. Moreover, different experts have different skill sets that are appropriate for different settings. This production network would seek to create a coordinated network of service providers that could effectively and efficiently provide targeted technical assistance and advice to developing countries.

These networks would constitute part of a broader coordinating platform to support FIT policies —and other policies as appropriate—in developing countries.

*The development of additional tools.* In addition to this report, developing countries may identify the need for other cross-cutting tools such as comparative studies of rate setting methodologies and practices in developing countries, case studies on the interaction of FITs and grid integration, or more specific issue papers addressing FIT design issues specific to countries that share certain characteristics (e.g. FITs for small island states). UNEP will work with its partners to respond to such needs on an ongoing basis.

*Additional research.* During the drafting of this report, numerous topics were identified that could be the focus of additional research but which were beyond the scope of this current effort. Following consultations with international stakeholders, the following topics were identified as priorities.

- *The interactions between FITs and other policies.* Debates between different policy mechanisms are increasingly giving way to discussions as to how different policy types can be most advantageously combined. Experience with auctions and FITs in China and Latin America, for example, and the combination of RPS, FITs, and RECs in India and the Philippines has created new opportunities for comparing previous international experience using these instruments with emerging models. In particular, it would be useful to examine how auctions can be used to set FITs and how FIT rate setting efforts can be used to set benchmarks for auctions.

- *Small-scale FITs.* The implementation of FITs in areas with small and/or remote grids is increasing, with FITs specifically for off-grid or mini-grid systems in place in Ecuador, Peru, and Tanzania, and the UK. There is also a recent trend towards FITs targeting islands, such as under FITs in France (e.g. Guadeloupe and Martinique), Greece, and the Cayman Islands. Lastly, there are an increasing number of countries such as Jamaica that are exploring the development of their own FIT policies. These examples represent a relatively new policy trend and it would be useful to examine how the lessons learned from these jurisdictions could be applied to other islands and areas that require energy access.

- *The compatibility of FITs and different power markets.* FITs are currently in place across a wide range of different electricity market structures. It would be useful to examine which FIT designs are currently in place in which market types and whether these designs are compatible or incompatible with the market structure. It would also be useful to explore how FITs interact with the broader electricity industry, including topics such as transmission planning or spinning reserve and capacity markets.

- *Rate setting in developing countries.* Although there has been research focusing on rate setting in developed countries, there has not yet been a focused effort to compile and compare the FIT rate setting methodologies, tools, and processes currently in use in developing countries (e.g., Abeygunawardana, 2012; Chatterjee, 2012). Such an effort could be useful to inform not only existing FIT policies but also to inform policy makers that are considering embarking on new rate setting proceedings.

Moving forward, UNEP and its partner organizations will continue to identify ways to build off of this report in ways that practically advance renewable energy in developing countries.

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