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Book

Renewable energy projects for sustainable development : financing options and policy alternatives

Centre for International
Governance Innovation

CIGI Papers No. 122 – March 2017

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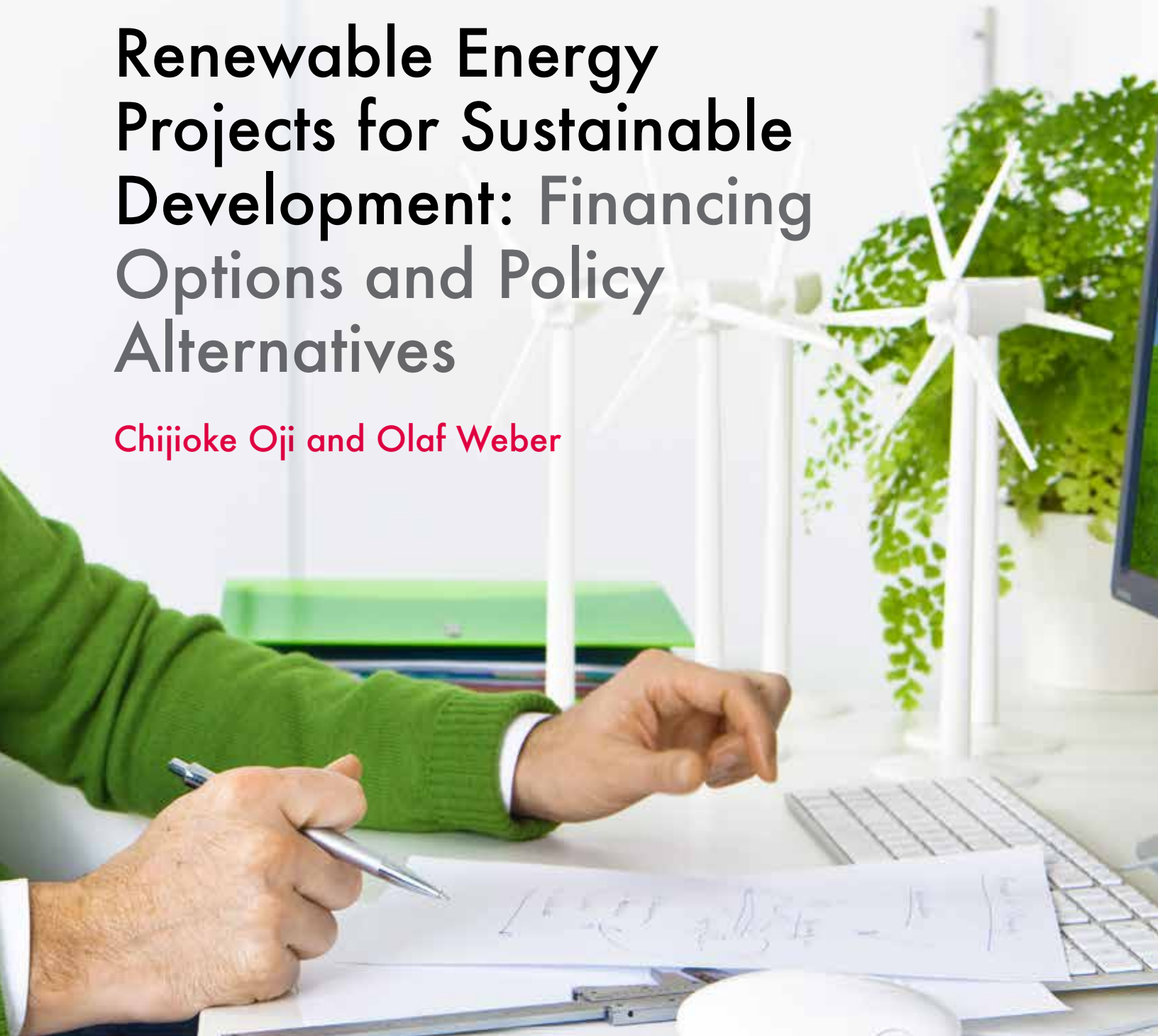

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About the Authors

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About the Global Economy Program

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With experts from academia, national agencies, international institutions and the private sector, the Global Economy Program supports research in the following areas: management of severe sovereign debt crises; central banking and international financial regulation; China's role in the global economy; governance and policies of the Bretton Woods institutions; the Group of Twenty; global, plurilateral and regional trade agreements; and financing sustainable development. Each year, the Global Economy Program hosts, co-hosts and participates in many events worldwide, working with trusted international partners, which allows the program to disseminate policy recommendations to an international audience of policy makers.

Through its research, collaboration and publications, the Global Economy Program informs decision makers, fosters dialogue and debate on policy-relevant ideas and strengthens multilateral responses to the most pressing international governance issues.

Acronyms and Abbreviations

Eskom	Eskom Holdings SOC Ltd.
FIT	feed-in tariff
GEAA	Green Energy Act Alliance
GHGs	greenhouse gases
IESO	Independent Electricity System Operator
IRENA	International Renewable Energy Agency
kW	kilowatts
IPPs	independent power producers
MaRS	Medicine and Related Sciences
MW	megawatts
MWh	megawatt-hour
OPA	Ontario Power Authority
PPAs	power purchase agreements
RECs	renewable energy certificates
REIPPPP	renewable energy independent power producer procurement program
REP	renewable energy project
RETs	renewable energy technologies
RO	renewables obligation
ROCs	renewables obligation certificates
RPS	renewable portfolio standard
SDGs	Sustainable Development Goals
SENER	Secretaria de Energia de Mexico
UNEPFI	United Nations Environment Programme Finance Initiative

Executive Summary

To further the dissemination of decentralized renewable energy in order to address climate change and access to energy in developing countries, finance is needed. This paper presents a summary of available options for financing renewable energy development and alternatives for policy implementation to support this process. Debt and equity financing options are highlighted and selected policy frameworks for promoting investment in renewable energy project (REP) development are discussed as well. Specifically, the paper uses case studies of renewable energy programs in three different countries to examine financing possibilities and policy options for governments developing renewable energy programs. The renewable energy programs investigated in this study are the feed-in tariff (FIT) program in Ontario, Canada, the clean energy auction program in Mexico and the renewable energy independent power producer procurement program (REIPPPP) in South Africa. While the three programs share a number of similarities, there are also some differences, in particular in the design of the renewable energy programs.

A comparative analysis of these renewable energy programs showed that all three programs were implemented to diversify the energy supply mix, while reducing greenhouse gases (GHGs), with an overarching objective of a transition to low-carbon energy systems as part of a broader agenda of fostering sustainable development through an increased supply of renewable energy. In essence, objectives for the renewable energy programs were aligned with national or provincial economic development plans, climate change policies and the major energy plans in the province or country. The study suggests that in establishing a renewable energy program, different renewable energy policies may attract investment. However, the design of the policy and the method of implementation are critical in attracting investment necessary for the success of a renewable energy program. In addition, the study finds that due to the risks associated with financing large-scale REPs, financiers mostly prefer to finance REPs using project finance as a means to alleviate investment risks while making reasonable returns on capital invested for project development. Finally, since most renewable energy programs focus on large-scale REPs to develop renewable energy programs, governments can learn from Ontario's microFIT program and incorporate small-scale REPs into their programs. These smaller REPs can make great contributions to GHG reduction while advancing the agenda for sustainable development in developing countries.

Introduction

Finance plays a critical role in the delivery of REPs that possess the capacity to impact socio-economic development positively, while contributing to reduce GHG emissions. Most REPs have high upfront costs associated with the procurement of equipment, feasibility studies, land purchase or lease agreements and multiple service contracts for developing a project. When a provincial, state or national policy for developing renewable energy is lacking, it is common practice for lenders to set interest rates on bank loans for REPs at prohibitively high levels, based on perceived risks associated with financing REPs in these situations (Nelson and Shrimali 2013). The provision of finance by lenders to cover capital costs allows for an increase in the development of REPs, raising the electricity generation capacity of countries and improving the electrification profiles of communities in the process, depending on the objectives for which an REP is established. An increase in guided development of REPs, through establishing policy frameworks that target grid-connected and off-grid REPs, can result in the formation of a renewable energy industry as a subsector of a nation's electricity sector.

Finance is essential for developing REPs and policy plays a critical role in influencing potential lenders' decision making as they seek to invest in REP development (Pierpont et al. 2011). Policies provide insights on the priorities of governments and present a clear indication of positions and paths chosen by the leadership. The methods and approaches through which governments seek to implement established renewable energy policies vary from state, province or nation, one to another. However, the success or failure of a renewable energy program largely depends on the method a government adopts to implement its core renewable energy policy, and on the government's capacity to attract finance

and expertise. In situations in which a policy vacuum exists and a framework for developing renewable energy is lacking, the perception of risks associated with financing REPs is higher. This bears on lenders' assessments of project risks with the possible result of reduced capital flows into countries and the stifling of potential growth in the local renewable energy sector.

With respect to REP development, typically, financing decisions are based on analyses of policy implications and the impact of the renewable energy policy on profitability. Based on the nature of the capital market, the policy environment and the specific characteristics of a project, financiers select the most appropriate financing models to reduce investment and project-related risks. Importantly, the design of a renewable energy policy in terms of incentives, clarity and longevity influences the financing process for REP development.

An Overview of Energy Markets

The rates of progress in policy making to attract finance for REP development and the consequent growth and maturation of local renewable energy sectors differ greatly among countries. This disparity is largely based on the dynamics of energy generation and supply within a country and the stated objectives of policy makers in government in relation to advancing agendas for national energy security. Based on the policy positions of presiding governments and the direction of growth chosen, implemented policy proposals for energy development influence the state of local energy markets and the economics of energy production. Therefore, differences in the growth rates of domestic renewable energy markets exist among developed and developing countries.

Some countries (developed and developing) have lagged behind other countries in the transition to a low-carbon energy system fuelled by renewable energy. Some scholars suggest that this low level of progress is due to the abundance of fossil fuels and the advancement of policy to support the generation of energy from traditionally reliable sources in fossil-fuel-resource-rich countries. Countries that have abundant resources such as crude oil and coal depend heavily on these resources, and their energy systems are built on energy generation from the locally abundant resources. While there is evidence that some progress is being made through FIT programs, renewable energy generation targets and GHG reduction targets in some of these fossil-fuel-resource-rich countries, the transition to green energy has proceeded slowly. Ultimately, a continued policy focus on developing power plants fuelled by the locally abundant resources to meet the needs of the local population impacts negatively on the agendas aimed at transitioning to renewable energy (Hamilton 2010).

The transition to renewable energy in most developed countries is based on agendas for reducing GHG emissions to mitigate climate change. For developing countries, agendas for adopting REPs and developing renewable energy markets exist because of the need to increase the capacity for electricity generation, diversify the national energy mix and increase access to modern energy across remote geographical settlements (United Nations Environment Programme Finance Initiative [UNEPFI] 2012). These objectives are prioritized differently across varying countries. Because many developing countries lack adequate electricity supply, these countries prioritize increasing electricity generation capacity using large-scale REPs. Large-scale REPs make an important contribution in lowering GHGs; however, this category of REPs does not address the challenge of increasing access to energy, especially for developing countries.

REP Financing and Capital Markets

Although reports suggest that financiers are becoming more familiar with REPs, financing of REPs is still slow in a number of countries. Financiers from developed and developing countries show varying levels of commitment with respect to financing REPs. In developed countries with sophisticated capital markets, debt and equity can be raised much more quickly than in developing countries with unsophisticated capital

markets. In addition to the strength of the capital market, policy frameworks that support investment in renewable energy help to lower financiers' perceptions of risk, enabling opportunities for lending in strong capital markets (Hamilton 2011). In essence, as with any other financial transaction, financiers intend to minimize risks and maximize profits when financing REPs. The perception of risk influences established financing models, and projects are evaluated by lenders based on their risk profiles. Thus, the capacity of a project to return profits, based on previously conducted financial analyses, and the results of internal project risk assessments and feasibility studies impact lenders' decisions regarding possible investment in REPs.

Typically, in countries with strong capital markets accompanied by clear policies to guide investment in renewable energy, lending for REP development accelerates over time, using a range of financing mechanisms based on the source of capital — debt or equity. Some of these mechanisms include project finance, senior debt, mezzanine finance, venture capital funds, private equity funds, infrastructure funds and bonds (Hussain 2013). In contrast, in developing countries, the lack of policy to support REP investment influences the risk profiles of REPs and the consequent perception of project risks from the financiers' perspective. Ultimately, these factors contribute to increase the cost of capital for REPs, raising the threshold for project acceptance by lenders. This contributes to the stifling of REP development. In addition, though debt is available, REPs compete with capital-intensive infrastructure projects for funding through lenders. This compounds the challenge of accessing finance for REPs in developing countries.

Financing Options and Policy Alternatives

A variety of options exist for financing REPs in both developed and developing countries. The prevalent approach for delivering REPs within a country is largely dependent on the government's policy for renewable energy development, but some options may be more viable than others. However, whether a country elects to oversee the financing of REPs through its development finance institution — as observed in Brazil through the national development bank, Banco Nacionale de Desenvolvimento Economico e Social (Förster and Amazo 2016) — or selects the market-based approach as the model for REP financing (Sahoo, Nelson and Goggins 2015), most financiers use project finance for financing REPs. Project finance is preferred by financiers based on the ability to limit risks while accessing opportunities for profit making in financing REPs (Justice 2009). Since transactions do not appear on the balance sheets of the financial institution and transactions are entered on a project-by-project basis, project finance is generally preferred by financial institutions when financing high-risk capital-intensive infrastructure projects. In addition, since the debt is repaid with revenue generated from the project, long-term power purchase agreements (PPAs) — for example, through long-term FITs — represent guarantees for revenue generation and financial returns. This provides a partial guarantee for financiers, influencing the risk profile of REPs on a case-by-case basis (Wiser and Pickle 1997).

REP developers may also access mezzanine finance as an option for raising capital to finance their projects. Mezzanine loans are usually issued for a shorter period and are more expensive for REP developers, but they provide higher returns for the lenders. Mezzanine loans carry more risk than senior debt, which is normally the first tranche of debt repayment made by REP developers to financiers. Senior debt is usually paid before the mezzanine loan in the REP financing cycle. Despite this, REP developers seek mezzanine loans when the loan provided by financiers is insufficient for the financing of the project as financiers typically cover only a portion of the capital requirement for the REP. Mezzanine loans carry less risk than equity financing in the capital repayment process, as mezzanine loans normally are repaid before equity contributions.

Because equity carries greater risk, it is common for project developers to access mezzanine finance as a less expensive means to raise funds for the REP while lowering the overall cost of capital. The financing of an REP is undertaken by a number of lenders with varying levels of contribution comprising the required pool of capital. The various sources of capital, reflecting the ratio between debt and equity, provides an indication of the capital structure of the REP. These project financing options are generally issued by banks

or other financial institutions to finance large-scale REPs with the potential to yield profits (Medicine and Related Sciences [MaRS] 2010). These financing options for REPs are more readily accessible in developed countries with mature capital markets. In the absence of a mature capital market, government grants, subsidies and credit emerge as basic options for financing REPs. Based on governments' limited financial resources, especially in developing countries, these financing options possess limited capacity to accelerate REP development and the growth of a local renewable energy industry (International Renewable Energy Agency [IRENA] 2012).

Policy alternatives for renewable energy development are selected by governments based on the potential to accelerate renewable energy development and provide financial incentives in terms of profitable returns to investors, while minimizing the overall cost to governments and citizens during the lifespan of the renewable energy policy. The renewable energy FIT is by far the most accepted policy option for spurring local renewable energy markets, based on the structure of the policy, specifically the existence of a PPA or FIT contract that is typically valid for 15 to 20 years. The PPA provides some form of guarantee that an REP would yield returns, serving as security for capital investment made, but other factors, such as the purchase price of renewable electricity, ease of access to the national grid and the legal certainty of the agreement also impact investment decisions for potential REP lenders and investors (Pembina Institute 2010).

Often, governments establish FIT programs to promote the development of local renewable energy markets by supporting various renewable energy technologies (RETs), providing differentiated costs for electricity generated from mature and less mature RETs. Hence, it is essential to create a fair tariff system that would ultimately yield a fair return on investment for investors. Although various methods are used to determine the tariffs for electricity generated from RETs, many countries have used the real cost of electricity to determine the price for electricity generated in the FIT program (Weibel 2011). Policy makers understand that at the core of the FIT program, for investors, financial incentive in terms of profit is necessary to trigger interest in investing capital in renewable energy development, particularly in early stages. Thus, the design of a FIT policy and the selected method for implementation are critical for the impact of the policy in contributing to the development or stimulation of the local renewable energy market. Canada (Ontario), Germany and Switzerland have all implemented FITs to encourage investment in renewable energy development.

In designing national renewable energy programs, some countries have opted to adopt other major policies to foster growth of their renewable energy markets. Some of these policies include the renewable energy auction or bidding process, renewable portfolio standard (RPS) (also known as renewable electricity standard) and renewables obligation (RO). In the renewable energy auction process, governments establish an amount of renewable electricity to be generated by independent power producers (IPPs) across various regions of the country. Electricity generation capacity is allocated to specific RETs and REP developers are invited to apply to generate selected amounts of electricity through a competitive bidding process (Lucas, Ferroukhi and Hawila 2013). In some cases, the energy regulatory commission and local ministry of energy establish a "base and cap" limit for electricity costs. This cost incorporates a premium on renewable electricity, providing REP developers and financiers a degree of flexibility to price electricity generated on their terms and estimate the amount of profit obtainable, according to their financial models. The government screens these bids using established criteria previously provided to potential IPPs. Often, criteria include the stated price for electricity generation, the location of the REP site and potential impact on local economic development.

In implementing the renewable electricity auction policy, a government essentially "shops" for the best projects that fit the government's established criteria and plans for developing its local renewable energy market, within its budgetary constraints. Again, as observed with other policies, the estimated price of electricity plays a significant role in attracting subscriptions to a country's renewable energy bidding program. The challenge for governments in triggering the interest needed to develop REPs is to provide some room for investors to make fair profits, while reducing overall expenditure on the program, which is associated with the cost of electricity. South Africa and Brazil are

two countries that have implemented renewable energy auction policies (Ferroukhi et al. 2015).

Popular in the United States, an RPS is a type of policy implemented by a state, provincial or national government to support a mandate to increase electricity generated from RETs. Scholars have suggested that having sufficient generation capacity for renewable electricity is critical for the success of an RPS, and that the policy is most successful when it is combined with a production tax credit (Wiser et al. 2016). In situations where the capacity to generate electricity from RETs is lacking, implementing an RPS can help trigger investment in RETs and advance electricity generation through the development of REPs. As with other renewable energy policies, the cost of electricity is critical for the success of an RPS. In designing an RPS, it is necessary to provide for investors making profit; however, consideration for electricity consumers is essential. Thus, balancing the estimated price of renewable electricity with objectives for impacting economic development through a local renewable energy market is necessary (Vinci et al. 2014).

In order to achieve success with an RPS, best practices for design and implementation should be considered. Some of these include establishing targets for renewable electricity generation along with a well-defined plan to increase generation systematically, considering longer periods for active implementation of the policy to allow for long-term financing, and incorporating the use of tradable renewable energy credits or renewable energy certificates (RECs) to increase renewable electricity production.

The RO is designed to support large-scale generation of electricity from RETs. With the RO, a government places an obligation on licensed electricity suppliers to obtain a portion of the electricity supplied from renewable energy sources. Electricity suppliers meet this obligation by either generating renewable electricity, if the capacity to do this exists within the firm, or by purchasing renewables obligations certificates (ROCs) from generators of renewable electricity (E.ON 2013). In the event that suppliers are unable to meet renewable electricity generation targets, electricity generators meet the RO by presenting the electricity regulator with ROCs to the total value of their obligation, which is the amount of expected renewable electricity generation as a portion of the annual total electricity generating capacity of the supplier. Suppliers of electricity may also use a buyout clause allowing for payment of a set amount per megawatt-hour (MWh) for shortfalls in obligation levels to meet their established targets, or they may use a combination of ROCs and the buyout option to meet the RO. The RO is the dominant renewable energy policy in the United Kingdom; it has been severely criticized for its complex design and the inability to reduce electricity generation using fossil fuels because electricity suppliers can go on with normal business and purchase ROCs from IPPs to meet the obligation levels. The UK government plans to replace the RO with a contract for difference in 2017 (Grimwood and Ares 2016).

Regardless of the policy selected, the strategy for implementation and the intricate design features of the policy are critical for the success of the policy in attracting investment and promoting renewable energy development through the growth of local renewable energy markets. The following section details short cases on renewable energy programs established in different countries. Among other issues, the section highlights the role of the government in renewable energy policy design and implementation, while examining the importance of a developed capital market in enabling financial investments in REP development.

The FIT Program in Ontario

Ontario is one of the most economically progressive provinces in Canada. As a province in a developed country, Ontario has an adequate supply of reliable and readily available electricity generated from fossil fuels. With the emission of GHGs and the increase of smog polluting the environment, the Ontario government, in 2009, set out to develop a program for encouraging electricity production through renewable energy sources. The province established the FIT program as a means of reducing the negative impacts of GHGs on the environment and of smog on human health (Ontario 2012). The FIT program was enabled by the Green Energy and Green Economy Act, 2009, based on Ontario's 2013 Long-Term Energy Plan, and was implemented by the Independent Electricity System Operator (IESO). According to the IESO, the program was started to facilitate an increase in the development

of renewable energy generating facilities of various technologies. In essence, the FIT program should accelerate renewable energy production through the growth of a local renewable energy market catering to the energy needs of the Ontario community. Under the FIT program, qualifying renewable energy sources include renewable biomass, biogas, solar photovoltaic, onshore and offshore wind power, water power and landfill gas (Ontario Power Authority [OPA] 2010).

In North America, the Ontario FIT program represents the first comprehensive guaranteed pricing structure for the production of renewable energy with established prices of electricity generated from RETs designed to cover the costs of projects, and provide reasonable returns on investment to REP financiers and developers. The program aims to encourage the production of renewable electricity across industry and residential communities by focusing on large-scale REPs in its FIT program and small-scale REPs in its microFIT program. The FIT program, which was developed for REPs with generating capacity over 10 kilowatts (kW) and that require higher capital investments, aims to encourage renewable energy production using large-scale REPs, while the microFIT program focuses on smaller REPs with generating capacity of less than 10 kW, mostly catering to homeowners interested in generating electricity using RETs (Green Energy Act Alliance [GEAA] and Shine Ontario 2011). Under the FIT program, REP developers apply to the IESO to develop REPs with electricity generating capacity greater than 10 kW, but less than or equal to 500 kW. The purpose of this design element in the FIT program was to increase the volume of projects and encourage broad participation of REP developers across the province (Cameron 2011). In designing the FIT program, the challenge for the government was to encourage wide participation by limiting the sizes of single projects, while balancing the financial viability of participating in the program for investors and REP developers. Successful applicants received contract offers from the IESO that guaranteed the purchase of electricity generated from the REP at a set price over a period of 20 years.

Under the microFIT program, launched in 2009, homeowners and other eligible participants applied to the IESO to develop small REPs on their properties and to supply electricity generated from renewable energy sources to the province's electricity grid. Successful applicants received a microFIT contract that guaranteed payment for electricity supplied to the province's electricity grid, over a period of 20 years. As with the FIT program, the guaranteed electricity price for participants in the microFIT program incorporated the cost of developing the REP and provided profits to homeowners over the 20-year period of the microFIT contract. The IESO offered 20-year contracts for solar, wind and bioenergy projects and 40-year contracts for water power projects (OPA 2011). In addition to the requirement of feasibility of the project, social criteria for REPs, such as involvement of a local renewable energy cooperative or involvement of First Nation communities in the projects, were also introduced by IESO.

The Ontario government plans to phase out the FIT program in 2018 and to replace the policy with a competitive bidding process. The program has been criticized for increasing the price for electricity, although this is controversial. On the other hand, renewable energy, such as wind and solar power, have become competitive in terms of energy costs, compared to many fossil fuels. Obviously, FIT programs, such as those in Ontario, Germany and Switzerland, require governments that are affluent enough to support the program financially. The question remains whether developing countries are able to afford such programs. With decreasing costs for renewable energy, however, FITs might not be needed any more.

The South African REIPPPP

In the most advanced economy in Africa, South Africa, energy-intensive industries such as mining, smelting, and pulp and paper production are significant contributors to the national economy. In 2007, however, the country suffered a major energy crisis during which the current supply of electricity was insufficient to power homes and industries. This led to frequent power cuts that had negative impacts on the national economy. With the stated electricity capacity at the time of 40,000 megawatts (MW), the electricity output was insufficient to provide reliable power. South African consumers and industrial sectors were

subjected to "load shedding," a process in which electricity supply was systematically rationed and geographical locations were provided with electricity within a specified time period (normally two hours) during the day. This meant that industrial sectors, specifically the mines, had to shut down temporarily (Futuregrowth 2016).

The South African government realized that Eskom Holdings SOC Ltd. (Eskom) — the state-owned electricity utility that operates as a monopoly in the electricity sector, generating over 90 percent of South Africa's electricity mostly through coal-fired plants — was unable to meet the electricity needs of the country alone. The situation was the result of the increasing demand for electricity and energy security, as stated in the government's Integrated Resource Plan, released in 2010, that set a target for new electricity generation capacity of 50,000 MW by 2030, with 17,800 MW of this capacity generated from renewable energy sources. This provided the rationale for embarking on an extensive program for generating electricity from renewable energy sources to increase energy security, stabilize the supply of electricity and diversify the country's energy mix (Macfarlanes 2015).

The policy a government selects to promote renewable energy influences investment flows and financing decisions, making the policy a critical component of a renewable energy program. In 2009, the South African government through the National Energy Regulator of South Africa selected a FIT as its policy for developing renewable energy in the country. Following debates about the cost to the government for implementing the program, the South African government reversed its decision to explore options for FIT designs, and replaced the FIT policy with the competitive bidding process as its policy for developing renewable energy in the country. Some investors suggested the change in policy direction reflected a lack of commitment to delivering a renewable energy program, concluding that this change in policy signalled a level of unpreparedness in government. In 2011, however, the government launched its REIPPPP, which uses the competitive bidding process, a modified price-tendering process in which electricity generation capacity was auctioned (Papapetrou 2014).

The REIPPPP was structured to take place over a period of three years (2011–2014), with four different bidding windows in which IPPs and REP developers applied to the Department of Energy to generate selected renewable electricity capacity and supply the off-taker, the state-owned electricity utility Eskom. Under the REIPPPP, the department mandated the procurement of 3,625 MW from a range of RETs including solar voltaic, wind, concentrated solar, biogas, biomass, small hydro and landfill gas power. As the program progressed, additional generation capacity was announced, and 3,100 MW and 1,500 MW of electricity was made available for procurement. By 2014, 64 projects generating 3,922 MW of renewable electricity had been awarded to the IPPs and REP developers in the private sector. By this time, a total investment of US$14 billion had been committed to the development of REPs to add capacity to the national grid (Eberhard, Kolker and Leigland 2014). In early 2016, a total of 6,400 MW from 102 IPPs had been procured by the department from the four bid windows and the small renewable energy program. By late 2016, all projects from the first and second bidding windows had been connected and were delivering electricity to the national grid (Mangondo 2016).

The design of the REIPPPP showed that the South African government relied strongly on non-price factors in the bid evaluation process. Referred to as economic development requirements and accounting for 30 percent of the total bid value, these factors were designed to encourage bidders to promote domestic industrialization, job growth, community development and black economic empowerment. Some of these requirements, such as ownership and job growth, can be quantified and consequently assessed. However, in this situation, factors such as community development are difficult to quantify as the REIPPPP had no standard indicators to measure these, undermining the objective importance of these requirements. Additionally, since conditions with respect to community development differ from one project site to another, a level of complexity emerges from this process, making it problematic for the government to receive accurate established quarterly monitoring and evaluation reports from REP developers regarding progress on the economic development requirement.

Clean Energy Auction Program in Mexico

According to the International Monetary Fund, Mexico was the fifteenth-largest economy in the world in 2015 and will become the fifth-largest economy by 2050. Meeting the projected growth rate requires an expansion of energy supply in order to cater to growing economic sectors. In 2015, Mexico's energy generation mix was comprised of nuclear (three percent), renewables (three percent), hydro (12 percent), coal (13 percent), oil derivatives (20 percent) and natural gas (49 percent). Mexico embarked on a process to transform its energy sector due to slow GDP growth and a steady drop in the production of oil over the last decade. The energy reformation process resulted in the establishment of Mexico's energy transition law and the formation of an energy ministry and other institutions responsible for the management of the electricity sector in the country. In addition, policy proposals for energy transformation specified clean energy and energy efficiency goals as targets in the electricity reform process aimed at cutting GHG emissions and boosting economic growth.

Mexico's 2014 Energy Reform Act outlined the country's commitment to diversifying its energy mix and transforming its electricity sector from one dominated by energy plants supplying electricity generated from fossil fuels to one producing low-carbon electricity for distribution across the country. Prior to this, the 2012 General Law of Climate Change established a goal for the supply of clean energy, setting a target of 35 percent of electricity supplied in the country to be derived from clean energy sources by 2024. Estimates had shown that local electricity producers in Mexico did not have the capacity to meet this target. Hence, the government established a clean energy auction program to attract private investment into clean energy projects in order to meet its clean energy goals within the set time frame.

In order to achieve its target for clean energy supply, the government set milestones as yearly targets to advance its clean energy procurement agenda. The government decreed that electricity producers generating power from non-clean energy sources purchase tradable clean energy certificates from firms producing clean energy. Essentially, for clean energy producers, one clean energy certificate is to be issued per one MWh of clean electricity generated. For 2018, Secretaria de Energia de Mexico (SENER), the Mexican ministry of energy, set the minimum clean energy certificate purchase for each non-clean energy producer at five percent of the total energy produced by the individual utility. For 2019, SENER establishes that each non-clean energy producer will purchase clean energy certificates amounting to 5.8 percent of total energy it produces in that year (Valera et al. 2016).

In Mexico's clean energy auction program, bidders, which typically were local or foreign IPPs or project developers, were required to submit bids to supply clean energy generated from different clean energy technologies. In 2016, Mexico had two clean energy auctions and auctions were open to competition from wind, solar photovoltaic, cogeneration, geothermal and large hydro. Winning bids were offered 15-year PPAs with the state-owned electricity utility, Comision Federal de Energia. In the first auction, electricity generation capacity of 1,860 MW was awarded to clean energy IPPs. The results of the first auction showed that 74 percent of the awarded electricity generation capacity went to solar energy REPs and 26 percent to wind energy producers. In the second auction, wind and solar energy producers were awarded 1,038 MW and 1,853 MW of electricity generation capacity, respectively (Roy and Briones 2016).

While establishing the clean energy auction in Mexico is commendable, the clean energy certificates, similar to RECs in the United States and ROCs in the United Kingdom, seem not to be designed specifically to discourage production of electricity using traditional fossil fuels. This is because electricity producers and consumers are provided with an open market on which clean energy certificates are traded. Hence, electricity consumers and producers can carry on with their business as usual, purchasing clean energy certificates on the open market to meet their required clean electricity obligations. Stimulating a market shift toward clean energy generated from RETs using this policy approach may result in challenges in achieving climate objectives for GHG reduction within the time frame a country establishes as its target.

Policy Structures and Design Features

In addition to the general political and economic climate of a country, the structure and design of renewable energy policies are critical to the success of renewable energy programs. Despite the call for countries to transition to low-carbon economies, financiers who invest capital in REPs seek to make reasonable profits on invested capital as REPs compete with several infrastructure projects also requiring financial investment. In essence, policy makers have to structure policy frameworks to address environmental and socio-economic challenges, incorporating features that influence the design of renewable energy policy proposals to attract investments for developing a local renewable energy market, while catering to the financiers' needs to make profits on capital invested. Policy proposals for renewable energy development may differ from one country to another, but elements such as the price of electricity offered, tenure of the PPA, ease of access to the national grid, operational stability of the off-taker and a clear linkage of policy proposals to targets for renewable electricity production and GHG reduction, establishing long-term commitment to increasing renewable energy production stemming from national energy development plans, are critical policy design features. These features contribute to the attraction of financial interest and possible investment in REP development.[1]

The primary rationales for developing renewable energy programs — diversifying the energy mix, reducing GHG emissions and pursuing an agenda for sustainable development, using renewable energy development as a pathway — were mostly consistent among the three countries highlighted in this paper. However, the selected approaches for designing and implementing policies to promote renewable energy programs differed among the countries. Additionally, based on established criteria for success, the structure and design of the various renewable energy programs can influence the fair participation in the program and capacity of REP developers to raise finance, specifically through community involvement, to fund capital costs of REPs. The overall design of Canada's renewable energy program encouraged participation of small and large-scale REPs. Because the microFIT program was specifically designed to address GHG emissions at household levels, it provided citizens with the option to participate in the Ontario government's agenda to increase production of renewable electricity; citizen engagement can help to accelerate movement toward low-carbon energy systems. In addressing the possibility of increasing large-scale production of renewable electricity, the FIT program focused on encouraging participation of large REP developers across communities in the province.

In contrast, South Africa's REIPPPP and Mexico's clean energy auction program focused primarily on encouraging the production of renewable electricity from large-scale REPs, excluding the production of electricity from small-scale REPs that have an equally high potential to reduce GHGs and contribute toward achieving objectives for sustainable development if programs are properly implemented. Although South Africa made provision for smaller REPs, qualifying projects had to bid for generating capacity of between one and 10 MW, which excluded homeowners and small businesses. In comparison to small-scale REPs, these projects required a large amount of capital for implementation. Moreover, especially in developed countries and in the urban areas of developing countries, financing for small-scale REPs is more attainable, less expensive and less complicated than for large-scale REPs. Although large-scale REPs are critical for a country's transition to renewable energy, small-scale REPs can play an important role in transforming electricity supply at the community level. Therefore, it is important that countries seeking to develop renewable energy programs incorporate small-scale REPs as complementary programs in renewable energy development frameworks to accelerate transitions to low-carbon economies.

In terms of the program design features, the renewable energy programs of all three countries adopted the standard approach, offering long-term PPAs accompanied by implementation agreements, or a variant of this with the respective governments backed by agreements with the off-taker and a reasonable price on electricity generated from RETs to encourage investment. Additionally, the renewable energy programs of Canada, Mexico and South Africa adopted multiple bid windows

1 This may be different for ROs and RPSs that use other mechanisms, such as certificates.

to create multiple bid opportunities for interested REP developers. This also provided the governments with opportunities to learn from previous bids, in order to adapt subsequent bids to address the core objectives of the renewable energy program. In addition, South Africa and Mexico's renewable energy programs used capped MW allocations to ensure effective competition among bidders in the different bid windows. The South African REIPPPP also adopted a two-step screening process in which bidders were screened against multiple criteria relating to the government's objectives for the renewable energy program. These criteria included impact on economic development, job creation, potential for GHG displacement and the ownership structure of projects. The projects eventually chosen were selected from a group of qualifying projects referred to as the preferred bidders list.

With respect to financing, the financing option of choice for large-scale REPs in the renewable energy programs of Canada, Mexico and South Africa was project finance. Large-scale REP developers typically obtained 70 percent of their financing through debt in the form of project finance from large banks. These REP developers also provided 30 percent equity for their REPs, financed through venture capital funds, infrastructure funds, pension funds, development banks and multilateral financial institutions as sources of capital. One financing feature unique to the Ontario FIT program was the development and sale of renewable energy bonds by renewable energy cooperatives, mostly for larger solar and wind REPs. Through their offering statements that outlined the capital requirements for a project (or portfolio of projects), REP developers invited the public to invest in their projects by raising bond sales. In some cases, REP developers were able to make their bonds eligible for the Ontario retirement savings plan, and, essentially, potential bondholders viewed these types of bonds as an investment for retirement. For a project to become eligible to raise capital from the public, an offering statement had to be approved by the Financial Services Commission of Ontario.

A Path to Sustainable Development

Largely, countries establish renewable energy programs as a means of catering to the energy needs of their economies while reducing their GHG emissions. The growth of low-carbon economies can make vast contributions to the global effort to mitigate climate change and preserve the integrity of the environment while economies function at optimal levels using electricity supplied from RETs. Electricity is critical for development in any society, and for a transition to a low-carbon energy economy. As observed in the cases highlighted in this paper, large-scale REPs play an important role in addressing national energy transitions from non-clean energy sources to renewable electricity. On the other hand, while large-scale REPs contribute to fulfilling the objectives of diversifying a country's energy mix, increasing the available generated capacity to expand electricity supply and reducing the GHG emissions of a country over time, they do not necessarily address the challenge of energy access, particularly in developing countries.

Especially in the rural areas of developing countries, financing small-scale REPs that have a greater capacity to fulfill objectives for sustainable development is highly challenging. This is due to unique characteristics of rural populations in developing countries, among which are the low capacity to afford modern electricity and the low, irregular income of rural dwellers. These factors, in combination with the cost of RETs and capital, contribute to the erosion of the perception of value in financing small-scale REPs located in remote communities. Electricity is crucial for development and rural electrification programs have been largely unsuccessful in addressing electrification problems in rural areas, compounding the challenges associated with achieving the UN Sustainable Development Goals (SDGs), particularly SDG 7: "Ensure access to affordable, reliable, sustainable and modern energy for all" (United Nations, n.d.). Hence, for SDG 7 to be achieved within the stipulated time, renewable energy policy frameworks should incorporate small-scale renewable energy production, using standard policy approaches for renewable energy procurement, which can be adapted to address conditions in rural communities. Designing and implementing small or mini IPP programs for

stand-alone green mini grids that create value for financiers while providing electricity to citizens might be a step in the right direction.

Conclusion

Energy is a critical resource for development. When linked to economic activity, energy spurs economic development within countries. In the quest to fulfill the objectives of sustainable development, countries establish renewable energy programs to advance the transition to low-carbon economies, while also aiming to diversify the national energy mix. This paper examined renewable energy programs in Canada, Mexico and South Africa, analyzing the policy frameworks and financing options available to most REP developers in these countries. The renewable energy programs in these countries had a number of similarities as well as differences in terms of the program structure and design features that potential financiers evaluate in making their investment decisions. More than any specific policy, among other factors, the design of a renewable energy program contributes to the determination of the level of interest from financiers and the consequent amount of capital the program may attract. In the same vein, the implementation of a renewable energy program has great impact on investor confidence, which is essential for making capital investments.

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