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Best Practices for Implementing a Feed-in Tariff Program

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The Los Angeles Business Council (LABC) is renowned for its effective advocacy and educational programs throughout the region, and is a vital representative of business leaders from all industry sectors. The LABC provides its members with strong conduits to local, state, and federal officials through targeted policy recommendations and key issue briefings, and annually hosts the influential Mayoral Housing, Education and Sustainability Summits and Los Angeles Architectural Awards luncheon. The LABC targets three key issue areas that are integral to Los Angeles' economic competitiveness and way of life: Sustainable Development, Workforce Housing, and Education and Business Development.

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Electronic copies

An electronic copy of the report is available at http://luskin.ucla.edu/solar.

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1. Executive Summary

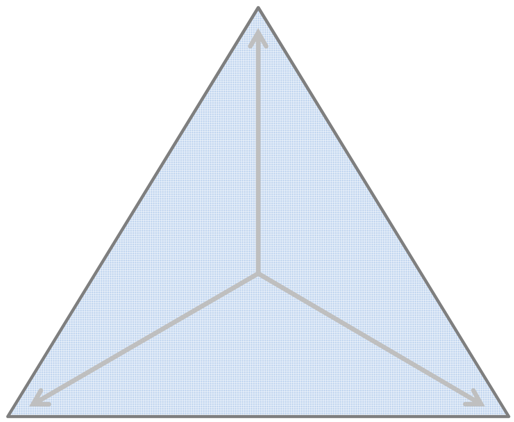
Over the last decade, feed-in tariffs (FiTs) have become increasingly important drivers of renewable energy growth in other parts of the world and are now gaining traction in North America. In 2005, about 32 countries, and 5 states or provinces, had adopted FiT policies.[1] By 2010, at least 50 countries worldwide, and 25 states and provinces, had FiT policies.[2] There are many types of programs that can facilitate the development of renewable energy. A FiT is one such type of policy mechanism. These programs, if well-designed and implemented, can quickly and efficiently facilitate widespread renewable energy development. Up to 2008, FiTs were responsible for 75% of worldwide installed solar photovoltaic (PV) capacity.[3]

There is no direct precedent in the U.S. for a comprehensive solar FiT, such as that proposed by the Los Angeles Business Council (LABC). The LABC is proposing a 600 MW FiT for Los Angeles, and it would be the largest cost-based FiT in the U.S. with capacity coming exclusively from distributed, in-basin solar PV. The unique characteristics of Los Angeles, and its vast in-basin solar resources, present implementation challenges, but also create opportunities for rapid renewable energy development, lasting economic growth, and regional leadership. Los Angeles can learn from other examples of FiT program implementation in North America. The policy objectives chosen by the City's leaders will ultimately determine the most appropriate program structure.

FiTs are special programs that procure energy and power, but also contribute to objectives, such as cost-effective renewable energy development, inclusiveness, and economic development. Every project and program configuration contributes uniquely to these goals. The design decisions of policymakers and program administrators affect not only the structure of a program, but also its ability to achieve any related goals. Every implementation decision is a balancing act of competing interests. Every decision will require a tradeoff in achieving objectives, and policymakers must therefore establish clear priorities. Since policy priorities will vary from jurisdiction to jurisdiction, so will FiT design. Every program must be tailored to the specific location, and cannot simply be copied. The design decisions discussed in this report are the policymaker's most important tools to develop a locally-tailored and effective FiT

[1] Renewable Energy Policy Network for the 21st Century. (2005). A *Global Status Report*. p. 5. Accessed September 22, 2010 from <http://www.ren21.net/Portals/97/documents/GSR/RE2005_Global_Status_Report.pdf>.
[2] Renewable Energy Policy Network for the 21st Century. (2010). *A Global Status Report*. p. 11. Accessed September 22, 2010 from <http://www.ren21.net/REN21Activities/Publications/GlobalStatusReport/tabid/5434/Default.aspx>.
[3] Deutsche Bank Group. *Global Energy Transfer Feed-in Tariffs for Developing Countries*. p. 6. Accessed November 20, 2010 from < http://www.dbcca.com/dbcca/EN/_media/GET_FiT_Program.pdf>.

Figure 1 Categories of Non-Energy FiT Objectives



Policy Objective: Cost-Effectiveness

Decisions affecting the cost-effectiveness of a FiT program are the total program cap, capacity allocation, allocation of utility-side network upgrade costs, and allocation of participant risk through specific contractual features. The total program cap is the most direct way to limit the economic risk borne by utility ratepayers, and a program with a total cap can be budgeted with relative certainty. Policymakers can target specific types of participation that influence cost-effectiveness. Allocation of network upgrade costs to participants will minimize ratepayer costs, but shift both cost and uncertainty to participants. In a dense urban center, addressing these challenges in the most efficient way will greatly reduce overall program cost. Finally, as more risk is shifted to the participant through contractual features, the cost to finance a long-term project will increase. Eventually, these costs will be passed to ratepayers. Appropriate balancing of risk between participants and sponsors is in the best interests of not only the participant, but also ratepayers.

Policy Objective: Inclusiveness

Inclusiveness and the ability to encourage diverse participation in terms of tax status, project size, or class of participant, is dependent upon the allocation of capacity, project selection criteria, participant pre-qualifications, and any fees, deposits, or other participant application requirements. Capacity allocation broadly affects cost and participation, so if inclusiveness is a priority, it must be planned into the program at this stage. If total capacity is limited, the establishment of project selection criteria can be structured to more efficiently meet program goals than "first-come, first-served" or lottery schemes. Inclusiveness criteria can ensure broad participation, supply diversity, and support local market development along the value chain. Pre-qualifications define who can submit an application, and any application fees or deposits can affect participation by increasing the initial commitment of the participant.

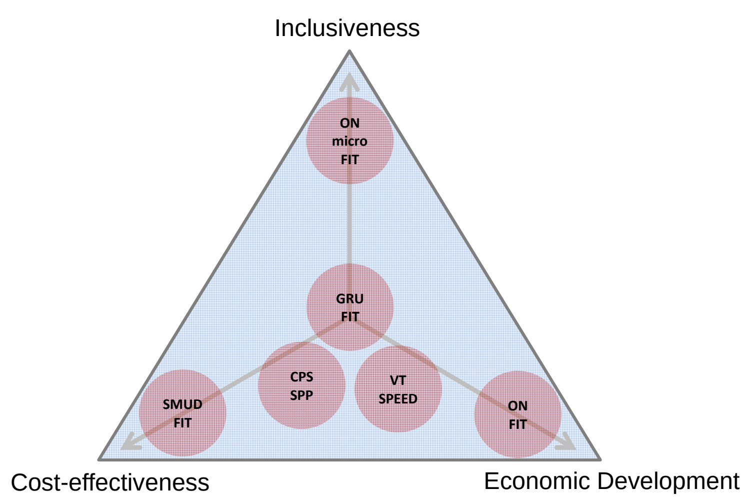
Policy Objective: Economic Development

Economic development is primarily related to capacity allocation, total program cap, and any provisions for specific labor practices or local content. Allocating capacity over time creates a steady, predictable pipeline of new renewable energy development. Compared to a large, one-time procurement, a long-term program encourages sustained attention from the renewable energy industry, which is constantly reassessing the global market, shifting resources, and making long-term investment decisions to maximize value. The positive economic benefits of a program will increase as the total program cap increases. Without mandates for local content or labor practices, there is no guarantee of economic development in the upstream value chain. Any FiT program can create downstream development related to the construction and operation of projects. A long-term program and local provisions are the most direct tools available to decision makers to capture benefits in other areas of the value chain.

Evaluating Success

The programs examined in this study are examples of the diversity of the FiT mechanism, and how it can be designed to achieve non-energy objectives. With respect to the three categorical objectives, the programs can be described in accordance with Figure 2. The Sacramento program was intended to maintain ratepayer neutrality, and economic development and inclusiveness were not objectives. The program accomplished its single objective by paying a low tariff, streamlining the contracting process, identifying the least-cost points of interconnection, and allocating capacity to professional developers of utility-scale solar who were willing and able to accept significant development risk. The one-time application process was designed to minimize Sacramento's transaction costs, and the contract transferred risk to the developer. Sacramento's program achieved no significant economic development for Sacramento. It did not present meaningful opportunities for residents, small businesses, or non-commercial entities to participate. If the projects enter commercial operation under the terms of the FiT, the program will have achieved its single goal of procuring solar without significant ratepayer impact

Figure 2 FiT Case Studies and Non-Energy Policy Objectives



Ontario's FIT has two separate ways to participate, and each is effectively a unique program. The microFIT was designed to provide a venue for residential utility customers to participate in the FIT authorized by the Green Energy Act. This program maximized inclusiveness by making it easy for non-commercial producers to participate. The microFIT contract is very simple, as there are no application fees, and participants can transfer the contract (to another eligible participant) after the project is in operation. While there are many participants in the microFIT, the total capacity participation is low relative to the FIT program. Because each program is subject to domestic content requirements, Ontario will benefit from manufacturing investment and employment (at least while the program is in place). The majority of jobs created will be to service the equipment for the larger FIT projects. The programs differentiate tariffs by size and category of participation, increasing the average cost of energy relative to the most cost-effective technologies and larger projects. Also, the total ratepayer impact is more uncertain since the total capacity is not capped. Ontario designed its FIT and microFIT programs to meet the dual goals of inclusiveness and economic development. The other FiT programs studied in this report are in San Antonio (Texas), Gainesville (Florida), and Vermont (see Figure 2).

Implementation of a FiT presents new challenges to the City of Los Angeles. It adapts the power procurement process to accommodate the specific needs of diverse renewable energy producers. It transforms an otherwise low volume, resource-intensive process into a high volume, streamlined process. It balances risk and cost between the buyer and seller in a different way than traditional procurement. Lastly, it may create cyclical workflow that must be anticipated in order to minimize administrative bottlenecks.

2. Introduction

Over the last decade, feed-in tariffs (FiTs) have become increasingly important drivers of renewable energy growth in other parts of the world and are now gaining traction in North America. In 2005, about 32 countries and 5 states or provinces had adopted FiT policies.[4] By 2010, at least 50 countries worldwide and 25 states and provinces had FiT policies.[5] There are many types of programs that can facilitate the development of renewable energy. A FiT is one such type of policy mechanism. These programs, if well-designed and implemented, can quickly and efficiently facilitate widespread renewable energy development. Up to 2008, FiTs were responsible for 75% of worldwide installed solar photovoltaic (PV) capacity.[6]

To be categorized as a FiT, a program must facilitate development by lowering barriers to entry to the wholesale electricity supply market by creating price certainty, simplifying the procurement process, and expanding access to the distribution network. Lowering barriers to entry allows for a more diverse set of market players than can participate in the energy production business, unlocking the supply potential of distributed renewable energy and facilitating its development. However, achieving regional policy objectives through the implementation of an effective FiT entails a deliberate balancing of the tradeoffs embedded in the design alternatives available to policymakers.

There is no direct precedent in the U.S. for a comprehensive solar FiT, such as that proposed by the Los Angeles Business Council (LABC). The other programs in this country were either geographically dispersed, implemented for a short time, targeted a small amount of total capacity, or incorporated other renewable technologies. The LABC is proposing a 600 MW FiT for Los Angeles, and it would be the largest cost-based FiT in the U.S. with capacity coming exclusively from distributed, in-basin solar PV. The unique characteristics of Los Angeles, and its vast in-basin solar resources, present implementation challenges, but also create opportunities for rapid renewable energy development, lasting economic growth, and regional leadership. Los Angeles can learn from other examples of FiT program implementation in North America. The policy objectives chosen by the City's leaders will ultimately determine the most appropriate program structure.

2.1 A Changing Energy Paradigm

FiTs are fundamentally different from conventional energy procurement processes, and their design and implementation present important and challenging issues. First, FiTs lower barriers to entry to wholesale power production. The traditional model of a vertically-integrated, regulated monopoly utility does not allow for private participation in the wholesale electricity market. With the passing of the Public Utility Regulatory Policies Act of 1978 (PURPA), utilities increasingly purchased power from

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[4] Renewable Energy Policy Network for the 21st Century. (2005). A *Global Status Report*. p. 5. Accessed September 22, 2010 from <http://www.ren21.net/Portals/97/documents/GSR/RE2005_Global_Status_Report.pdf>.

[5] Renewable Energy Policy Network for the 21st Century. (2010). *A Global Status Report*. p. 11. Accessed September 22, 2010 from <http://www.ren21.net/REN21Activities/Publications/GlobalStatusReport/tabid/5434/Default.aspx>.

[6] Deutsche Bank Group. *Global Energy Transfer Feed-in Tariffs for Developing Countries*. p. 6. Accessed November 20, 2010 from < http://www.dbcca.com/dbcca/EN/_media/GET_FiT_Program.pdf>.

private independent power producers (IPPs). These specialized commercial entities build, own, and operate power plants, selling the output to utilities at wholesale rates under long-term contracts. Due to the complex regulatory environment, technical nature of electricity, capital intensity of new development, and economies of scale, wholesale power production has traditionally presented significant barriers for small producers or new market entrants. FiTs allow more diverse market participation by creating a process in which small or non-commercial producers are not automatically disadvantaged relative to larger, or more well-established commercial producers.

Second, by lowering barriers to entry, FiTs diversify the generation resource base to small renewable producers, thereby necessitating the procedural and technical integration of a separate class of generation facilities with more diverse attributes.[7] Utility-scale generation for wholesale power supply primarily consists of centralized, remote facilities. Much of the supply potential of renewable resources is distributed among small sites, and throughout urbanized areas. FiTs have been used around the world to facilitate renewable projects of all sizes, but the focus in North America has been on smaller, distributed projects. In some instances, FiTs are the only policy tool that can create access to the existing distributed supply potential. Because a FiT lowers barriers to entry, small producers and non-commercial producers are able to participate. The emergence of this new market requires two parallel, but competing, activities: (1) streamlining the costly and lengthy energy procurement process to accommodate the unique needs of small and non-commercial producers, while (2) ensuring network integrity and reliability.

Third, FiTs shift the focus of energy market interventions from quantity (under renewable portfolio standards mandates) to price. Improving price certainty for small producers is one important aspect of reducing risk, but the higher rate offered to FiT participants will likely result in higher charges to utility ratepayers in the short-term. Long-term, fixed-price renewable FiT contracts are in investment in climate and energy security, a hedge against fossil fuel price volatility, and a mechanism to spur economic development. The quantifiable short-term impacts must be weighed against uncertain long-term benefits. But to make an informed tradeoff between these outcomes, policymakers must explicitly value the positive and negative externalities of both FiT generation and its alternatives.

FiTs intentionally allow greater participation in the energy supply market by providing price certainty, simplifying the contracting process, and allowing access to the grid for smaller producers. Each of these aspects of FiT implementation represents a paradigm shift for IPPs, utilities, policymakers, and regulators.

2.2 Embedded Tradeoffs in Implementation

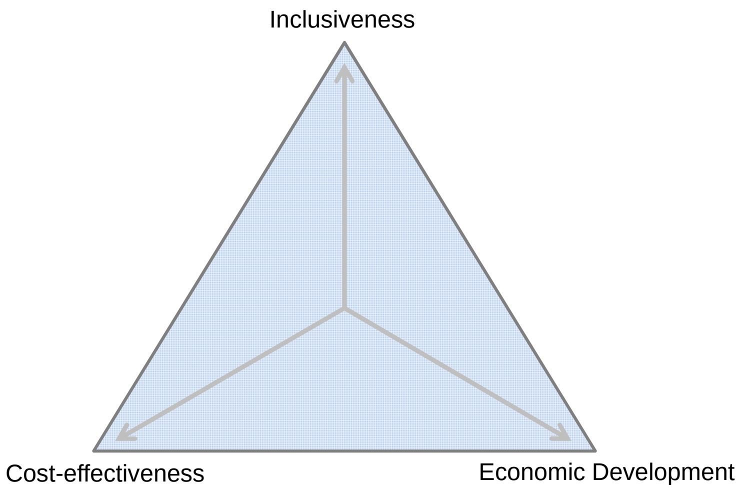
FiTs are fundamentally a power procurement program, designed to increase the penetration of renewables in the energy mix, but they often have multidimensional objectives related to non-energy objectives. The stated objectives of existing programs can be grouped into three general categories: inclusiveness, cost-effectiveness, and economic development. Inclusiveness is the degree to which the program facilitates participation from diverse market segments, primarily small and non-commercial producers. It also relates to the diversification of the electricity supply with respect to

[7] Logan, D., Neil C., & Taylor, A., (1995) *Modeling Renewable Energy Resources in Integrated Resource Planning*, p. 2-2.

geography, technology, project size, or other factors. Cost-effectiveness relates to the net economic impact of the program relative to its feasible alternatives over an appropriate investment time horizon. Most FiT programs procure renewables through ratepayer charges, so cost-effectiveness is directly expressed as ratepayer impact. Economic development is the ability of the program to create localized direct, indirect, and induced economic benefits, including employment, increased regional output, growth of the industrial base, and positive fiscal impacts. Each program places a different value on each of these three categorical objectives. The specific prioritization of each of these objectives is the responsibility of high-level policymakers.

Any program can be designed to maximize one of these dimensions, but the achievement of more than one of these objectives, to any degree, will require a tradeoff. For example, a program offering long-term, differentiated cost-based tariffs to small and medium-sized producers of various technologies will have more pronounced rate impacts than one only offering a single, lower value-based tariff only attracting large, commercial participants. In this hypothetical example, the value-based program minimizes ratepayer impact, but would not likely facilitate inclusiveness or spur significant economic development. Two FiTs stimulating equal amounts of renewable energy development may have very different economic development, inclusiveness, and cost-effectiveness impacts depending on the overall program structure.

Figure 3 Categories of Non-Energy FiT Objectives



These tradeoffs exist because of the significant differences in direct costs between energy resources (e.g., solar, wind, geothermal, etc.). Any comparison between resources must account for the total package of positive and negative externalities associated with different energy resources - even between projects of the same technology.[8] Policymakers are tasked with structuring FiT programs to capture the desired positive externalities of renewable energy sources, reduce the negative externalities of fossil fuels, and minimize the direct program costs.

[8] Externalities are benefits (i.e., positive externalities) or costs (i.e., negative externalities) that parties external to a transaction do not pay, or receive payment, for. For example, the environmental impacts of fossil fuel extraction and refining, such as air pollution, are an example of negative externalities; air pollution negatively affects human health, but this cost is not embedded in the fuel's price.

There is not a single, replicable model appropriate for every jurisdiction. Instead, FiT programs are flexible and scalable, and capable of being adapted to contribute to several different types of goals and policy objectives. The diversity of program types and design choices is well documented in recent research. Policymakers have an array of tools from which to structure their FiT, but their design choices are not arbitrary, and must follow from policy objectives.[9] Program success cannot be judged against other existing FiT programs. Instead, it must be measured against the achievement of a jurisdiction's specific policy goals.

2.3 Purpose, Scope, Methodology, and Organization

The purpose of this report is to explore the implementation of North American FiT programs and identify and describe the tradeoffs introduced by design choices. This report does not recommend policy objectives, but instead describes how different design decisions will affect common policy objectives. The information used in this report was gathered over the course of one year through review of FiT publications, compiling program documentation, interviewing participants and administrators in existing programs, and engaging stakeholders in Los Angeles.

This report focuses on five jurisdictions in North America that have implemented FiT programs: Ontario, Canada; Sacramento, California; Gainesville, Florida; San Antonio, Texas; and the State of Vermont. These examples are not an exhaustive list of existing FiTs in North America, but were chosen to highlight the salient tradeoffs that every policy decision must balance. While there are numerous decisions to be made by policymakers and administrators, this report is focused on several key categories of decisions: administration, application and program rules, contractual features, and interconnection.

[9] Couture, T.,Cory, K., Kreycik, C., Williams, E., (2010). *A Policymaker's Guide to Feed-in Tariff Policy Design*. p. 1.

Table 1 Summary Characteristics of Comparison North American FiT Programs

Jurisdiction	Total Capacity	Technologies	Program Term	Categories
Gainesville Regional Utilities FIT	32 MW	Solar PV; ground mounted and rooftop	4 MW per year for 8 years	Residential and commercial
Vermont SPEED	50 MW	Solar PV, Wind, Farm Methane, Landfill Gas, Biomass, Hydro	One-time procurement	One
San Antonio CPS Energy Solartricity Producer's Program	10 MW	Solar PV; rooftop	First year pilot program of 5 MW	One
Sacramento Municipal Utility District	100 MW	Solar PV	One time procurement	Two pools: 33 MW compliant with SB 32; 66 MW FIT
Ontario microFIT	Uncapped	Solar PV; ground mounted and rooftop, Wind	Indefinite	Multiple
Ontario FIT	Uncapped	Solar PV, Wind, Landfill Gas, Waterpower, Biogas,	Indefinite	Multiple

Each section revolves around a related set of decisions that a program administrator must make. The various options for design choices are explained and the tradeoffs associated with each are explored.

3. Administration

Administration of the program relates to the strategic decisions that translate the statutory or executive authority into a high-level structure that accomplishes the program's objectives. The purpose of these decisions is to create the overall program framework, allocate resources, and help ensure the program rules are aligned with its objectives.

Key Administration Decisions:

- Host Organization
- Total Capacity
- Capacity Allocation
- Program Adjustment

If the overall program structure is not matched with its goals, then all other implementation decisions will be rendered ineffective for achieving those goals.

3.1 Organizational Sponsorship

Deciding what type of organization should be responsible for administering a FiT program is important. In the U.S., FiTs have been justified as economic development tools and renewable energy programs, but they have been administered more like conventional power procurement programs. The traditional role of electric utilities is to procure reliable and cost-effective energy, but they normally do not take a leading role in regional economic development initiatives. The energy component is a FiT program's central aspect, but the social and environmental benefits are also among the stated objectives.

In the programs selected for this study, each municipal program is sponsored within the local utility, while the provincial and state programs are sponsored within separate organizations. In the municipal programs (i.e., Sacramento, Gainesville, and San Antonio), the entire program is administered by the utility, including applications, interconnection, contract administration, and production payments. Due to the need to serve multiple utility territories, the provincial and state programs are not administered at the local level. Vermont's Sustainably Priced Energy Development Program (SPEED) is sponsored by an independent purchasing agent, Vermont Electric Power Producers, Inc. (VEPP Inc.), which is authorized by the Vermont Public Service Board.[10] VEPP Inc. acts as a contractual intermediary between renewable producers and local utilities in Vermont. VEPP contracts with producers who sell electricity to VEPP. The electricity is then resold to local utilities. In Ontario, the FIT and microFIT programs are sponsored by the Ontario Power Authority (OPA), a provincial agency authorized to conduct long-term planning and power procurement.[11] While the contracts are originated and executed within the OPA, the local utilities maintain the original retail billing relationship and accept the new production payment relationship with the microFIT

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[10] Accessed on November 20, 2010 from <http://veppi.org/>.
[11] Accessed on November 24, 2010 from <http://www.powerauthority.on.ca/Page.asp?PageID=1224&SiteNodeID=118>.

participant. The OPA maintains the production payment relationship for FIT participants. The utilities manage the grid interconnection process in both Ontario programs.

FiTs are often framed as economic development programs, and there could be potential benefits by administering them as such. If the program were administered by an economic development agency there could be the ability to coordinate a FiT with other related economic development initiatives, possibly sharing resources, synchronizing activities, and aligning objectives. This approach would help mitigate the tension between the three categorical objectives (i.e., inclusiveness, cost-effectiveness, and economic development) and help keep managers focused on the program aspects they are best equipped to handle. Also, this approach could open up possibilities for alternative financing structures for these programs, such as partial funding from public revenue sources instead of utility collections from ratepayers. Administratively decoupling the technical energy procurement aspects from the economic development aspects of FiTs, could be one way to situate a program to achieve non-energy goals.

No single type of organization has internal core competencies aligned with all of the categorical objectives of FiTs. Utilities conduct least-cost energy planning and ensure grid reliability, but do not take an active role in economic development or creating opportunities for diverse market participation. Civic leaders, public agencies, non-profit groups, and trade associations are concerned with economic development, but do not control access to the grid, do not have any technical expertise with managing power systems, and do not possess the information required to ensure grid reliability and performance. The more expansive and ambitious a FiT program's goals, the stronger the argument to align administrative responsibilities with functional competencies.

In Ontario, an external agency was a natural choice to sponsor the province's FiT program. There are over 70 electric utilities operating in the province.[12] The Green Energy and Green Economy Act (GEA) of 2009 outlined a broad vision for provincial energy and economic development.[13] The key components of the comprehensive legislation included a FiT, energy conservation programs, and elements designed to facilitate participation by community and aboriginal groups. The bill clearly articulated a framework intended to create 50,000 jobs in the first three years and eliminate coal from Ontario's energy generation mix by 2014. Given the scope and scale of the goals, an overarching agency was required to implement the measure. The OPA is a provincial organization responsible for planning and procuring electricity for Ontario in a reliable, sustainable, and cost-effective manner.[14] The situation in Ontario satisfied the four conditions necessitating the creation of an external agency, so the decision to sponsor the FiT program within the OPA was appropriate.

Sponsoring a FiT outside the utility could more effectively capture the positive externalities of FiTs, but it also carries a risk of increasing indirect transaction costs for participants by potentially adding one more stakeholder. If the external sponsor designed the program as a "one stop shop" for participants, it could lower transactions costs, especially for non-commercial participants, while simultaneously facilitating economic development. This alternative requires a strong argument for

[12] Accessed on December 1, 2010 from <http://www.ieso.ca/imoweb/siteshared/local_dist.asp?sid=ic>.
[13] Accessed on November 27, 2010 from <http://news.ontario.ca/mei/en/2009/05/ontario-legislature-passes-green-energy-act.html>.
[14] Accessed on November 23, 2010 from < http://www.powerauthority.on.ca/about-us>.

developing the non-energy benefits outside of the utility, sufficient resources, effective management, and a formal political mandate authorizing it to operate externally.

3.2 Total Program Cap

An important design element of a FiT is the total amount of renewable energy capacity allocated to the program. It can be uncapped, allowing all eligible participants with a viable project to supply energy, or it can cap the total uptake at a predefined limit. The decision to cap the program will limit participation, economic benefits, and the achievement of any related objectives.

The Ontario FIT and microFIT do not constrain total uptake, but the U.S. programs do. Sensing the limited nature of the opportunity, renewable energy providers in each U.S. jurisdiction responded strongly to the FiTs. Vermont's SPEED program intended to procure 50 megawatts (MW) of renewables and 12.5 MWs of solar. The solar capacity was fully subscribed in one day. Gainesville's initial program targeted 4 MWs or renewable per year for 8 years. It achieved full subscription of the first year's capacity in one week, and the remaining capacity a few months later. Sacramento received applications for all of the 100 MWs or renewables available in the first 30 minutes that applications were accepted. Stakeholders in the U.S. programs expressed that a limited program allowed for learning and making improvements to any future iterations. Also, the cap makes it simpler to estimate program costs, thereby making it easier to justify the program to stakeholders whose primary concern is cost.

The decision to limit total capacity fundamentally alters the nature of a FiT program. There are significant amounts of latent demand for distributed renewable energy production in many areas of North America. The rapid oversubscription of the existing FiT programs in the U.S. is a clear indication that with reduced barriers to entry, many people who control access to productive sites are willing to supply renewable energy, or sell the rights to develop the renewable potential, to a third party. The potential supply of distributed renewable energy under well-designed feed-in regimes greatly exceeds any policy-supported demand for renewable energy in the U.S. to date. A FiT program unlocks the supply potential. But by simultaneously offering a reasonable, cost-based tariff and capping participation, the program creates policy-induced scarcity with respect to capacity. This scarcity can create uncertainty and administrative challenges.[15] Managing the issues related to this scarcity is one of the key implementation challenges for FiTs.

In times of fiscal austerity and economic uncertainty, capping a program may be the only practical alternative for a jurisdiction. It allows for learning and greater flexibility to shape future iterations of FiT procurement. By capping total capacity, the program limits participation and thus limits the economic risks borne by ratepayers. It also commensurately limits any positive economic development effects. As program capacity is made scarcer, participation becomes more competitive. Participants with less means - small and non-commercial producers - are at a relative disadvantage, thereby reducing inclusiveness. However, a program cap can be a control mechanism to avoid overwhelming related administrative functions, such as permitting and interconnection, with a surge of new renewable projects.

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[15] Couture, T., et. al. p. 81.

In capped programs, total program cost and rate impacts can be estimated with relative certainty, but administrators are then faced with a set of decisions about how to allocate the scare capacity to best harness the positive externalities.

3.3 Capacity Allocation

If policymakers choose to limit total capacity, it will be necessary to allocate it in accordance with the program's objectives. Capacity allocation in a capped program is one of the most valuable ways to help meet the goals related to cost-effectiveness, inclusiveness, and economic development. Allocation decisions shape participation, manage ratepayer impact, procure cost-effective energy, and influence economic development. There are several common ways to allocate capacity: by technology, application, project size, by market segment, or over a time period.

The North American programs differ in how they allocate renewable capacity. Gainesville's program seeks 32 MWs of solar capacity over 8 years. They recently allocated 400 kilowatts (kWs) for projects less than 10 kWs with the intention of creating favorable conditions for residential participants.[16] Vermont created a one-time opportunity for 50 MWs of renewables, with capacity caps for each technology: solar, wind, biomass, landfill gas, farm methane, and hydropower. The Sacramento program was a one-time procurement of 100 MWs of solar without explicit targets for types of projects. San Antonio's CPS Energy's pilot Solar Power Producer (SPP) program aims to procure 5 MWs from rooftop solar PV projects under 500 kWs. Ontario does not allocate capacity other than to limit eligibility to projects under 10 MWs.

3.4 Time

Capacity can be allocated over the program's lifetime. Vermont and Sacramento allocated the entire capacity to a single procurement cycle. San Antonio is undergoing a pilot program and could choose to conduct one more 5 MW application round. While these procurement cycles could be repeated, there is no firm commitment to future procurement under the same terms. Gainesville's program demonstrated the City's long-term commitment to solar by creating annual procurements for 8 years, each for a portion of the total capacity. Ontario's long-term commitment to renewable energy and economic development was formalized through the Green Energy Act and the implementation of long-term, uncapped programs. For the foreseeable future, most Ontarians have the opportunity to be renewable energy producers. The Act allows capacity uptake to be available according to market actors' willingness to participate.

Capacity allocation over time helps facilitate a steady, long-term pipeline of new renewable capacity - a key ingredient to sustainable economic development. It also allows for opportunities to adjust a program as market conditions evolve. In recent years, the economic drivers of renewable energy have become more favorable, and installation costs have decreased, while the cost of substitutes

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[16] Accessed on October 15, 2010 from <https://www.gru.com/AboutGRU/NewsReleases/Archives/Articles/news-2010-09-27.jsp>.

has increased (e.g., oil). If these trends continue, allocating capacity over the long-term will help achieve cost-effectiveness and reduce rate-payer impact.

3.5 Geography

No program has allocated capacity by geographical criteria. Sacramento provided a strong market signal to participants by offering a land parcel map indicating the maximum solar capacity nearby substations could accommodate. Because participants pay for any required grid upgrades, this map likely guided participants to the lowest-cost sites. Without using explicit program rules, this market signal may have minimized total grid integration costs. There are opportunities for administrators to spatially allocate capacity, using either explicitly-defined rules or implicit market signals.

Allocating capacity according to spatial criteria may have important implications for cost-effectiveness. Prioritizing projects near substations with excess capacity and on distribution feeder lines could reduce the overall grid integration costs. Spatial allocation can also exclude participants with projects not in the preferred areas, thereby reducing inclusiveness, but also limiting participation in areas of network congestion

3.6 Categories & Carve-outs

Creating participation categories is one practical way to implement allocation decisions. Tariffs, eligibility requirements, or even program rules can be differentiated by category. The creation of categories can increase administrative complexity, but can also help facilitate market participation and orient outcomes towards inclusiveness. A highly inclusive program could differentiate the application process by creating a separate category to accommodate the needs of certain types of participants. The Ontario microFIT is a good example of a participation category that not only provides differentiated tariffs, but also differentiates the application process, the program rules, and the contracts.

A variation of creating distinct categories is creating carve-outs. A carve-out is a mandate for a specific quantity within a participation category. Examination of the North American FiT programs demonstrate that in order to ensure participation by small solar producers (residential and small businesses), a specific carve-out is required. The carve-out reserves a slice of the total opportunity for certain participants and excludes others, such as professionals with greater means to find viable project sites, meet deadlines, post fees and deposits, and meet other application requirements. A carve-out is the most certain way to assure inclusiveness and provide opportunities for certain disadvantaged persons or entities to participate. With overall restrictions on total available capacity, appropriate allocation is critical to the success of the program.

3.7 Program Adjustment Procedures

The decision of how, when, and why to adjust the program parameters is important because every program experiences amendments and evolves with market conditions. The adjustment can be part of a scheduled program review or it can be a necessary, unscheduled revision to the program rules. For programs that are cyclical, having recurring application and contract cycles, it is important to plan how to review parameters like tariffs. Also, should a major amendment to the program rules be necessary, it is important to plan how to do this. Inevitably, market conditions will change, power producers will respond in unanticipated ways, or a few participants may take advantage of gaps in program rules to reap unintended benefits. Decision makers should proactively plan for adjustments.

The long-term FiT programs in Ontario and Gainesville have mechanisms to adjust the participation parameters as market conditions evolve. Gainesville published a rate schedule for each of the eight years of the program. The schedule decreased the tariffs each year for newly executed contracts. San Antonio is undergoing its first round of two 5 MW annual rounds. Year two will be revised based on what is learned from year one. There is less of a need to make adjustments or revisions to the Sacramento or Vermont programs since the procurements were single and limited.

Unscheduled revisions are detrimental to the credibility of the program and will reduce stakeholder confidence and increase uncertainty. Surveyed participants in the North American programs expressed frustration with unscheduled revisions, labeling this as a significant regulatory risk of participation. The need for greater transparency about how, when, and why revisions will occur was a frequently mentioned criticism. Furthermore, any systemic uncertainty regarding program adjustments or revisions can increase the cost of capital, requiring higher tariffs and increasing ratepayer impacts.[17] It is beneficial for administrators to minimize unscheduled revisions. Limiting unscheduled revisions only to when the fundamental integrity of the program's objectives is at risk, is in the best interest of stakeholders.

Because of the negative impact of unscheduled revisions and the need to maintain program flexibility, adjustment and revision can be structured into the program before they are necessary. Scheduled adjustments and decision points are one way to avoid the uncertainty of ad hoc revisions, and to share cost savings with ratepayers if market conditions improve.

3.8 How and When

Administrators are faced with two alternatives for making a scheduled rate adjustment. Changes can be pre-programmed like Gainesville's tariff degression scheme, or there can be a comprehensive review of market conditions and a subsequent adjustment decision. The costs of a pre-programmed schedule can be forecast with relative certainty, thereby limiting risk to ratepayers. A market review and subsequent adjustment could work either in favor of, or against, ratepayer interests, assuming it is intended to provide a consistent rate of return to participants throughout the adjustment cycles. The advantage of a market review is that changes in costs are shared equally by all stakeholders, regardless of the direction of the change. Also, a market review model shifts the economic risks of renewable energy production from individuals to society, thus better aligning the production costs with those who are reaping the economic and environmental benefits. A hybrid of these two models (i.e., scheduled forecast, and market reviews) would require an annual decline of tariffs within a pre-defined range, such as the tariffs offered by the German EEG FiT.[18]

[17] California Energy Commission (2010). *Feed-in Tariff Designs for California*. p. 14.
[18] The EEG (Erneuerbare-Energien-Gesetz) is Germany's renewable energy law.

Finally, administrators must decide when to make the adjustment decision. One option is to make adjustments when certain capacity milestones are met. This model is used by the California Solar Initiative, often described as having some of the characteristics of FiTs.[19] Another method is to plan for regular reviews. Annual or biannual reviews are a common way to make rate adjustments. A capacity-based trigger creates uncertainty about the actual rate adjustment date, while a time-based trigger can expose the program to the risks of rapid market evolution between adjustments.

The most important characteristic of any revision or adjustment scheme is risk. Because risk is related to cost, the party bearing the risk may affect the party bearing the rate increase. Administrators must astutely balance program flexibility with risk to participants. The more flexibility reserved to amend a program during future periods, the more risk allocated to participants. As risk increases, some participants will be excluded, lacking either the desire to bear the risk or the ability to pay increasing financing costs.

4. Application & Program Rules

Decisions about program rules relate to the procedures governing the pre-contractual relationship between sponsors and participants. The pre-contractual phase entails both program application and project development activities. The structure of the program application and rules directly affect the ability to achieve a FiT's goals. Eligibility as it pertains to inclusiveness and economic development is defined at this stage. If the application process is onerous, time consuming, or expensive, it may automatically eliminate potential participants, especially those with less means. Overall cost-effectiveness will be affected by the application and project development activities. If transaction costs are high, then tariffs must be sufficiently high to attract participants. Inversely, if transaction costs are too low, speculative participation may create unnecessary costs for all involved. The decisions made at this stage are the primary means to discouraging counterproductive participation.

Key Decisions about Program Rules:

- Application Interface
- Participant Pre-Qualifications
- Project Evaluation & Selection Criteria
- Fee, Deposits & Development Milestones
- Transfer of Queue Positions

The application includes the procedures used by an applicant to request participation in the program, and procedures for sponsors to select projects in the event of oversubscription. This phase includes all interactions and exchanges of information and/or funds from the initial contact, to the execution of the purchase contract between the participant and the sponsor. These activities involve the participant providing information about themselves, their project, and the site. The participant may be required to demonstrate a reasonable amount of commitment to the project. The

[19] The California Solar Initiative is one example of degression of a performance-based incentive. Accessed on October 16, 2010 from < http://csi-trigger.com/>.

sponsor is required to collect the applications, evaluate them, prioritize them, and communicate the results to the participant.

The purpose of the application phase is to efficiently process a large number of participants and to formalize the relationship between the sponsor and the participant. Other important objectives of this phase are to ensure grid reliability, minimize transaction costs, and allocate risk between parties in a mutually acceptable fashion. Businesses, government entities, utilities, and individuals undergo similar contracting activities in their normal day-to-day activities, but FiT programs are different. Well-designed FiT programs transform a low-volume, resource-intensive process (conventional power procurement) into a high-volume, resource-efficient process. It will eliminate or reduce the unnecessary barriers to entry, create access to renewable energy resources controlled by small producers, expand the market for distributed renewable energy, and facilitate local economic development. If the application process itself presents unnecessary burdens, it can reduce overall program effectiveness.

The North American programs have many features in common with regard to the application process. The basic mechanisms are fairly straightforward. Each program has a well-defined application interface that requires the participant to submit an initial packet of information about themselves and the potential project. The sponsor checks the packets for completeness and ensures the participant's eligibility. Incomplete packets or ineligible participants are rejected, while those that fulfill the conditions are assigned a tracking number representing the order in which the applications were received. Given the program's capacity limitations, late application submissions may not be reserved capacity. From this point forward, the utility evaluates the grid interconnection impacts of individual projects, determining the cost of interconnection. The participant is required to prove control of the project site and pay the cost of interconnection. The application phase is completed after the purchase contract and interconnection agreement are executed. Permitting and code compliance is the responsibility of the participant or their representative.

4.1 Application Interface

Decisions about how to design the application medium can affect inclusiveness and cost-effectiveness. The three basic options are hand delivery, postal delivery, or a web interface. The municipal utility sponsors we studied required applicants to submit paper-based applications; San Antonio required a hand-delivered packet, and Sacramento allowed hand delivery or postal delivery, but could not guarantee a place in the queue for postal deliveries. Gainesville allows hand or postal delivery for its periodic application windows. The provincial or state programs created a web-based application with procedures to submit the required paper documentation.

The application interface decision is related to the queue management decision. Hand-delivered applications can add significant transaction costs to participants residing or operating outside of the jurisdiction. Also, in programs with both FCFS selection criteria and high demand, hand-delivery will favor those participants who can afford to arrive in line earliest. It would be challenging to efficiently differentiate postal deliveries if the evaluation criteria were FCFS. Furthermore, a web-based application interface could be automated to gain an advantage in a FCFS system.

4.2 Pre-Qualifications

Having pre-qualifications to participation is a useful tool to help shape participation, deter speculative participation, and ensure the intended objectives are met. Pre-qualification requirements determine participant and project eligibility. The sponsor can shape participation, influence economic development outcomes, and determine the program's costs by implementing pre-qualification requirements.

Programs differ significantly in participant eligibility requirements. All programs require generation systems to be connected to the sponsor's grid, and most require physical location within the sponsor's jurisdictional borders. Sacramento does not explicitly require location in its service territory, and only requires connection to its distribution system. Presumably, it would be possible for the project be physically located outside of Sacramento's service territory and still be connected to its distribution network. All other programs require projects to be located within the borders of the jurisdictional programs or within the service territory of the utility programs.

No programs require a retail utility account except for the Ontario microFIT program. All others require participants to demonstrate evidence of site control early in the application process. San Antonio and Sacramento explicitly exclude projects that have received benefits under other ratepayer funded incentive programs. Gainesville's program guidelines exclude projects which have previously received a rebate or entered into a net metering arrangement. However, early participants were able to take advantage of Florida's solar rebate, the federal investment tax credit (ITC) and MACRS[20], and Gainesville's FiT, thereby decreasing their total investment payback time to one year or less. None of the programs require equipment invoices or contracts at the time of application. If a program has project capacity limits, they are enforced at this stage of the process.

4.3 Project Evaluation & Selection Criteria

If a FiT program has a capacity cap and is oversubscribed, it will be necessary to create a mechanism to select projects, allocate scare capacity, and reprioritize projects. The criteria used to evaluate and select projects in this scenario will shape participation and create unique management challenges.

Most programs selected projects on a "first-come, first-served" (FCFS)basis. Under this approach, projects are not evaluated on their intrinsic merits, but only by the order of their arrival. The sponsor manages the program reservations by chronologically sorting projects, thereby creating a "queue." Should all the program capacity be reserved for the earliest applicants, the later applicants are assigned an unreserved position in the queue and moved forward only as the earlier projects withdraw from the program. There were only two exceptions to the FCFS method. Participants in Vermont's SPEED program were selected for queue positions by random-number lottery. Gainesville

[20] Modified Accelerated Cost Recovery System (MACRS) is the U.S. Internal Revenue Service tax depreciation system.

initially relied on FCFS, but will open an application window in 2011 for queue positions to replace withdrawn capacity, and will use a random drawing in the event of over subscription.[21]

FCFS schemes are an important aspect of uncapped, European-style FiTs. There is an important difference between uncapped FiTs and U.S. FiTs, however. In the European-style FiT schemes total participation is not limited. Any potential producer is guaranteed access to the grid and a purchase contract with the local electricity distribution entity. Uncapped FiTs do not create the policy-induced, artificial scarcity conditions associated with capped FiTs. Ontario's programs are uncapped, and because the transmission and distribution network is generally congested in Ontario, projects must be evaluated with respect to the feasibility of grid integration (i.e. applicants are not guaranteed grid connection). Other than the nuance between priority interconnection and guaranteed interconnection, the Ontario and European FiTs are similar, as both bypass artificial scarcity by avoiding total project caps.[22]

The U.S. programs exhibit surprising homogeneity with regard to the evaluation and selection of projects. FCFS criteria favor those with the ability to be first in line, and not necessarily those with the best projects or the greatest ability for commercial operation. The first person standing in line on January 4, 2010 for the Sacramento program received queue positions for 60 MWs of the 100 MWs available. Lotteries create massive uncertainty regarding the outcome of the queue process. The uncertainty reduces the incentive for participants to invest time and money into finding and submitting high quality projects.

While they are an administratively expedient method to manage the queue, FCFS and lottery methodologies are a missed opportunity to commit limited public funds in a more responsible way. Similar to other public contracting mechanisms, applicants can be evaluated according to stated program goals. FiTs must create simplicity and accessibility, and introducing numerous or overly-complex evaluation criteria can create obstacles which are counterproductive to a simple and accessible program.

Any project evaluation and selection criteria must be relatively few, simple to understand, and transparent. Otherwise they undermine the inherent advantages of the FiT concept.

Examples of FiT Project Selection Criteria:

- Minimizing the cost of network upgrades
- Maximizing reliability of the existing network
- Investment in areas with specific socio-economic characteristics
- Minimizing visual impact
- Greatest ability of participant to perform (financial resources, development capability)
- Preferences for local content or certain labor practices

[21] Accessed November 10, 2010 from <https://www.gru.com/OurCommunity/Environment/GreenEnergy/solar.jsp>.
[22] Fink, Sari,Kevin Porter, Jennifer Rogers. "The Relevance of Generation Interconnection Procedures to Feed-in Tariffs in the United States," National Renewable Energy Laboratory, U.S. Department of Energy, October 2010.

FiTs are most effective at achieving rapid, widespread renewable energy and economic development when designed as uncapped, standard offers for renewable energy. Given uncertain political support and limited willingness to pay for renewable energy, there are opportunities to evolve the design of capped FiTs toward greater market responsiveness to program objectives and more responsible use of public funds.

4.4 Fees, Deposits & Development Milestones

Fees and deposits are funds committed by the participant at the time of application. These funds help align participant and sponsor interests during the pre-contractual phase of the project. A reasonable, non-refundable fee does not present a significant barrier to participation for single applications or for viable projects. Instead, it creates a justifiable disincentive to submitting a high volume of applications, or for submitting insufficiently planned projects. Generally, fees are not refundable, while the deposit is refundable under certain conditions. The deposit is held to ensure the participant's good faith in developing a viable project that meets the program's goals. The refundable deposit helps align participants' and sponsors' interests throughout the application and development processes.

Each program, except the Ontario's microFIT, requires participants to demonstrate their commitment to the project by paying an application fee and a development deposit. Gainesville's initial program did not include fees or deposits at the time of application, but they have been added after some applicant's failure to perform. Furthermore, Gainesville experienced the emergence of a secondary market for queue positions in its initial program design, suggesting that some of the initial applicants were more interested in the option value of the contract rather than investing in a solar project. Each program places a time limit for the participant to complete their obligations under the program rules. The participant's responsibility is to make progress towards commercial operation in accordance with pre-determined development milestones. Three programs studied require interim milestones to be met by the participant, or the participant risks losing their queue position.

Table 2 Table of Fees, Deposits, & Development Milestones

Jurisdiction	Fee	Deposit	Milestones
Ontario microFiT	None Required	None Required	Commercial Operation 12 months from Conditional Offer
Ontario FIT	Application fee of $0.50 per kW up to $5,000 (non-refundable)	Application security of $20 per kW for Solar PV in cash or letter of credit (refundable with performance)	Commercial Operation 3 years from contract date
Vermont SPEED	Administrative fee of $200 Due upon winning lottery queue selection (non-refundable)	Deposit of $10 per kW of installed capacity (refundable)	Commissioned within three years of contract date
SACRAMENTO (SMUD)	Interconnection Review fee of $1,400 (refundable if not offered a queue position)	Reservation Deposit of $20 per kW (refundable if not offered a queue position)	Commercial operation by end of 2012
Gainesville Solar FIT	Processing Fee $500 for <10kW, $1,200 for > 10kW (non-refundable)	Reservation deposit of $30 per kW (refundable)	3 milestones 1 year to put into operation
San Antonio CPS Energy	Application Fee of $200 (non-refundable)	I/C Evaluation fee of $10 per kW (refundable if application is rejected)	Commercial Operation within 270 days

Requiring an application fee can reduce transaction costs for the sponsor, but it increases the application burden for the participant. FiT programs are most effective at inducing widespread adoption of renewables when they are as simple and accessible as possible, but not every individual or entity is fully prepared to be a renewable power producer. Requiring a modest, non-refundable fee may help encourage small producers to conduct proper due diligence before submitting an application. This may also help prevent third party power purchase agreement (PPA) aggregators from submitting a high-volume of applications when they only have the resources for following through on a few.

Development deposits help motivate participants to meet pre-defined milestones in bringing the project to commercial operation. The deposits are applied to the project costs or refunded once the participant performs in accordance with the program guidelines. In the absence of a performance-based deposit, professional developers may be incentivized to delay progress until conditions are more favorable (e.g., equipment prices are lower or financing terms improve) or a fatal flaw is somehow resolved. Deposits may not be appropriate or necessary for non-commercial FiT participants, specifically residential participants. The tradeoff with requiring a significant development deposit is that less well-capitalized developers, many of which may be local entrepreneurs, are disadvantaged relative to established players. Performance-based deposits make it unattractive for developers to retain bad projects. They also prevent a “free option” on a publicly-funded asset. The way to ensure maximum inclusiveness is to remove any fees or deposits, but this can lead to speculative participation, reducing efficiency and increasing transaction costs for all parties involved. Careful design of this aspect of the program is required to balance competing interests.

4.5 Transfer of Queue Positions

The ability to transfer, sell, or assign a queue position before the project is in operation is an important element of a program's rules. Transfer of a queue position is distinct from a participant assigning the rights and obligations of an executed contract or an operating project. The legal definition of a queue position, and its associated rights and obligations, is an important consideration that can affect administrative costs and program participation .

Program designers must define the legal nature of a queue position and the participant's rights and obligations associated with this asset. There are two general alternatives that effect transferability: (1)a queue position could restrict the participant's rights to FiT payments at one specific energy delivery point, or (2) it could grant the participant the right to receive FiT payments for energy at any delivery point.

Participants in San Antonio, Gainesville, Vermont and Sacramento may not transfer queue positions to other participants. In the microFIT, participants cannot transfer or assign the conditional offer for a contract. The contract is only assignable after the project is in operation.. For the Ontario FIT, participants cannot transfer or assign their application until one year after it is submitted. Gainesville's program initially allowed transfer of queue positions, but an unintended consequence was the development of a secondary market for queue positions.

The ability to freely transfer an unrestricted queue position could make the program more attractive to some participants, but it may also create incentives that may be counterproductive to a program's goals. A queue position is a valuable financial asset, and the ability to transfer this asset to another party is a valuable financial option. A financial option allows participants to acquire the queue position and sell it for a profit if the opportunity arises. A secondary market for these assets may develop. While this would be beneficial to enterprising participants, it might prove to be unmanageable for the sponsor of a large program, generating excess costs and unreasonable administrative burdens. The option to transfer an unrestricted queue position may lead to speculative participation from those who are more interested in the option value of the contract than the project itself. Furthermore, allowing participants to transfer unrestricted queue positions reduces the sponsor's ability to manage the program in a way that best meets the program objectives.

On the other hand, the ability to transfer a queue position associated with one specific location allows professional developers the flexibility they need to manage a comprehensive portfolio of development projects in a dynamic market. Without the ability to transfer their work to another eligible participant, a developer assumes more risk by depositing any funds required at the time of the application. Also, participants will not be able to access capital if lenders and investors cannot acquire assets in the case of financial default.

5. Contracts

The terms and conditions of power purchase agreements (PPA) are an important means of distributing risk and cost between participants and sponsors, ultimately affecting transaction costs, participation and inclusiveness.

Key Decisions about Contractual Features:

- Assignability
- Default, Remedy & Termination
- Curtailment
- Products Purchased
- Labor Provisions
- Local Content

The bilaterally negotiated PPA is the cornerstone of the utility-scale renewable development process. It is the key agreement which aligns the interests of project stakeholders, and ensures that risk, costs, and benefits are allocated in a mutually acceptable manner.23 While the agreement is made directly between the project developer and the utility, there are many other stakeholders whose interests must be considered before any development can move forward.   Stakeholders include the developer, the utility, investors and lenders, the transmission operator, the engineering-procurement-construction contractor (EPC), the original equipment manufacturer (OEM), and regulatory agencies. Because of the numerous issues to be addressed and many indirect stakeholders to be accommodated, the negotiation process can be long and costly for all parties involved. A typical PPA negotiation period for large scale renewable energy projects may take 6 to 12 months, and cost between $100,000 and $200,000 in legal fees and transaction costs for the developer.

A FiT contract is a form of PPA, but it is different from conventional PPAs between commercial independent power producers (IPPs) and utilities. One of the benefits of FiT contracts is that the terms and conditions are standardized and non-negotiable, thereby creating a “take it or leave it” offer for market participants. Therefore, FiT contracts can reduce transactions costs by eliminating the need to negotiate numerous terms and conditions for every individual renewable energy project. In contrast to the time and money costs necessary to originate, negotiate, and execute a conventional utility PPA, FiT contracts are very resource efficient. However, great care must be taken at the project’s outset to design a standard FiT contract that suits the needs of all the project stakeholders.

A well-designed FiT contract accomplishes many things. First, it ensures the basic integrity of the power system by maintaining necessary operating standards and sound engineering practices. Second, it allocates risk and cost between parties in a way that facilitates broad market participation among a diverse set of participants. At the same time, the contractual-defined development milestones and deposits help ensure the good faith of the participant. Third, a FiT contract can lower financing costs and facilitate project development by reducing risk and simplifying the contracting process.

[23] Stoel Rives, LLP. (2009). *Lex Helius: The Law of Solar Energy, Second Edition*. Ch. 3. p. 1.

Some important features are contained in the interconnection agreements, and not in the FiT contracts. In Vermont and Ontario the interconnection agreements are between the participant and the local load serving entities because the two entities are separate, and are therefore are not standardized.

Relevant only to Utility PPAs:

- Base term (years) & extension options
- Energy performance & equipment availability guarantees
- Liquidated damages for not meeting guarantees or milestones
- Separate prices for delivered products (capacity, pre-commercial energy, contract energy, excess energy, RECs)
- Pre-pay provisions
- Curtailment (for economic reasons)

Relevant to both Utility PPAs and FiT contracts:

- Default & remedies
- Assignment rights
- Termination rights
- Curtailment (for technical or safety)
- Development security deposits
- Development milestones
- Interconnection agreements
- Tax obligations
- Purchase options
- Lender protections

5.1 Assignability

The ability to assign the rights and obligations of the executed FiT contract to another party will affect participants' perceptions of risk. This is distinct from the ability to transfer a queue position, which is a pre-contractual asset.

Gainesville and Vermont allow the participant contracts to be freely assigned, while the other programs require the sponsor's consent to assign participant rights and obligations. The contracts also require that consent not be unreasonably withheld. In all other programs studied, assignability of the sponsor's rights and obligations is allowed with consent, except for the Ontario microFIT, where no consent is required.

Assignability is a critical aspect of reducing risk and increasing certainty for participants. For small, non-commercial participants, the ability to assign the contract is important because the ownership of smaller sites, such as residential homes, may frequently be transferred. For larger commercial participants, assignability is an important part of project financing. It is unlikely that a commercial FiT project could be financed without collateral assignment stipulations in the contract. When a project loan is in financial default, lenders will require the right to assume the FiT contract from the developer and keep the project operating in order to maintain cash flow. Therefore, assignability is a necessary feature of FiT contracts.

5.2 Default, Remedies & Termination

Default provisions specify the conditions for contract non-compliance. Each contract lists conditions or events which place one or both of the parties in default. Gainesville, San Antonio, Vermont and the Ontario microFIT define default to be non-performance, or misrepresentation by the participant. Ontario's FIT specifies a detailed list of conditions where either the participant or the sponsor is in default. More importantly, each contract, except for SACRAMENTO, provides remedy procedures, primarily consisting of cure periods up to 30 days.

Termination clauses dictate the conditions under which a party to the contract may exit the agreement. The San Antonio, Gainesville, and Ontario's microFIT contracts allow the participant to freely terminate the contract without cause. In these programs the sponsors may terminate only when the participant is in default and only after a cure period. In Vermont, the participant and sponsor may terminate only after a default event and a cure period. In Ontario's FIT a party may terminate the contract if the other party defaults.

The Sacramento contract is favorable to the sponsor with respect to termination rights. The sponsor retains the option to terminate the agreement immediately without a cure period under certain conditions of participant default (i.e., participant fails to meet development milestones, does not deliver energy for any period of 12 months or more, loses California state RPS certification, or if the law prevents SACRAMENTO from fulfilling its obligations). Furthermore SACRAMENTO may also terminate if uncontrollable external events (known as "force majeure") prevent them from performing.24 The participant may terminate only due to force majeure. It does not allow for participant termination without cause, or even for sponsor non-performance.

The ability to terminate without cause reduces overall participant risk. If for unforeseen circumstances the participant is unable to produce energy within the contract-defined parameters, termination at the option of the participant is a mutually-beneficial exit strategy. Given that many participants in a FiT program are not professional energy producers, unforeseen circumstances that impede production capability could become a concern.

It is not in the economic interest of the participant to prematurely terminate the contract once the project reaches commercial operation. Because the participant has made a large investment in generation equipment, the risk associated with capital asset ownership is shouldered by the participant. Each participant is incentivized to maintain the system in order to receive the recurring, long-term benefits of participation.

Participants' ability to freely terminate the contract does not increase the aggregate risk to the sponsor in a comprehensive FiT program. The effect on total capacity of a single contract

[24] These types of events are defined as "force majeure," or events or circumstances which prevent a party to the contract from performing its obligations. These events are those that are beyond the reasonable control of the parties and not due to negligence.

termination is not material. Since the production capacity is diversified over a large geographic area and several market segments, termination risk among projects will not be highly correlated. Furthermore, in a capped program with sufficient tariffs, there would be replacement capacity readily available in the queue.

It would be impossible to generate widespread renewable development if the purchase contract could be terminated by the sponsor without significant cause. This would introduce barriers making it difficult to obtain project financing.

Gainesville's solar FiT allows participants to terminate the FiT contract and apply for a new interconnection agreement under prevailing policies (presumably net metering). Should the participant feel that it would be more valuable to self-supply, they can opt out of the FiT. This flexibility offers a valuable option to the participant with adequate site load.   FiT participants cannot move back and forth between these arrangements, but the ability to opt-out and reconnect under net metering is an important program feature that increases flexibility and reduces overall participant risk. The exercise of this option would not represent a material shift in the generation mix for the Gainesville Regional Utility. The ability to switch to a net metering program near the end of the FiT contract could be an additional incentive, as the equipment will likely continue to be operational for several more years.

5.3 Curtailment

Curtailment is the right of the sponsor to require the participant to reduce or halt energy delivery, and can be necessary for safety, technical, or economic reasons. Programs differ in the sponsor's ability to curtail the participant's production. All programs can curtail production for safety reasons or emergencies. The contracts vary in the description of the conditions where this action can be taken. In Gainesville's Appendix A to the contract, the interconnection agreement allows the utility to isolate the facility from the grid, without compensation, in emergencies where adverse impacts to the grid are suspected, or where participants fail to comply with the contract. Sam Antonio's contract allows the sponsor to disconnect the system when it "endangers persons or property," when there is evidence it "causes disruption or deterioration of service to other customers," or where they "reasonably determine that [the] Seller is failing to meet its obligations under the Interconnection Agreement."   In the contracts in Ontario and Vermont, where the sponsor is the not the same entity that manages the grid, no curtailment is specified.

While curtailment for safety reasons is an essential feature of any power system operation, technical curtailment for extended periods without compensation, or curtailment for economic reasons, increases risk to participants. If this risk is too great, it would reduce the ability to arrange financing for the FiT project and increase the cost of capital. This, in turn, reduces cost-effectiveness.

5.4 Purchase of Electricity and Environmental Attributes

Each contract contains a purchase or sale requirement, where the sponsor must purchase the entire output from the participant's contracted facility. In all cases, both the electricity and environmental attributes are transferred from the participant to the sponsor. The sponsor reimburses the participant in accordance with the FiT program guidelines.

All programs reviewed offer a tariff for bundled electricity and environmental attributes. Neither product is separately valued. Participants do not have the right to deliver any other energy except that which is generated by the contracted renewable facility. San Antonio and Sacramento are only required to compensate participants up to contractually defined periodic production caps. These caps are calculated from the maximum expected production under realistic conditions.

All programs offer cost-based tariffs, except Sacramento which offers a tariff equivalent to retail electricity rates with time-of-delivery multipliers. There were only six applicants for the solar capacity in Sacramento's program.[25] Each one was a professional solar developer willing to accept the development and financing risk allocated to participants by this program. This tariff structure meets Sacramento's policy objective to minimize ratepayer impacts, but it does not leverage renewable development to create an inclusive program, or spur local economic development.

5.5 Special Contract Provisions

FiTs can encourage economic development, but administrators must carefully balance this objective with cost-effectiveness. FiTs create direct employment opportunities associated with the construction of renewable energy facilities, but the upstream manufacturing employment effects of a FiT are uncertain. In the global market for capital, equipment, and services there is no guarantee of localized employment effects in the manufacturing sector without specific contractual provisions.

Ontario is the only program with contractual requirements to build a facility from locally-procured equipment. This provision ensured the FiT program supported the economic development objectives formalized with the passage of the Green Energy Act. Ontario's FIT requires that wind and solar projects in 2010 consist of at least 40% domestic content. In 2011 the requirement increases to 60%. The microFIT also requires 60% domestic content for solar projects.

FiTs can be framed as economic development tools. FiT projects create direct and indirect employment during the construction phase, but without a local hardware requirement there is no guarantee that materials will be locally procured, thereby stimulating manufacturing employment. A contract stipulation requiring a certain amount or type of equipment to be procured locally can encourage the development of the local industrial base, but it may also increase the cost of the equipment and reduce participation. Solar system integrators in Ontario indicated that locally-manufactured equipment was in short supply during late 2010, as the industry prepared for the 2011 increase. While they suggested this may be compressing margins, the overall effect on the program is not yet known.

Only one program stipulates labor certifications. Gainesville requires that FiT projects be installed by an installer certified by the North American Board of Certified Energy Practitioners (NABCEP), or by a solar or electrical contractor licensed by the state of Florida. The other programs did not specify any requirements in their program documentation. Every program is subject to electrical codes and local standards.

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[25] Accessed on September 25, 2010 from <http://www.smud.org/en/community-environment/solar-renewables/Documents/FIT%20Queue%20Applicants.pdf>.

6. Interconnection & Network Upgrades

The design of a FiT program introduces important decisions about how to integrate distributed renewable energy into the grid. Because the distribution network is an infrastructure asset with shared benefits, the problem of cost estimation and cost recovery is complex.

Key Decisions about Network Upgrades:

- Allocation of Cost
- Cost Estimation Methods

The cost of grid integration is variable. The key determining factors are the size of the project, the configuration of the distribution network (radial or area), and the penetration of the distributed energy source (e.g., solar) on the surrounding network. Small projects with modest penetration levels may not substantially impact the grid. Larger projects (hundreds of kilowatts), or dense concentrations of smaller projects, may necessitate upgrades to the utility-owned distribution network. The costs must be estimated on a case by case basis by conducting feasibility, system impact, and engineering studies of the proposed project or group of projects.

6.1 How to Assign Network Upgrade Costs

Each program in North America, except the Ontario's microFIT program, requires participants to pay the total cost of grid integration. Cost components include, the participant-owned electrical improvements up to, and including, the point of interconnection with the utility network (e.g., line extensions and interconnection hardware) but also any required improvements past the point of interconnection (i.e., on the utility-owned network). In the microFIT program, participants do not pay for network upgrades, but if the OPA determines that a project cannot be integrated without a formal Connection Impact Assessment study, the participant is ineligible for the microFIT and must apply for the FIT program. The participant is required to pay these costs before the FiT contract and interconnection agreements are executed, and before any upgrade work is performed.

Allocating network upgrade costs to individual participants is a way to keep ratepayer funded program costs as low as possible. For FiT programs with geographically dispersed projects or low total capacity targets, allocation of network upgrade costs to individual participants may be the most efficient choice. But in large programs or geographically concentrated programs, allocating incremental utility-side network upgrade costs to individual participants may be inefficient and unfair. Assigning these incremental costs to participants as they move through the chronological queue, inefficiently and unfairly allocates costs to the unlucky participant whose project necessitates the upgrades. Earlier participants may escape upgrades, while the later participants shoulder the network upgrade costs for both. These incremental network upgrade costs may cause many participants to withdraw their projects, thereby creating a built-in barrier for specific projects that may not exist for comparable projects in different locations. Since the benefits of both clean energy generation and network reinforcements are system-wide, it is unreasonable to allocate the entire cost to individual producers seeking to interconnect.

6.2 *Cost Estimation*

Allocating network upgrade costs in an incremental fashion may be unworkable for large programs or those in dense urban areas. For this type of program, there is an opportunity to optimize the costs of utility-side network upgrades through periodic system-wide impact and engineering assessments. These evaluations could determine the optimal upgrade configuration that would accommodate the scheduled FiT capacity, ensure grid reliability, and be cost-effective. This cost could then be allocated to the overall FiT program instead of individual participants. This cycle of planning and implementation could be repeated periodically and coordinated with other complementary utility capital planning programs. Furthermore, this systematic approach could identify optimal locations for grid-tied renewables and incentivize participants to locate there.

7. Conclusions

FiTs are special programs that procure energy and power, and contribute to objectives, such as cost-effective renewable energy development, inclusiveness, and economic development. Every project and program configuration contributes uniquely to these goals. The design decisions of policymakers and program administrators affect not only the structure of a program, but also its ability to achieve any related goals. Every implementation decision is a balancing act of competing interests. Every decision will require a tradeoff in achieving objectives, and policymakers must therefore establish clear priorities. Since policy priorities will vary from jurisdiction to jurisdiction, so will FiT design. Every program must be tailored to the specific location, and cannot simply be copied The design decisions discussed in this report are the policymaker's most important tools to develop a locally-tailored and effective FiT.

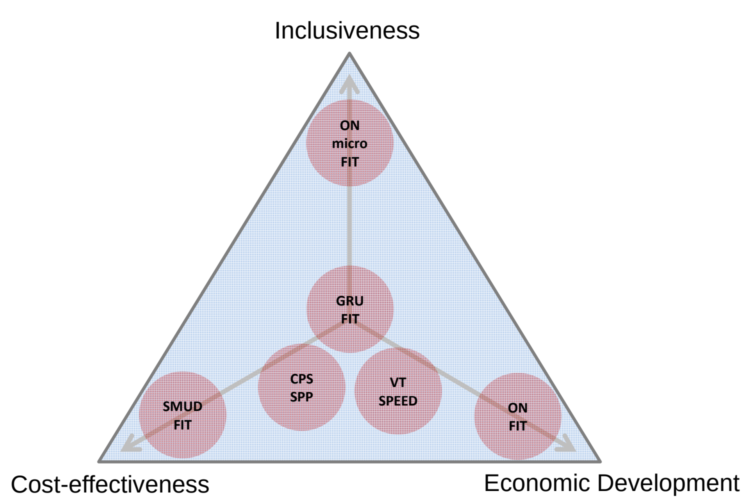
Decisions affecting the cost-effectiveness of a FiT program are the total program cap, capacity allocation, allocation of utility-side network upgrade costs, and allocation of participant risk through specific contractual features. The total program cap is the most direct way to limit the economic risk borne by utility ratepayers, and a program with a total cap can be budgeted with relative certainty. Policymakers can target specific types of participation that influence cost-effectiveness. Allocation of network upgrade costs to participants will minimize ratepayer costs, but shift both cost and uncertainty to participants. In a dense urban center, addressing these challenges in the most efficient way will greatly reduce overall program cost. Finally, as more risk is shifted to the participant through contractual features, the cost to finance a long-term project will increase. Eventually, these costs will be passed to ratepayers. Appropriate balancing of risk between participants and sponsors is in the best interests of not only the participant, but also ratepayers.

Inclusiveness and the ability to encourage diverse participation in terms of tax status, project size, or class of participant, is dependent upon the allocation of capacity, project selection criteria, participant pre-qualifications, and any fees, deposits, or other participant application requirements. Capacity allocation broadly affects cost and participation, so if inclusiveness is a priority, it must be planned into the program at this stage. If total capacity is limited, the establishment of project selection criteria can be structured to more efficiently meet program goals than "first-come, first-served" or lottery schemes. Inclusiveness criteria can ensure broad participation, supply diversity, and support local market development along the value chain. Pre-qualifications define who can submit an application, and any application fees or deposits can affect participation by increasing the initial commitment of the participant.

Economic development is primarily related to capacity allocation, total program cap, and any provisions for specific labor practices or local content. Allocating capacity over time creates a steady, predictable pipeline of new renewable energy development. Compared to a large, one-time procurement, a long-term program encourages sustained attention from the renewable energy industry, which is constantly reassessing the global market, shifting resources, and making long-term investment decisions to maximize value. The positive economic benefits of a program will increase as the total program cap increases. Without mandates for local content or labor practices, there is no guarantee of economic development in the upstream value chain. Any FiT program can create downstream development related to the construction and operation of projects. A long-term program and local provisions are the most direct tools available to decision makers to capture benefits in other areas of the value chain.

The programs examined in this study are examples of the diversity of the FiT mechanism, and how it can be designed to achieve non-energy objectives. With respect to the three categorical objectives, the programs can be described in accordance with the Figure 5. The Sacramento program was intended to maintain ratepayer neutrality, and economic development and inclusiveness were not objectives. The program accomplished its single objective by paying a low tariff, streamlining the contracting process, identifying the least-cost points of interconnection, and allocating capacity to professional developers of utility-scale solar who were willing and able to accept significant development risk. The one-time application process was designed to minimize Sacramento's transaction costs, and the contract transferred risk to the developer. Sacramento's program achieved no significant economic development for Sacramento. It did not present meaningful opportunities for residents, small businesses, or non-commercial entities to participate. If the projects enter commercial operation under the terms of the FiT, the program will have achieved its single goal of procuring solar without significant ratepayer impact.

Figure 4 FiT Case Studies and Non-Energy Policy Objectives



Ontario's FIT has two separate ways to participate, and each is effectively a unique program. The microFIT was designed to provide a venue for residential utility customers to participate in the FIT authorized by the Green Energy Act. This program maximized inclusiveness by making it easy for non-commercial producers to participate. The microFIT contract is very simple, as there are no application fees, and participants can transfer the contract (to another eligible participant) after the project is in operation. While there are many participants in the microFIT, the total capacity participation is low relative to the FIT program. Because each program is subject to domestic content requirements, Ontario will benefit from manufacturing investment and employment (at least while the program is in place). The majority of jobs created will be to service the equipment for the larger FIT projects. The programs differentiate tariffs by size and category of participation, increasing the average cost of energy relative to the most cost-effective technologies and larger projects. Also, the total ratepayer impact is more uncertain since the total capacity is not capped. Ontario designed its FIT and microFIT programs to meet the dual goals of inclusiveness and economic development.

Implementation of a FiT presents new challenges to the City of Los Angeles. It adapts the power procurement process to accommodate the specific needs of diverse renewable energy producers. It transforms an otherwise low volume, resource-intensive process into a high volume, streamlined process. It balances risk and cost between the buyer and seller in a different way than traditional procurement. Lastly, it may create cyclical workflow that must be anticipated in order to minimize administrative bottlenecks.

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9. Appendix: Counterproductive Participation Activities

Experience from other FiT programs highlights some of the unintended consequences that can occur when implementing a FiT program. Problems include overstimulation of the market, loss of political support, unexpected recalibration of program parameters, windfall profits to some participants, abuse of the program guidelines, or no participation at all. Some of these activities are common in the development market place. Not all of them are counterproductive, but they may or may not be acceptable for publicly-funded FiT programs.   Administrators must anticipate these activities and make deliberate decisions on which are detrimental to the program's goals. Examples of counterproductive or "gaming" activities:

Queue sitting: Reserving queue positions with the intention to build, but before site control is obtained (e.g., an installer reserving a queue position without before having obtained a purchase order from a homeowner).

Hoarding: Submitting many applications and reserving many queue positions but only having the resources (e.g., experience, access to capital, site control) or intention to deliver on one, or a few projects.

Speculative participation: Reserving a queue position with no intention to build, and waiting to be bought out at a profit.

Project splitting: A single owner on a single parcel dividing up the available generation into multiple metered projects to qualify for higher tariffs.

Category switching: Manipulating a project's characteristics to become eligible for a different category or more favorable tariff (e.g., construction of a simple, expedient structure where there was none before to transform a ground mounted project into a roof mounted project).

Clustering: A single owner of adjacent land parcels separately metering generation sited on each parcel to qualify for smaller projects and higher tariffs.

Double dipping: Receiving multiple ratepayer funded incentives (e.g., receiving both cash-based rebates and production-based FiT payments for the same project).

Misrepresentation: Intentionally supplying false or misleading information about the project, equipment, installation, labor services, or the eligible participant. Related to eligibility or special provisions.

Supplemental generation: Supplementing metered production with other non-qualified or non-contracted capacity ex post (e.g., diesel generation or incremental solar capacity).

Intentional delay: Once the queue position or contract is obtained, intentionally delaying the financing or construction of a project for unreasonable lengths of time to wait for more favorable conditions.

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